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**DEVELOPMENT, VALIDATION, AND TESTING OF THE EATING AND
FOOD LITERACY BEHAVIORS QUESTIONNAIRE WITH YOUNG
ADULT UNIVERSITY STUDENTS**

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The School of Nutrition and Food Sciences

by
Kwadernica Rhea
B.S., Spelman College, 2014
August 2019

This body of work is dedicated to my late grandmother,
Lula Mae Brown,
who taught me the value of education at an early age.

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ABBREVIATIONS

BMI	Body Mass Index
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
DGA	Dietary Guidelines for Americans
EFA	Exploratory Factor Analysis
EFLBQ	Eating and Food Literacy Behaviors Questionnaire
KMO	Kaiser-Meyer-Olkin
RMSEA	Root Mean Square Error of Approximation
SD	Standard Deviation
SRMR	Standardized Root Mean Square Residual
TLI	Tucker-Lewis Index

ABSTRACT

The Eating and Food Literacy Behaviors Questionnaire (EFLBQ) was developed, and its validity, reliability, and ability to measure construct changes was established. Items related to the originally proposed domains of food literacy were included in the initial questionnaire, however five, new components were discovered. The second version of the EFLBQ was tested with 257 young adult university students using exploratory factor analysis, and a five-factor model ($R^2=57.4\%$) was returned. Cronbach's alpha coefficients were calculated (health and nutrition=0.89, taste=0.72, food preparation=0.77, planning /decision-making=0.64, and convenience=0.63). A confirmatory factor analysis, with 923 new responses provided evidence of an adequate fit for the proposed five-factor model ($\chi^2=588.05$ (142), RMSEA=0.06, CFI=0.98, TLI=0.97, SRMR=0.05). The EFLBQ was administered to 67 different students two weeks apart and evaluated using a test-retest procedure. Pearson's r correlation coefficients demonstrated that the instrument was reliable over time (health and nutrition=0.92, taste=0.75, food preparation=0.74, planning/decision-making=0.63, and convenience=0.69).

In a second study, the EFLBQ's ability to measure change in young adult's health and nutrition, taste, food preparation, planning/decision-making, and convenience behaviors following participation in a four-week intervention program was assessed. Sixteen veterinary medicine students completed the *Eating with Ease* curriculum that was offered once per week for four weeks and included 30-minute sessions that emphasized each of the EFLBQ's factors. Twelve graduate students participated in a control group that did not receive the intervention. Both groups completed the EFLBQ pre- and post-program. Significant improvements in health and nutrition (pre-Mdn=2.9 to post-Mdn=2.9,

Z=2.222, $p=0.026$, $r=0.555$) and food preparation (pre-Mdn=2.8 to post-Mdn=3.0, Z=2.155, $p=0.031$, $r=0.539$) behaviors scores were noted in the intervention group. No differences were detected between change in EFLBQ factor scores between the intervention and control groups.

These findings support the EFLBQ's validity, reliability, and ability to measure changes in its factors. The results also suggest that the *Eating with Ease* Program promotes change in factors related to food literacy. Future studies are needed to validate the EFLBQ with larger, more diverse populations and to determine if the EFBLQ scores correlate with dietary quality.

CHAPTER 1. INTRODUCTION

Food literacy, comprehensively defined by Vidgen and Gallegos (2014), describes the practical elements of healthy eating and involves the ability to plan and manage, select, prepare and eat food. The novel concept emerged as an integrative framework to define relevant knowledge, skills, and behaviors necessary to maintain a healthy diet consistent with nutrition guidelines (Vidgen & Gallegos, 2014). Maintaining a healthy diet supports improved well-being and quality of life, and therefore acquiring the abilities needed to become food literate may offer a promising approach to foster healthier relationships with food. Studies have reported that food literate adults are more knowledgeable about nutrition guidelines, demonstrate better diet quality and more positive food-related behaviors than those with lower levels food literacy (Krause, Beer-Borst, Sommerhalder, Hayoz, & Abel, 2018; Poelman et al., 2018). Thus, helping individuals achieve higher levels of food literacy may be an effective strategy to foster healthier relationships with food.

Young adulthood may be an ideal period to strengthen food literacy, as obesity rates and evidence of young adults' poor dietary behaviors continue to grow in this population. Recent data suggest that nearly one of three young adults have obesity, a chronic disease often resulting from mediocre lifestyle choices (Dietz, 2017). Young adults tend to engage in poor dietary habits, including increased fast food and sugar-sweetened beverage consumption, and lower intake of fruits and vegetables (Popkin, 2010; Nielsen & Popkin, 2004; Paeratakul, Ferdinand, & Champagne, 2004). Consequently, most of the young adult population fail to meet nutrition recommendations, (Thorpe, Kestin, Riddell, & Keast, 2014). Supporting the implementation of programs that

support improvement and maintenance of healthy dietary behaviors has the potential to protect young adults from obesity and improve their diet quality (Allman-Farinelli, 2015; Chae, Ju, Shin, Jang & Park, 2018)

Interventions aimed at improving dietary habits have most often focused individual behaviors, rather than comprehensively targeting multiple behaviors as suggested by food literacy. Findings from these studies report significant improvements in distinct behaviors, such as meal planning, cooking, and food label use (Stran et al., 2016; Neuenschwander, Abbott, & Mobley, 2013; Brown & Richards, 2010). Demonstrating mostly positive results, these studies provided insight into the components needed to develop more comprehensive interventions that emphasize behaviors required to practice food literacy. To evaluate the efficacy of these forthcoming programs, adequate, food literacy survey tools, capable of monitoring food literacy behavior change, are indispensable.

Few food literacy measurement tools exist. Many of the available instruments based on Vidgen and Gallegos explanation of the concept, reveal its highly contextually nature and have been validated with limited populations (Begley, Paynter, Dhaliwal, 2018; Palumbo et al., 2017; Poelman et al., 2018; Wallace, Lo, & Devine, 2016). More comprehensive instruments that can measure various components of food literacy and recognize personal factors that may influence ability to attain food literacy are warranted (Poelman et al., 2018). Additionally, it would be beneficial if these tools were capable of monitoring behavior change in individuals who participate in food literacy interventions. These limitations demonstrate the need for more comprehensive tools that consider various components of context-specific food literacy and are valid in populations.

Therefore, the purpose of this study was to develop and validate a food literacy instrument that was capable of measuring change in young adults' food literacy behaviors following participation in an intervention program.

Study 1: Develop a food literacy survey instrument capable of measuring the components and behaviors related to food literacy in a sample of young adults

Objectives

1. Identify the components and behaviors of food literacy reported by a sample of young adults
2. Establish construct validity of the components used to measure food literacy by conducting an EFA and a CFA
3. Evaluate the internal consistency of the instruments using Cronbach's alpha coefficients
4. Test the reliability of the instruments using a test-retest procedure

Study 2: Determine the instrument's ability to measure pre- to post-program change in food literacy factors after participating in an intervention program and conduct a formative evaluation of the program

Objectives (Numbered) & Hypotheses (Lettered)

1. Determine if the proposed food literacy questionnaire demonstrates change in food literacy behaviors in a group of young adults who participate in an eating behaviors improvement program.

- A. The proposed questionnaire will measure pre- to post-program changes in young adults' food literacy following participation in a four-week eating behaviors improvement program.
- 2. Evaluate the effectiveness of an eating behaviors improvement program by measuring change in young adults' food literacy behaviors assessed by the proposed questionnaire.
- B. Young adults who participate in an intervention program will demonstrate positive changes in food literacy behaviors pre- to post-program while no change will be observed in a control group.

CHAPTER 2. REVIEW OF LITERATURE

Higher food literacy is associated with improved dietary habits and better diet quality in adults (Krause, Beer-Borst, Sommerhalder, Hayoz, & Abel, 2018; Poelman, Dijkstra, Sponslee, Kamphius, Battjes-Fries, Gillebaart, & Seidell, 2018). Studies have shown that food literate individuals more frequently consume fruits and vegetables and fish and eat larger portions of fruits and vegetables than those with lower levels of food literacy (Poelman, Dijkstra, Sponslee, Kamphius, Battjes-Fries, Gillebaart, & Seidell, 2018). Additionally, these individuals tend to be more knowledgeable about nutrition recommendations (i.e. salt intake) and possess greater self-control and less impulsiveness when eating (Krause, Beer-Borst, Sommerhalder, Hayoz, & Abel, 2018; Poelman, Dijkstra, Sponslee, Kamphius, Battjes-Fries, Gillebaart, & Seidell, 2018). These results suggest that food literacy supports healthy eating and positive dietary behaviors; however, studies to this end and adequate food literacy measurement tools are sparse.

2.1 The Emergence of Food Literacy & Defining the Concept

Mounting evidence supports the notion that many individuals lack the knowledge, skills, attitudes, and behaviors needed to maintain a healthy relationship with food (Colatruglio & Slater, 2014). In addition, complex challenges exist between personal desires, social norms, environmental influences, and health that adversely impact food choices, often resulting in overweight and obesity and the development of chronic disease (Colatruglio & Slater, 2014). These paradoxes ultimately point to the “lack of a healthy relationship with food.” To improve the public’s relationship with food, the concept of food literacy was developed.

Food literacy manifested as an integrative framework intended to describe the practicalities associated with healthy eating and offered the public an idea of what people need to know and do to navigate the current food environment and to cultivate a healthy relationship with food (Velardo, 2015; Vidgen & Gallegos, 2014; Colatruglio & Slater, 2014). Often used synonymously with nutrition literacy, food literacy substantially differs from the former as it is inherently more practical (Velardo, 2015; Krause, Sommerhalder, Beer-Borst, & Abel, 2016). Food literacy not only explained what constitutes a healthy relationship with food but how these components can be applied in daily living (Vidgen, Gallegos, & Caraher, 2012). Its usefulness offered a practical guide for individuals to foster healthier relationships with food, and therefore the term became a popular buzzword in policy and practice, although, there was no general consensus on its definition or its defining characteristics (Vidgen & Gallegos, 2012b; National Academies of Sciences, Engineering, and Medicine, 2016; Velardo, 2015).

The lack of a clear definition of food literacy guided research efforts intended to define the concept. Several definitions emerged, most of which considered the complexities of healthy eating in various context and attempted to identify food-related knowledge, skills, and behaviors that explain the concept (Pendergast, Garvis, & Kanasa, 2011; Desjardins, 2013; Slater, 2013; Cullen, Hatch, Martin, Higgins, & Sheppard, 2015; Vidgen & Gallegos, 2014). Some of these definitions are listed in Table 1, adapted from Truman et al.

Table 1.1. Some Existing Food Literacy Definitions (adapted from Truman, Lane, & Elliot, 2017)

Author(s)	Definition
Pendergast, Garvis, & Kanasa (2011)	“The term ‘food literacy’ as a component of health literacy has emerged, adopting the three levels generally used in the health schema. That is, an amalgamation of functional, interactive, and critical dimensions of food and nutrition that collectively can be described as food literacy. According to the Eat Well South Australia project (Government of South Australia, 2010, np), food literacy is the ‘capacity of an individual to obtain, interpret and understand basic food and nutrition information and services as well as the competence to use that information and available services that are health enhancing’ (p. 418)
Slater (2013)	Functional food literacy: basic communication of credible, evidence-based food and nutrition information, involving assessing, understanding and evaluating information; Interactive food literacy: development of personal skills regarding food and nutrition issues, involving decision-making, goal setting and practices to enhance nutritional health and well-being; Critical food literacy: respecting different cultural, family and religious beliefs in respect to food and nutrition (including nutritional health), understanding the wider context of food production and nutritional health, and advocating for personal, family and community changes to enhance nutritional health (p. 623)
Desjardins (2013)	A set of skills and attributes that help people sustain the daily preparation of healthy, tasty, affordable meals for themselves and their families. Food literacy builds resilience, because it includes food skills (techniques, knowledge and planning ability), the confidence to improvise and problem solve, and the ability to access and share information. Food literacy is made possible through external support with healthy food access and living conditions, broad learning opportunities, and positive socio-cultural environments (p. 65)

(Table cont’d.)

Author(s)	Definition
Vidgen & Gallegos (2014)	A collection of inter-related knowledge, skills and behaviors required to plan, manage, select, prepare and eat foods to meet needs and determine food intake,” as well as, “the scaffolding that empowers individuals, households, communities or nations to protect diet quality through change and support dietary resilience over time” (pg. 54)
Cullen, Hatch, Martin, Higgins, & Sheppard (2015)	Food literacy is the ability of an individual to understand food in a way that they develop a positive relationship with it, including food skills and practices across the lifespan in order to navigate, engage, and participate within a complex food system. It’s the ability to make decisions to support the achievement of personal health and a sustainable food system considering environmental, social, economic, cultural, and political components. (p. 143)

Most of the existing food literacy definitions share several defining characteristics including: skills and behaviors, food and health choices, culture, emotions, and food systems (Truman, Lane, & Elliot, 2017; Cullen, Hatch, Martin, Higgins & Sheppard, 2015). By considering the various factors that influence the relationship with food, food literacy provided a comprehensive approach to empower individuals to maintain a healthy diet amid complex challenges. However, most definitions focused on knowledge and understanding of these domains, rather than their functional components (Truman, Lane, & Elliot, 2017). Truman et al (2017) reported only 10% of 38 definitions available highlight skills and abilities related to the idea, and therefore neglect the practical components of food literacy. Given this information, definitions that include more practical elements of the concept may be better suited to promote food literacy (Truman, Lane, & Elliot, 2017).

Vidgen and Gallegos (2014) often receive credit for developing the most thorough definition of food literacy (Perry et al., 2017; Velardo, 2015; Truman, Lane, & Elliot, 2017), empirically defined as:

The scaffolding that empowers individuals, households, communities or nations to protect diet quality through change and support dietary resilience over time. It is composed of a collection of inter-related knowledge, skills and behaviors required to plan, manage, select, prepare and eat foods to meet needs and determine food intake (Vidgen & Gallegos, 2014, p. 54).

In simpler terms, these author's definition of food literacy referred to "the tools needed for a healthy lifelong relationship with food" (Vidgen & Gallegos, 2014). Vidgen and Gallegos's food literacy definition was cited as more comprehensive than others (Truman, Lane, & Elliot, 2017). These authors identified four individual, but inter-related domains and explicitly described individual components that constitute the ability to plan and manage, select, prepare, and eat food in everyday life (Truman, Lane, & Elliot, 2017; Vidgen & Gallegos, 2014).

The domains of food literacy were identified and described from extensive qualitative studies, conducted by Vidgen and Gallegos, with Australian food experts (n=43) and young people (n=37) to define food literacy (Vidgen & Gallegos, 2011; Vidgen & Gallegos, 2014). In these studies, planning and managing food emerged as a strong theme (Vidgen & Gallegos, 2014). Food experts conceptualized the ability to plan and manage food as the relationship between planning food intake and meeting nutritional guidelines, particularly in the context of a food environment where unhealthy options are more readily available (Vidgen & Gallegos, 2011; Vidgen & Gallegos, 2012; Vidgen & Gallegos, 2014). From the viewpoint of young people, this domain emerged from

reflecting on food arrangements in the home that may influence one's ability to plan and manage food (Vidgen & Gallegos, 2012; Vidgen & Gallegos, 2014). Secondly, selecting food was found to be related to understanding where food originated (Vidgen & Gallegos, 2014). More specifically, this included the ability to understand nutrition facts labels and the skills needed to choose healthy options (Vidgen & Gallegos, 2014). Though referred to more often by experts, young people were aware that understanding where food came from was important; however, their selection of certain foods was grounded in convenience, taste, shelf-life, availability of equipment, and skills (Vidgen & Gallegos, 2011; Vidgen & Gallegos, 2012; Vidgen & Gallegos, 2014). Both groups agreed that preparing food was an essential life skill, yet their perception of the level of skill needed to prepare food varied (Vidgen & Gallegos, 2014). Food experts suggested that preparing food included being able to control food intake and supported a healthy balance between nutrition and cost (Vidgen & Gallegos, 2011; Vidgen & Gallegos, 2012; Vidgen & Gallegos, 2014). Taste was highly regarded by young people as a significant factor in food preparation, and therefore, the motivation to prepare food was related to the ability to prepare "good tasting" food (Vidgen & Gallegos, 2014). Lastly, eating food was linked to nutrition and the consequences of inadequate food intake (Vidgen & Gallegos, 2014). The eating domain considered the impact nutrition has on personal well-being and how nutrition knowledge can be applied while consuming food (Vidgen & Gallegos, 2014).

To specify elements related to each domain, Vidgen and Gallegos combined data from both studies and established eleven components of food literacy (Vidgen & Gallegos, 2014). The ability to plan and manage, select and eat food included three components each, while preparing food consisted of two components (Vidgen &

Gallegos, 2014). For instance, planning and managing food encompassed the ability to prioritize money and time for food, plan food intake so that food is accessible irrespective of environmental changes, and make feasible food decisions that balance individual needs with available resources (Vidgen & Gallegos, 2014). The three remaining food literacy domains along with their respective components are detailed in Figure 1 (Vidgen & Gallegos, 2014).

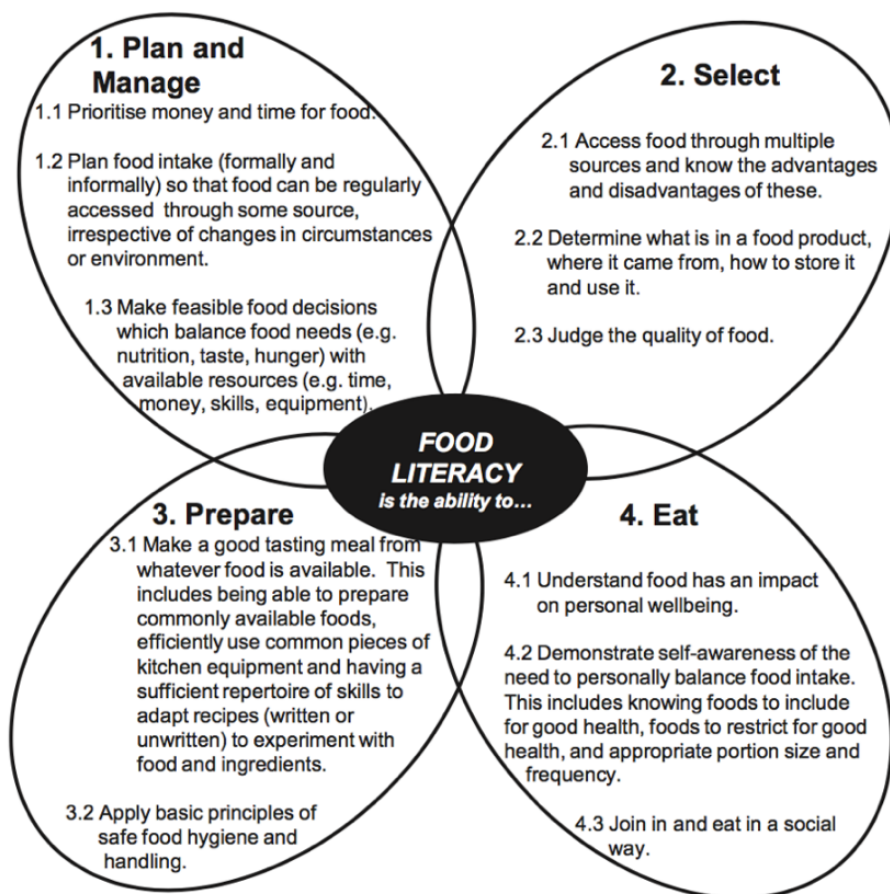


Figure 1.1. The eleven components of food literacy derived from the Expert and Young People’s Studies conducted by Vidgen H.A. & Gallegos D. (2014). Defining food literacy and its components. *Appetite*, 76, 50-59.

Vidgen and Gallegos’s definition of food literacy and its components propose an integrative framework to promote healthy eating, an important component of health

promotion (Truman, Bischoff, & Elliott, 2019). Thus, encouraging the public to become more food literate is a potential strategy to mend unhealthy relationships with food, particularly in vulnerable populations, who may be at a greater disadvantage. One group that comes to mind is young people, a population Vidgen and Gallegos (2014) used to develop the term, who expressed challenges with healthy eating.

Conceptualizing food literacy from two differing perspectives provided an in-depth look into the practical nature of the concept, particularly from the viewpoint of young adults (Vidgen & Gallegos, 2012; Palumbo, 2016). Vidgen & Gallegos' (2014) studies detailed young adults' perceptions of food literacy, which revealed concerns that hinder this population's ability to maintain a healthy relationship with food. In these studies, young adults indicated that they planned for better diet quality and managed their resources; however, they often lacked time, skills, and abilities to successfully implement their plans (Vidgen & Gallegos, 2014). Moreover, when asked about their experiences selecting foods, Vidgen and Gallegos (2014) reported that one of the more "conscious consumers," appeared to have limited food knowledge. Knowledge of these concerns demonstrate the need to promote food literacy in young adults.

2.2 Promoting Food Literacy during Young Adulthood

Young adulthood, often characterized as the ages between 18 and 30 years, is a critical developmental period during which many health behaviors are formed and these behaviors often track into adulthood (Laska, Larson, Neumark-Sztainer, & Story, 2012; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008). Unfortunately, young adults tend to engage in unhealthy behaviors, especially as it relates to diet (Guenther, Dodd, Reedy, & Krebs-Smith, 2006). Difficulty engaging in healthy dietary habits may persist

into adulthood and led to more complex health issues, such as obesity (Trivedi et al., 2015). Thus, it is essential to develop effective intervention programs that promote food literacy and specifically target behavior change in young adults.

2.2.1 Overweight and Obesity in Young Adults

In recent decades, obesity rates have increased exponentially among young adults. In 1971-1974, approximately 8% of young adults were considered obese (Ogden et al., 2013). Recent data suggest that this number has increased nearly three-fold to 35.7% of young adults living with obesity in 2017 (Hales, Carroll, Fryar, & Odgen, 2017). The growing prevalence of obesity presents serious concerns, especially for young adults, because its development is associated with poorer mental health outcomes and reduced quality of life (Centers for Disease Control and Prevention, 2017). Obese individuals are also at a greater risk for developing chronic conditions such as cardiovascular disease, type 2 diabetes mellitus (T2DM), musculoskeletal disorders, and some cancers (Hu, Jacobs, Larson, Cutler, Laska, & Neumark-Sztainer, 2016; *World Health Organization*, 2018).

Obesity is a multifaceted, complex disease that results from various causes and contributing factors, including individual behaviors. Behaviors may include dietary patterns and food-related habits. A healthy diet pattern follows recommendations from the Dietary Guidelines for Americans (DGAs) which emphasize consumption of fruits, vegetables, whole grains, lean-protein, low-fat and fat-free dairy products, and drinking water (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Conversely, young adults consistently fail to meet these guidelines

resulting in lower diet quality (Thorpe, Kestin, Riddell, & Keast, 2014). Diet quality in young adults is associated with food-related behaviors, which are a potential target for reducing obesity and improving young adults' relationships with food (Laska, Larson, Neumark-Sztainer, & Story, 2012; Krebs-Smith, Guenther, Subar, Kirkpatrick, & Dodd, 2010; Lipsky et al., 2017).

2.2.2 Young Adults' Dietary Behaviors

Studies suggest that young adults display some of the poorest dietary behaviors of all age groups, typically marked by excessive sugar, sodium, and fat intake and low consumption of fruits, vegetables, and fiber (Guenther, Dood, & Reedy, 2006; Popkin, 2010; Nielsen & Popkin, 2004; Paeratakul, Ferdinand, & Champagne, 2004). This is supported by the notion that young adults are major consumers of convenience foods and sugar sweetened beverages, habits linked to adverse metabolic health outcomes such as insulin resistance, increased waist circumference, and higher levels of LDL cholesterol (Popkin, 2010; Nielsen & Popkin, 2004; Paeratakul, Ferdinand, & Champagne, 2004; Duffey, Gordon-Latsen, Stefffen, Jacobs, & Popkin, 2009). Increased consumption of fast foods is negatively associated with healthy food intake in this population. Thus, it is no surprise that young adults consume less fruit, vegetables, and dairy than they did during childhood and engage in irregular meal patterns, such as meal skipping and excessive snacking (Cha et al., 2014; Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010; Satalic, Baric, & Keser, 2007; Kremmyda, Papadaki, Hondros et al., 2008).

Some components related to food literacy have been studied in this population. Studies have shown that young adults frequently consume convenience foods, engage

in unhealthy habits, and consume healthy foods in lower quantities. A recent study suggested that many young adults find it difficult to select appropriate foods, and as a result tend to make more impulsive food decisions prior to an eating occasion (Ducrot et al., 2017; Graham, Moe, Lytle, & Fulkerson, 2011). Additionally, young adults tend to select and consume foods that are commercially prepared, which is associated with poor diet quality (Thorpe, Kestin, Riddell, & Keast, 2014). Young adults also tend to report less frequent at-home food preparation, which is positively correlated with lower diet quality (Larson, Perry, Story, & Neumark-Sztainer, 2006). Lastly, young adults tend to consume the same foods on a daily basis leading to excess and/or deficiency of certain nutrients and are less likely to meet dietary recommendations for fat, calcium, fruit, vegetable, and whole grain consumption (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008; Larson, Perry, Story, & Neumark-Sztainer, 2006).

Improving young adults' food-related behaviors may be a possible strategy to foster healthier relationships with food and serve as a protective factor for developing overweight and obesity. Evidence of poor dietary behaviors during young adulthood imply that young adults may be an important audience for interventions to target behavior change. Strategies that apply the components of food literacy need to be implemented to support healthier eating habits and improve young adults' physical health, emotional well-being, and quality of life.

2.2.3 Interventions that Target Healthy Dietary Behavior Change

To our knowledge, studies aimed at developing and evaluating programs that explicitly promote food literacy behaviors are unavailable. However, there is evidence that

programs targeting behavior change of a single food literacy component, such as meal planning, at-home food preparation, food and nutrition label use, and healthy food/beverage consumption are effective. These programs, some of which have been evaluated with young adults, show promising results as it relates to dietary behavior change (Brace, De Andrade, & Finkelstein, 2018. Comprehensively targeting these behaviors in food literacy interventions may be a beneficial strategy to improve dietary quality and well-being (Ducrot et al., 2017; Reicks, Trofholz, Stang, & Laska, 2014; Graham, Moe, Lytle, & Fulkerson, 2011; Neuenschwander, Abbott, & Mobley, 2013; Larson, Perry, Story, & Neumark-Sztainer, 2006; Clark et al., 2019).

Recent studies have demonstrated significant improvements in behaviors related to food literacy. Stran et al (2016) conducted a quasi-experimental study with university students (n=97) to evaluate use of calorie-labels in fast-food restaurants. Participants selected food items from a menu with calorie labels after being distracted. These authors found that these students ordered significantly fewer calories when selecting from a labeled menu versus a menu without labels (Stran et al., 2016). They concluded that college students must overcome barriers such as cost and hunger status to select healthier dietary choices (Stran et al, 2016). By understanding barriers faced by young adults, researchers can develop strategies to facilitate healthy behavior change to improve food selection.

In a randomized, controlled trial, Neuenschwander et al discovered that low-income adults who participated in either a traditional, in-person (n=66) or web-based nutrition intervention (n=57) program reported significantly higher fruit, vegetable, and whole grain intake, and increased frequency of nutrition label use, breakfast consumption,

and meal-planning pre- to post-program (Neuenschwander, Abbott, & Mobley, 2013). Additionally, the web-based program, which included interactive lessons adapted from Supplemental Nutrition Assistance Program Education (SNAP-Ed) curricula that focused on specific nutrition behaviors, was determined to be more favorable among study participants (Neuenschwander, Abbott, & Mobley, 2013). Incorporating web-based modules, especially in programs geared towards younger adults, may provide a useful tool that supports behavior change in various contexts.

Lastly, as it relates to food preparation, Brown & Richards (2010) evaluated if a single assignment given to students enrolled in a university-level nutrition course could improve their cooking skills (Brown & Richards, 2010). To complete the assignment, students had to prepare a meal that included a protein, starch, and a fruit or non-starchy vegetable and serve the entree to someone who, in turn, would provide written feedback on the taste and nutrient content of the food (Brown & Richards, 2010). Some of the students indicated that the cook-an-entree assignment helped them realize that improving cooking skills is practical, valuable, and feasible (Brown & Richards, 2010).

These study outcomes demonstrate that individual behaviors, including meal planning, food preparation, food/nutrition label use, and healthy food intake, can improve following participation in an intervention program. These individual behaviors are related to components of food literacy, and therefore, should be addressed in programs that target improvements in food literacy. Additionally, findings from these studies may offer insight into the components that may be used to develop effective interventions. Programs that have utilized hands-on activities and web-based technology, support autonomy, and offer participants a supportive environment to thrive produced favorable

results (Neuenschwander, Abbott, & Mobley, 2013; Brown & Richards, 2010). This information may be used to develop interventions that target multiple components and behaviors related to food literacy. In addition to developing effective food literacy interventions, valid food literacy measurements tools are needed to evaluate program effectiveness.

2.3 Measuring Food Literacy

Accompanying the growing interest in food literacy and clarity of its components is the demand for comprehensive measurements tools (McKechnie, 2016). Adequately measuring food literacy is critical to evaluate the conceptualization of the new approach (Vidgen & Gallegos, 2010). To this end, valid instruments are needed to monitor individuals' food literacy, plan and assess the effectiveness of interventions, and inform policy and practice (Truman, Lane, & Elliot, 2017; Truman & Elliot, 2019). However, there is limited evidence detailing food literacy measurement (Truman & Elliot, 2019).

To date, few food literacy measurement tools exist that measure food literacy in adults. Amouzandeh et al (2019) found twelve valid, food literacy instruments, seven of which were based on Vidgen and Gallegos' (2014) definition of the concept (Begley, Paynter, Dhaliwal, 2018; Palumbo et al., 2017; Poelman et al., 2018; Méjean et al., 2017; Wallace, Lo, & Devine, 2016; Wijayaratne, Reid, Westberg, Worsely, & Mavondo, 2018). Wallace et al (2016) used a valid food literacy measurement tool to evaluate a food literacy in older adults living in Australia. Their 11-item instrument, based on Vidgen and Gallegos' definition of food literacy, captured change in participant attitude, confidence, dietary patterns, cooking behavior, and knowledge. Begley et al (2018) and Palumbo et al (2017) also developed valid food literacy tools that incorporated elements of Vidgen

and Gallegos' food literacy with adults in Australian and Italy, respectively. The 14-item Food Literacy Behaviors Checklist endured validity testing and revealed three, food literacy factors: planning and managing, selecting, and preparing food (Begley, Paynter, Dhaliwal, 2018). This brief checklist is easy to use and can evaluate behaviors related to known food literacy domains; however, it did not consider consumption or other possible influencers on food literacy. Drawing on the European Health Literacy Survey, the 96-item, Italian Food Literacy Survey evaluated knowledge and concept-specific skills related to all four food literacy domains identified by Vidgen and Gallegos (2014) (Palumbo et al., 2017). Pilot testing the instrument with a sample of adults revealed that food literacy in this population was lacking (Palumbo et al., 2017). When compared to other factors, lower food literacy was associated with poor health status and overweight (Palumbo et al., 2017). Unfortunately, this instrument is extensive and may place a burden on respondents and is only appropriate for use with Italian adults. Although, these instruments show evidence of validity, considerations should be made to develop concise measurement tools that measure a broad range of food literacy components in more diverse populations.

Additionally, Poelman et al (2018) developed the Self-Perceived Food Literacy Scale using Vidgen and Gallegos' framework and tested its validity with Dutch adults and registered dietitians (Poelman et al., 2018). Evaluation of this scale demonstrated its ability to comprehensively measure food literacy in adults. Their analyses revealed personal factors related to food literacy identified as resilience and resistance, social and conscious eating. Some of Vidgen and Gallegos' domains of food literacy were also identified as important components of the instrument (Poelman et al., 2018). Subsequent

studies conducted by these researchers compared the Self-Perceived Food Literacy Scale with dietary intake and found a positive association between higher food literacy and better diet quality (Poelman et al., 2018). Findings from these studies acknowledged personal factors that potentially influence food literacy and established the instrument's ability to comprehensively measure food literacy (Poelman et al., 2018).

To further expand the availability of food literacy measurement tools, multidimensional instruments that prioritize capturing the greatest amount of food literacy components should be established. These instruments also need to undergo validity testing to contextualize food literacy in more diverse and vulnerable groups. Additional research is needed to develop instruments that consider each of these factors and test their use in intervention programs.

CHAPTER 3. DEVELOPMENT AND PSYCHOMETRIC EVALUATION OF THE EATING AND FOOD LITERACY BEHAVIORS QUESTIONNAIRE WITH YOUNG ADULT UNIVERSITY STUDENTS

3.1 Introduction

Food literacy is a novel idea that describes an individual's ability to successfully manage their behaviors associated with eating an adequate and balanced diet (Cullen, Hatch, Martin, Higgins, & Sheppard, 2015). The most comprehensive definition of this concept states that, "food literacy is a *collection of interrelated knowledge, skills and behaviors required to plan, manage, select, prepare and eat food to meet needs and determine intake*" (Vidgen and Gallegos, 2014). Those with higher food literacy are thought to practice healthier meal planning, food selection, at-home food preparation, and higher consumption of fruits and vegetables (Ducrot, Méjean, Aroumougame, Ibanez, Allès, Kesse-Guyot, Hercberg, & Péneau, 2017; Graham, Moe, Lytle, & Fulkerson, 2011; Thorpe, Kestin, Riddell, & Keast, 2014; Larson, Perry, Story, & Neumark-Sztainer, 2006). Therefore, improved food literacy has the potential to promote nutritional health and play a critical/pivotal role in the prevention and management of chronic diseases such as obesity and type 2 diabetes mellitus (T2DM) (Palumbo, 2016).

Chronic diseases such as obesity, diabetes, cardiovascular disease and certain cancers are the leading causes of morbidity and mortality in the United States (Johnson, Hayes, Brown, Hoo, & Ethier, 2014). Nearly half of the American population (roughly 117 million people) have one or more chronic diseases, including obesity and type 2 diabetes (T2DM). Both of these chronic diseases are commonly associated with poor dietary intake and physical inactivity (HHS/USDA, 2015). Proper management and prevention of chronic disease requires consistent selection and consumption of the appropriate foods

and long-term maintenance of healthy habits. Alarming, the growing prevalence of chronic diseases posits a challenge for many individuals.

One of the leading challenges associated with chronic disease prevention and management involves the complexity of today's food system. The current food environment, which is convenience-centered, supports consumption of processed foods high in sodium, sugar, and fat (Hetherington & Blundell-Birtill, 2018). More specifically, young adults are the largest consumers of highly processed, convenience foods and sugar-sweetened beverages. In contrast this same age group consumes the lowest amount of fruits and vegetables (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008; Pelletier, Graham, Laska, 2014). Overall, young adults tend to exhibit some of the poorest dietary habits of all age groups (Guenther, Dood, & Reedy, 2006; Cha, Kim, Lerner et al, 2014). These unhealthy dietary behaviors support the growing prevalence of overweight, which leads to obesity and T2DM (Trivedi et al., 2015). Studies have emphasized the importance of better dietary choices in preventing chronic disease; however, young adults continue to engage in poor dietary behaviors (Cha et al., 2014; Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010; Satalic, Baric, & Keser, 2007; Kremmyda, Papadaki, Hondros et al., 2008; Thorpe, Kestin, Riddell, & Keast, 2014). Nonetheless, improving food literacy may have the potential to comprehensively address poor dietary behaviors.

The ability to measure food literacy behaviors among young adults requires validated survey instruments capable of measuring factors and behaviors related to the concept. However, to our knowledge, the few validated food literacy survey instruments available to evaluate food literacy either measure characteristics of food literacy as a

subset of health literacy, a distinct concept from food literacy, or overlook important factors that might be considered when making food decisions (Krause, Beer-Borst, Sommerhalder, Hayoz, & Abel, 2018; Velardo, 2015; Poelman et al., 2018). Therefore, survey instruments are needed to comprehensively evaluate and monitor food literacy as well as tailor interventions that address gaps in program evaluation, advocacy, and allocation of resources (Perry, Thomas, Samra, & Edmonstone, 2017).

In order to effectively measure food literacy in young adults, we need valid instruments, which take into account the various components and are designed to measure behaviors related to the different concepts. Therefore, the purpose of this study was to develop and validate a survey instrument, namely the Eating and Food Literacy Behaviors Questionnaire (EFLBQ), a questionnaire capable of measuring food literacy behaviors in young adults/university students. To this end, research objectives include: 1) Identification of components and behaviors related to this idea in a sample of young adult university students and 2) Determination of how these components factor into a food literacy survey instrument.

3.2 Methods

3.2.1 Item Generation

The EFLBQ was developed to be a comprehensive measurement tool capable of measuring young adult university students' food literacy behaviors as they related to planning, managing, selecting, preparing and eating healthy foods. To reflect the most current recommendations of the Dietary Guidelines for Americans (DGA), the EFLBQ described healthy foods fruits, vegetables, low-fat milk, fat-free milk, dairy products, protein foods and whole grains. In contrast, foods high in sodium (salt), solid fats, and

added sugars are considered less healthy” (HHS/USDA, 2015). The initial EFLBQ included behavioral statements related to each of Vidgen and Gallegos’ (2014) four components of food literacy. These components include one’s ability to plan/manage, select, prepare and eat food. Behavior statements were developed from the defining characteristics of each food literacy component (Vidgen and Gallegos, 2014). Each item was accompanied by a four-point Likert-type answer choice which includes: Never,” “Sometimes”, “Often”, “Always” and “Does not apply.” Eight questions asked about the respondent’s demographic information such as age, gender, race/ethnicity, height and weight, and living arrangements. Living arrangement options included where and with whom respondents lived, with respondents having option to select all that applied. Respondents were asked if they lived alone, with a roommate, with a spouse or significant other, with children, with a parent or grandparent. Similarly, respondents were asked if they lived in a dorm, an apartment, townhouse, condominium or house. If none of these options applied, respondents were able to choose “other” and asked to explain.

Behavior statements included in the questionnaire were developed based on Vidgen and Gallegos’ defining characteristics of each domain. The statements used to measure planning and managing food were based on behaviors *to prioritize money and time for food, devise a plan to access food regardless of changes in circumstance or environment, and make feasible food decisions to balance food needs with available resources* (Vidgen and Gallegos, 2014). Statements to assess selecting food included behaviors *to judge the quality of food, determine what is in a food product and/or its origin, access food through various sources, and understand the advantages and disadvantages of these*. The food preparation statements included behaviors performed *to make good*

tasting meals, properly use common kitchen equipment, and possess the skills to make and adjust recipes. Lastly, statements related to eating food included behaviors performed to *demonstrate understanding that food impacts personal well-being and the social context of eating.* All statements were written to be understood by a young adult university student audience and were reviewed by a nutrition educator and a program evaluation specialist prior to distribution

3.2.2 Questionnaire Development

A convenience sample of young adult university students 18 to 30 years of age enrolled at a large university in the southeastern United States participated in the preliminary analyses from February 2018 to September 2018. Professors gave permission for researchers to visit their classes, and students were recruited to voluntarily complete the online version of the EFLBQ. Researchers administered the questionnaire via Qualtrics (Qualtrics, Provo, UT) to students using a standard protocol where respondents were informed about the research study and the ability to win a \$10 gift card upon completion of the survey. Students were advised not to complete the questionnaire if they were younger than 18 years of age or older than 35 years of age and/or pregnant. Respondents were instructed to answer each question honestly and that their responses would remain anonymous. This study was approved by the Louisiana State University Agricultural Center Institutional Review Board.

The initial questionnaire consisted of 28 statements with seven statements for each of the four components of food literacy defined by Vidgen and Gallegos (2014). These preliminary data were analyzed using EFA to identify the latent constructs of the responses. Responses were subjected to principal axis factoring with promax rotation

(Tabachnick & Fidell, 2007). Principal axis factoring was used to minimize nonnormal data effects. Sample size was estimated using the recommended 10:1 ratio of observation of statements (Costello & Osborne, 2005). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used to determine item correlation quality, with a value greater than 0.6 being expected (Guadagnoli & Velicer, 1988). Redundancy of factors was evaluated using the Bartlett's test of sphericity and was expected to have a significant p-value ($p < 0.001$) (Hair, Black, Babin, & Anderson, 2009). Factor inclusion criterion was determined by using a minimum value of 1.0 extracted eigenvalue and the number of factors indicated by a scree plot. Individual statements were retained if factor loadings on both the pattern matrix were greater than 0.40 and no extreme multicollinearity was observed ($r \geq 0.90$). If an item loaded highly on more than one factor, it was removed prior to further analyses.

The questionnaire was administered to 310 students in five university classes. These five classes included two nutrition classes ($n=40$ and $n=58$, respectively), one psychology class ($n=77$), one residential college class ($n=50$), and one business law class ($n=85$). Demographic information regarding age, gender and race/ethnicity were collected. Body Mass Index (BMI) was calculated from each participant's self-reported height and weight. A total of 304 responses remained in the analysis after responses containing missing data were removed. Respondents had a mean age of 20.2 ± 2.2 years and mean BMI of 24.0 ± 5.1 kg/m². The largest majority of respondents were female (69.1%, $n=210$) and self-identified as White/Caucasian (79.0%, $n=240$). The largest percent of respondents lived with a roommate (72.4%, $n=225$) and in an apartment, townhouse, or condominium (39.1%, $n=119$).

The analysis (n=304) demonstrated acceptable sampling adequacy (KMO=0.810) and significant sphericity (Bartlett's test $p < 0.001$), both suggesting sufficient correlation among statements to permit factor analysis. The initial EFA returned 14 statements and four factors that explained 45.4% of the variance. Three of the four factors were related to Vidgen and Gallegos's food literacy: planning, managing and eating food (4 statements), selecting food (5 statements), and preparing food (3 statements). The fourth factor was interpreted as food safety and included only two statements. Because food safety was thought to be an important factor related to food literacy, it was retained with only two loaded items. Thus, the questionnaire did not factor as expected into planning, managing and eating, selecting food, and preparing food suggesting that Vidgen and Gallegos' components may differ in a young adult university student population. An important observation was that planning and managing factored with eating. This suggests that young adult university students may engage in planning immediately before eating rather than in advance. As a result, this finding was addressed in the second version of the questionnaire.

A second version of the questionnaire consisted of 27 statements that examined food literacy behaviors including choosing, purchasing, preparing and consuming foods in a young adult university student population. This version of the survey underwent the previously mentioned preliminary validity testing. These constructs appeared to be more appropriate after it was determined that food literacy did not factor into the four domains explained by Vidgen and Gallegos (2014). New constructs were developed after the initial analysis was carefully reviewed. Twelve statements were retained from the first analysis. They included four statements related to planning/managing and eating food, five

statements related to selecting, and three statements related to preparing food. However, most of these statements were reworded to fit the aspects of the new constructs and for clarity. Fifteen new statements related to choosing, purchasing, preparing and consuming foods were created. Statements about choosing foods were similar to the domains of planning and managing and selecting as explained by Vidgen and Gallegos. The construct of choosing included statements about immediate planning, decision-making and appropriate food selection. Statements regarding purchasing food focused on prioritizing money for, budgeting, and buying food. Statements about preparing food were adapted from Vidgen and Gallegos (2014). Lastly, statements with respect to eating were also adapted from Vidgen and Gallegos's eating domain. However, it is important to note that some statements were added to include behaviors performed while consuming food. In total, there were seven statements each to examine choosing, purchasing, and consuming foods and six statements to examine preparing foods. This questionnaire included demographic questions about the respondent's age, gender, race/ethnicity, height and weight. Questions about the respondent's living arrangements were removed. Respondents were asked to indicate the extent to which they identified with each of the statements based on a 4-point Likert scale with possible responses of: "Never," "Sometimes," "Often," and "Always." The choice "Does not apply" was removed.

Previously mentioned data collection methods were used to gather responses from a separate sample of young adult university students. The second version of the questionnaire was administered to 277 students in six university classes: three nutrition classes (n=44, n=61 and n=10, respectively), marketing class (n=71), accounting class (n=32), and kinesiology class (n=59). Demographic information about age, gender, and

race/ethnicity, were collected. Each participant's BMI was calculated from their self-reported height and weight.

A total of 263 respondents remained in the analysis after the removal of missing data responses. Respondents had a mean age of 21.3 ± 2.7 years and BMI of 24.2 ± 4.5 kg/m². Most of the respondents were female (59.0%, n=161) and white (75.1%, n=205). An EFA demonstrated acceptable sampling adequacy (KMO=0.869) and significant sphericity (Bartlett's test, $p < 0.001$) were established providing evidence to perform factor analysis. Twenty-one statements were retained in the analysis. Five factors were returned that explained 55.7% of the variance. The factors were interpreted as food literacy behaviors regarding health and nutrition, food preparation, planning and decision making, convenience and conscious eating. While taste was interpreted as a sixth factor, this factor contained only two statements and did not meet the previously mentioned factor inclusion criteria. Based on the interpretation of the factors retained in the model, taste was suggested to be an important factor. Therefore, additional taste statements were added to a third questionnaire to test this idea. All of these preliminary analyses were performed using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).

3.2.3 Survey Validation

A third version of the EFLBQ with 24 items was administered to 265 students in September 2018. The students were from four university classes: nutrition (n=28), psychology (n=100), finance (n=49), and sociology (n=88). Data collection methods remained as previously stated. Demographic information including age, gender, race/ethnicity, and self-reported height and weight were collected. Each participant's BMI

was calculated from their self-reported height and weight. Exploratory factor analysis was performed using the previously explained methods. Internal consistency and reliability of the questionnaire was assessed using Cronbach's alpha coefficients greater than 0.60 for each retained factor. Factor mean scores and standard deviations were created. Analyses were conducted using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).

A CFA was performed on the proposed five-factor model generated by the EFA to confirm the factorial structure of the EFLBQ. A convenience sample of young adult university students between 18 and 30 years of age were recruited to complete the online EFLBQ for the CFA. The same standard protocol used for the EFA was followed. A total of 936 students enrolled in management (n=715), mass communications (n=129), nutrition (n=26), and philosophy (n=59) courses completed the questionnaire in October 2018.

Goodness of fit for the model was assessed using absolute and comparative fit indices as well as parsimonious fit. Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) were used to assess comparative fit. For both of these indices, values greater than or equal to 0.95 indicated models with good fit (Hu & Bentler, 1999). A point estimation of reliability was computed as part of the confirmatory factor analysis along with a 95 percent confidence interval for the Root Mean Square Error of Approximation (RMSEA). The confidence interval provided a clear representation of the range of plausible reliability point values in the sample. RMSEA and Standardized Root Mean Square Residual (SRMR) were used to assess absolute fit. Cutoff values close to 0.06 for RMSEA and

0.08 for SRMR were considered a good fit (Hu & Bentler, 1999). *Mplus* Version 7.3.1 was used for this analysis (Muthén & Muthén, 2015).

Questionnaire reliability was further analyzed using the test-retest procedure. This method determined the replication of scores in the same population over time. There was a two-week period between the initial test and retest administration for the EFLBQ. The EFLBQ was administered to 87 students enrolled in two nutrition courses (n=45, n=42) from December 2018 to January 2019. The test-retest was limited to these courses due to availability and instructor permission. The same standard protocol used for the EFA and CFA was followed for the test-retest analysis. Pearson's *r* correlation coefficients were expected to be greater than 0.60 for each of the factors to demonstrate acceptable test-retest reliability. Analyses were conducted using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).

3.3 Results

3.3.1 Descriptive Statistics

We first sought to understand the gender, race and ethnicity of respondents' who participated in the EFA, CFA, and test-retest reliability analyses performed on the third and final version of the EFLBQ presented in Table 3.1. In each of the analyses, most of the respondents were female and white (Table 3.1). In total, 256 students provided demographic information for the EFA. The mean age of respondents was 20.0 ± 3.4 years and BMI was 24.7 ± 5.5 kg/m². Demographic information was obtained from 919 respondents for the CFA. Respondents' mean age was 20.6 ± 1.8 years and mean BMI was 24.4 ± 4.8 kg/m². The test-retest reliability population was comprised of 67 students.

Respondents' mean age was 21.5 ± 1.8 years, while mean BMI was 23.3 ± 3.9 kg/m² for this group.

Table 3.1. Descriptive Statistics of Young Adult University Students who Participated in an Exploratory Factor Analysis, Confirmatory Factor Analysis, and Test-Retest Reliability of the EFLBQ

<i>Variable</i>	Exploratory Factor Analysis (n=256)		Confirmatory Factor Analysis (n=919)		Test-Retest Reliability (n=67)	
	n	%	n	%	n	%
Gender						
Female	168	65.6	465	50.3	54	80.6
Male	88	34.4	454	49.4	13	19.4
Race/Ethnicity						
American Indian or Alaska Native	2	0.8	4	0.4	0	0
Asian	20	7.8	39	4.2	4	6.0
Black or African-American	43	16.7	112	12.2	7	10.4
Hispanic or Latino	15	5.8	41	4.5	4	6.0
Native Hawaiian or Pacific Islander	1	0.4	0	0	0	0
White	169	65.8	706	76.48	51	76.1
Other	6	2.3	17	1.8	1	1.5

* One respondent included in the EFA did not provide demographic information about gender and race/ethnicity.

3.3.2 Exploratory Factor Analysis and Test-retest Reliability

To identify the latent constructs of the instrument, we conducted an exploratory factor analysis. The EFA (n=257) demonstrated acceptable sampling adequacy (KMO=0.817) and significant sphericity (Bartlett's test $P < 0.001$) both suggesting sufficient correlation among statements to permit factor analysis. The EFA returned five factors that explained 57.4% of the variance. The scree plot also illustrated a five-factor model. Factors were retained with extracted eigenvalues greater than or equal to one (health and nutrition=5.3, taste=2.8, food preparation=2.0, planning/decision-making=1.5, and convenience=1.3). Statements were retained with factor loadings greater than 0.4 on

the pattern matrix (Guadagnoli & Velicer, 1988). Table 3.2 shows the item loadings and responses for each factor. Correlations among EFLBQ factors were also examined in Table 3.3.

Table 3.2. Exploratory Factor Analysis Pattern Coefficients, Communalities (h^2), and Structure Coefficients of the EFLBQ (n=257)

Statements by Factor	Pattern Matrix Coefficients	Communalities (h^2)	Structure Matrix Coefficients	Explained Variance (%)
<i>F1: Health and Nutrition</i>				25.95
I buy foods that are healthy.	0.79	0.66	0.80	
I choose nutritionally balanced meals.	0.82	0.65	0.80	
I cook healthy foods.	0.72		0.77	
I select foods that are healthy.	0.85	0.72	0.84	
I eat a balanced diet.	0.81	0.62	0.78	
I read nutrition information before purchasing foods.	0.59	0.35	0.59	
I consume healthy foods.	0.88	0.73	0.85	
<i>F2: Taste</i>				12.44
I buy foods that are tasty.	0.77	0.58	0.75	
I choose foods that taste good to me.	0.84	0.68	0.82	
I eat foods that taste good to me.	0.71	0.61	0.76	
<i>F3: Food Preparation</i>				8.61
I follow recipes when preparing food.	0.60	0.37	0.60	
I accurately measure dry ingredients when preparing food.	0.94	0.60	0.76	
I accurately measure liquid ingredients when preparing food.	0.74	0.85	0.92	

(Table cont'd.)

Statements by Factor	Pattern Matrix Coefficients	Communalities (h ²)	Structure Matrix Coefficients	Explained Variance (%)
F4: Planning /decision-making				5.33
I decide what I want to eat before a meal.	0.62	0.37	0.60	
I plan what I will eat.	0.82	0.71	0.84	
I eat foods that I have previously planned to eat.	0.63	0.44	0.65	
F5: Convenience				5.07
I eat foods that are convenient for me.	0.41	0.29	0.50	
I prepare foods that can be made quickly.	0.40	0.16	0.35	
I purchase foods that are convenient for me.	0.98	0.94	0.97	

Table 3.3. Correlations Among of the Eating and Food Literacy Behaviors Questionnaire Factors (n=257)

Factor	1	2	3	4	5
F1: Health/Nutrition	1.00				
F2: Taste	-0.13	1.00			
F3: Food Preparation	0.20	0.10	1.00		
F4: Planning/Decision Making	0.40	0.13	0.08	1.00	
F5: Convenience	-0.22	0.35	0.02	0.03	1.00

The questionnaire demonstrated acceptable reliability and a range in factor mean scores. Food preparation had the lowest eating and food literacy behavior mean score, while taste had the highest mean score (Table 4). Each of the five factors demonstrated acceptable internal consistency and reliability as measured by Cronbach's alpha coefficients. The assumptions of normality and homogeneity of variance for the Pearson's

test were met. Pearson's *r* correlations for each factor further confirmed that the questionnaire also had acceptable test-retest reliability (n=67) (Vincent, 1999). Test-retest correlations for food literacy behaviors were health and nutrition=0.92, taste=0.75, food preparation=0.74, planning /decision-making=0.63 and convenience=0.69.

Table 3.4. Factor Means and Reliability of the Eating and Food Literacy Behaviors Questionnaire (n=257)

Factor/Scale	Statements, n	Reliability ^a	Mean	SD
F1: Health/Nutrition	7	0.89	2.6	0.54
F2: Taste	3	0.72	3.5	0.44
F3: Food Preparation	3	0.77	2.5	0.70
F4: Planning/Decision Making	3	0.64	2.9	0.51
F5: Convenience	3	0.63	3.1	0.40

^aCronbach's alpha measure of internal consistency and reliability.

Mean values are based on a 4-point Likert-type scale. Response categories included: 1= never, 2=seldom, 3=often, and 4=always.

3.3.3 Confirmatory Factor Analysis

To confirm the proposed, five-factor model, a confirmatory factor analysis was performed. Responses from 923 students remained in the CFA after removing missing data responses. The results suggest there were no influential univariate or multivariate outliers. While observations in the analysis were independent, the data exhibited nonnormality, thus maximum likelihood with standard errors and a chi-square test were selected for the CFA. A single CFA was conducted to test the hypothesized five-factor model that emerged from the EFA. Support for adequate fit of the hypothesized model was established (Table 5). The chi-square test statistic was statistically significant. Comparative Fit Index and Tucker-Lewis Index values greater than 0.95, and RMSEA

and SRMR values less than 0.08 suggest that the hypothesized 5-factor model was a good fit for the data (Hu & Bentler, 1999).

Table 3.5. Goodness-of-fit Indicators of the Eating and Food Literacy Behaviors Questionnaire (n=923)

Model	χ^2	df	RMSEA ^a	CFI ^b	TLI ^b	SRMR
5-Factor	588.05*	142	0.06 [0.053-0.063]	0.98	0.98	0.05

^a Cutoff of 0.06

^b Values close to 0.95 were acceptable

^c Cutoff of 0.05

* $P < 0.001$.

Ultimately, the 5-factor model containing 19 items, seven statements for health and nutrition and three statements each for taste, food preparation, planning /decision-making, and convenience, was determined to be most parsimonious with 142 degrees of freedom (Figure 1, Kline, 2005).

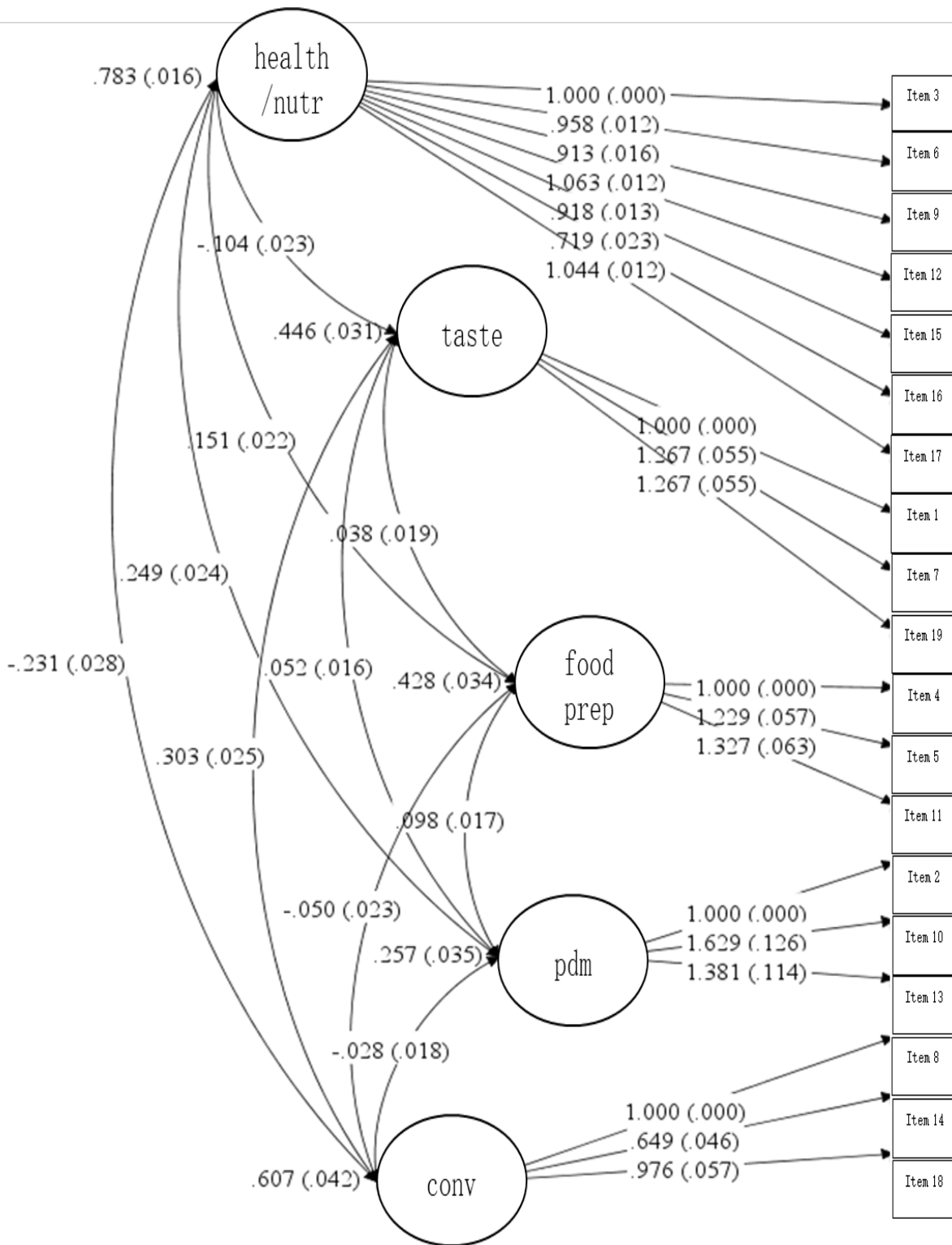


Figure 3.1. Confirmatory Factor Analysis of the five-factor EFLBQ (n=923). Parameter and SE estimates are in parentheses. *Note:* health/nutr=health and nutrition, food prep=food preparation, pdm=planning and decision making, and conv=convenience.

3.4 Discussion

Valid food literacy instruments to measure and contextualize food literacy in diverse populations are limited (Amouzandeh, Fingland, & Vidgen, 2019). In this study, we developed and utilized the EFLBQ to identify components and behaviors related to food literacy in young adult university students. Our results suggest that the 19-item EFLBQ is a valid and reliable instrument capable of measuring behaviors related to two of the food literacy domains described by Vidgen and Gallegos (2014). More specifically the EFLBQ was a valid and reliable instrument for determining factors young adult university students consider when making food decisions. The EFLBQ revealed five factors that were interpreted as health and nutrition, taste, food preparation, planning /decision-making and convenience. These findings suggest that food literacy is more than one's ability to perform behaviors necessary to maintain a healthy relationship with food. This research expands the present scope of food literacy to include not only one's ability to prepare food, plan and manage food intake, and make feasible food decisions, but also personal factors individuals consider when making food-related choices.

Two of the EFLBQ's five factors presented strong similarities to the four domains of food literacy explained by Vidgen and Gallegos (2014). These two factors included: food preparation and planning /decision-making. Health and nutrition explained the most variance in the model and appeared to be a fundamental aspect of food literacy in this group of young adult university students. Although, health and nutrition was not regarded as one of Vidgen and Gallegos's four food literacy domains, statements representing this factor captured behaviors relevant to all four domains of food literacy. For example, statements such as: I buy foods that are healthy and I consume healthy foods are closely

related to Vidgen and Gallegos's domains of planning and managing food, selecting, and eating food.

A similar trend was observed with the statements that factored with food preparation and planning and decision making in the EFLBQ. However, these statements appeared to be more closely related to a single domain of food literacy. Statements from the EFLBQ that grouped with food preparation were nearly identical to Vidgen and Gallegos' interpretation of preparing food which included one's ability to efficiently use common kitchen equipment, such as measuring cups, and follow recipes. This EFLBQ factor included statements such as: I follow recipes when preparing food and I accurately measure dry ingredients when preparing food. Similarly, the statements grouped with planning /decision-making were also closely linked to Vidgen and Gallegos's domain of planning and managing food. These statements included: I choose nutritionally balanced meals and I read nutrition information before purchasing foods. These two factors appeared to be more concrete and were closely related to the previously explained domains of food literacy.

Unlike Vidgen and Gallegos's model of food literacy, the EFLBQ revealed two additional factors related to food literacy: 1) taste and 2) convenience. Taste and convenience were retained as factors in the EFLBQ suggesting that they are important when explaining food literacy and provide broader context. It is evident that taste and convenience strongly influence what people eat and are determinants for their food choices, and therefore should be acknowledged when describing food literacy (Aggarwal, Rehm, Monsivais, & Drewnowski, 2016). Including personal factors, such as taste and convenience, when describing food literacy strengthens the concept's ability to capture

personal behaviors associated with eating an adequate and balanced diet. Moreover, these results suggest that food literacy is highly contextual, and includes more behaviors than one's ability to plan and manage, prepare, select, and eat food, but also personal factors that are considered important when making food decisions.

These findings provide preliminary evidence for the validity of the EFLBQ for use with young adult university students. The EFLBQ's ability to measure behaviors related to health and nutrition, taste, food preparation, planning /decision-making, and convenience provides researchers with a useful tool to comprehensively measure eating and food literacy behaviors during young adulthood, a critical developmental period where many health behaviors are formed. Many questionnaires evaluate only a single component of food literacy such as meal planning, food preparation, or consumption (Bailey, Cater, O'Neil, Miketinas, & Tuuri, 2018; Ducrot, Méjean, Aroumougame, Ibanez, Allès, Kesse-Guyot, Hercberg, & Péneau, 2017; Thorpe, Kestin, Riddell, & Keast, 2014; Larson, Perry, Story, & Neumark-Sztainer, 2006). Thus, the inclusion of multiple eating and food literacy behaviors in a single questionnaire allows researchers to assess various components of food literacy in one setting and identify areas of improvement for individuals. Two validated food literacy instruments have been compared to actual dietary intake in European adults (Krause, Beer-Borst, Sommerhalder, Hayoz, & Abel, 2018; Poelman et al., 2018). The Short Food Literacy Questionnaire is a 12-item instrument capable of measuring a broad range of functional, interactive, and critical elements of food literacy explained by Nutbeam's ideology of evolving health literacy (Krause, Beer-Borst, Sommerhalder, Hayoz, & Abel, 2018). The elements of Nutbeam's "food literacy" instrument include understanding nutrition information (functional), exchanging nutrition

information with family and peers (interactive), and evaluating the longer-term impact of dietary habits on health (critical) (Nutbeam, 2008). Similar to the EFLBQ, Poelman et al's Self-Perceived Food Literacy Scale was based on Vidgen and Gallegos' definition of food literacy and contained similar factors as the EFLBQ. Factors include food preparation skills and daily food planning. Similarly, the Self-Perceived Food Literacy Scale also consisted of personal factors of importance such as resilience and resistance and social and conscious eating. This notion supports the idea that food literacy is best explained when personal factors that influence behavior are also considered.

The strengths of this study included adequate sample sizes, acceptable internal structure and consistency, and test-retest reliability. This study was limited, however, by the use of convenience samples of young adults enrolled in a large public university in the southeastern United States. Most participants were white and female, therefore the results may not be generalizable to other populations or those with lower educational attainment. These findings are also limited by the truthfulness of the subjects' responses.

Chronic disease prevention and management requires healthful eating and food literacy behaviors, especially for vulnerable groups such as young adults who may be vulnerable to obesity and T2DM. This research further examines food literacy and offers a more comprehensive evaluation tool that considers personal factors such as taste and convenience when evaluating behaviors toward food. Colleges and universities may be ideal places to offer eating behavior improvement programs that can use the EFLBQ to examine program effectiveness. Future research should examine if the perceived behaviors toward food scores estimated from the EFLBQ are associated with dietary quality. The validity of the EFLBQ should also be tested with other populations, as the

nature of the questionnaires' components may vary across groups. Future studies could possibly discover behavioral factors not consistent with this study. Therefore, additional testing of the EFLBQ with other populations and against dietary intake is necessary to better understand food literacy and contextualize behaviors related to the concept.

CHAPTER 4. FORMATIVE EVALUATION OF A FOUR-WEEK EATING BEHAVIORS IMPROVEMENT PROGRAM USING THE EATING AND FOOD LITERACY BEHAVIORS QUESTIONNAIRE WITH YOUNG ADULT UNIVERSITY STUDENTS

4.1 Introduction

Adults with higher food literacy tend to exhibit healthier dietary behaviors and consume better quality diets (Poelman et al., 2018; Krause, Beer-Borst, Sommerhalder, Hayoz, & Abel, 2018). Food literate adults have reported higher fruit, vegetable and fish consumption as well as less impulsiveness and greater self-control when making food choices (Poelman, Dijkstra, Sponselee, Kamphuis, Battjes-Fries, Gillebaart, & Seidell, 2018). These individuals possess certain knowledge, skills and behaviors necessary to maintain a healthy relationship with food desired and improve well-being (Vidgen & Gallegos, 2014; Perry, Thomas, Samra, Edmonstone, 2017). Evaluating food literacy in younger adults and developing effective programs that encourage behavior change in this group provides an advantageous strategy to attenuate overweight and obesity later in life.

As suggested by Vidgen and Gallegos (2014), possessing food literacy requires the ability to plan and manage, select, prepare, and eat food. However, these authors have acknowledged that these domains are highly contextual. Rhea et al. (2019) have taken measures to conceptualize this idea in younger adults, particularly university students. The Eating and Food Literacy Behavior Questionnaire (EFLBQ), a validated survey instrument, posits that food literacy includes behaviors motivated by health and nutrition, taste, and convenience as well as food preparation and planning and decision making in this population (Rhea, Cater, & Tuuri, 2019). Promoting food literacy in this group requires developing interventions that target behavior change within the context of the EFLBQs' five factors in a college or university setting. Effective programs for young

adult university students resulting in behavior change have the potential to reverse undesirable dietary habits developed during this period.

Currently, behavior change interventions that comprehensively target components of food literacy with young adults are unavailable. However, young adulthood is an ideal period to alter unhealthy health behaviors that would otherwise track into adulthood. Most programs focus on moderators of behavior change including nutrition knowledge, intention to prepare nutritious foods at home, and motivation and self-efficacy to cook in this population (Clifford, Anderson, Auld, & Champ, 2009; Levy & Auld, 2004). Few interventions for young adults address behavior change. Although there are few intervention programs geared towards young adults, the ones available tend to focus on specific behaviors such as cooking and at-home food preparation, meal planning, and healthy food consumption. These studies demonstrate that young adults, including college students, are capable of improving behaviors such as milk consumption and limiting sugar-sweetened beverage consumption and performing meal planning via mobile technology use (Ha, Caine-Bish, Holloman, Lowry-Gordon, 2009; Kerr et al, 2016; Batch et al, 2014). More rigorous interventions are needed to comprehensively target healthy behavior change along with high-quality measurement tools to analyze outcomes.

Therefore, the purpose of this study was to develop a program for young adult university students that promoted food literacy behavior changes and to examine if the EFLBQ could measure these changes as a result of participating in the intervention. The objectives of this study were to: 1) Increase behaviors motivated by health and nutrition, taste, and convenience as well as food preparation and planning and decision making in

this group and 2) To evaluate the effectiveness of the intervention program compared to a control group.

4.2 Methods

4.2.1 Curriculum Development

An eating behaviors improvement program, named *Eating with Ease*, was developed to target healthy behavior change in young adult university students. The program's curriculum was based on the validated, EFLBQ's five-food literacy factors: 1) health and nutrition, 2) taste, 3) food preparation, 4) planning and decision making and 5) convenience (Rhea, Cater, & Tuuri, 2019). The factors were used as a framework to design a four-week curriculum consisting of four, 30-minute lessons to improve eating behaviors in young adult veterinary medicine students.

The curriculum format directly addressed each EFLBQ factor. Health and nutrition was the focus of the first lesson and was emphasized in each subsequent lesson. The focal point of the second lesson was planning and decision making. Participants planned meals and strategized ways to make easy, healthy decisions quickly. Food preparation was reinforced in the third lesson. The reality-based cooking television game show series, *Chopped*, was used to design an activity for this lesson (Lea, Noll, & Krupat, 2009). Participants were assigned to groups of three. Each group of three individuals was provided four unknown ingredients to prepare a healthy snack in 10 minutes. This activity allowed participants an opportunity to practice food preparation and kitchen safety. Lesson four was a summary of the previous three lessons and offered participants an opportunity to apply the information and skills taught throughout the program. In addition, participants were able to sample two quick and easy recipes each week. This weekly

sampling emphasized taste and convenience. In addition, all five ELFBQ factors were highlighted in a weekly handout (paper and electronic dissemination) (See Appendix). The one-page handout included two breakfast, lunch, dinner, or snack recipes (one on either side of the document). See Table 4.1 for details on the four-lesson curriculum.

Table 4.1. Lessons and learning objectives for *Eating with Ease*, a curriculum designed to improve young adults eating behaviors

	Learning Objectives
Lesson One: Overview of Nutritional Health	<ul style="list-style-type: none"> ● Define and identify components of a healthy eating pattern ● Emphasize the key recommendations from the 2015-2020 Dietary Guidelines for Americans ● Introduce MyPlate and identify food from each of the five food groups ● Determine individual nutrition needs using the MyPlate Plan ● Taste “Tomato Basil Pasta Salad” and “Rotisserie Chicken Wrap” and prepare lunch recipes at home
Lesson Two: Planning Ahead	<ul style="list-style-type: none"> ● Identify barriers and develop strategies to promote healthier food decisions ● Understand how to read nutrition facts information, determine portion sizes, and compare unit pricing ● Taste “Berry Breakfast Parfait” and “Turkey Sausage Breakfast Tacos” and prepare breakfast recipes at home
Lesson Three: Food Prep on the “Geaux”	<ul style="list-style-type: none"> ● Demonstrate basic food safety and handling techniques for at-home food preparation ● Demonstrate how to accurately measure dry and wet food ingredients ● Demonstrate how to read and follow a recipe ● Practice food safety, proper kitchen etiquette, and food handling ● Prepare a healthy snack using common food ingredients ● Taste “Seasonal Fruit Salad” and “Roasted Chickpeas” and prepare snack recipes at home

(Table cont’d.)

	Learning Objectives
Lesson Four: Maintaining Healthy Eating Patterns for Life	<ul style="list-style-type: none"> ● Review health and nutrition knowledge, food preparation and planning skills, and methods to improve taste and convenience ● Identify goals to change unhealthy dietary behaviors along with a strategic plan to achieve the goal ● Taste “Turkey Spaghetti” and “Veggie Stir Fry” and prepare dinner recipes at home

4.2.2 Curriculum Testing

To test the curriculum, a pilot program was offered in October and November of 2018. A convenience sample of young adult university students enrolled in a post-baccalaureate program at a large university in the southeastern United States participated in the program from October to November 2018. Graduate students in animal and food sciences were recruited because these students were thought to be similar to veterinary medicine students who were previously identified to receive the eating behaviors improvement program. Participants included currently enrolled students between 18 and 30 years of age who were not pregnant. Those who did not meet these criteria were excluded from the study. This study was approved by the Louisiana State University Agricultural Center Institutional Review Board.

Students were recruited to participate by the researchers who posted flyers and sent emails to students with the assistance of departmental staff. Correspondence included an online link and QR code that potential participants could use to access an online form through *Survey Monkey* to express their interest in participating in the program (Survey Monkey, Inc. San Mateo, CA). Potential participants were asked to answer several questions that the researchers used to determine their eligibility for the

program and to provide their name, email address, availability and demographic information (gender, age, and year of study). The program was scheduled at a mutually convenient time for the participants and the researchers. Eligible participants were notified via email and informed of the program overview and program dates/times. At the program overview, participants were given a brief description of the study and allowed to ask the researchers questions before consenting to participate.

The *Eating with Ease* Program consisted of a four-week curriculum based on the EFLBQ. Each lesson was designed to emphasize the instruments' five factors through dissemination of nutrition information and complementary activities targeting behavior change. *Eating with Ease* encouraged and assisted participants to improve their eating and food literacy behaviors by: 1) enhancing their awareness of nutrition information and individual nutrition needs, 2) encouraging them to taste and prepare easy, healthy recipes, and 3) allowing them to practice skills such as following recipes, planning complete meals and making grocery lists. The four sessions were designed to each last 30 minutes. Specific objectives were identified and met with activities led by the researchers. The general structure of the lessons included a sampling of two recipes prepared by the researchers. Lunch, breakfast, snack, and dinner recipes were prepared. Students were offered modified recipes based on dietary restrictions and food allergies. A handout of these recipes emphasizing all five factors of the EFLBQ was offered to participants (paper form and electronic form). A recap of the previous lesson was then given before students participated in interactive, hands-on activities that reinforced the EFLBQ's five factors. A summary of the session's activities was presented at the end of each lesson. GroupMe, a mobile, group messaging app, was used to share information

with participants including weekly recipe handouts, encourage exchange of information, and offer participants peer support (Skype Communications S.a.r.l, New York, NY). Participants were given instructions on how to download and use the app, if necessary, and encouraged to use the GroupMe app during and outside of the lessons. The paper version of the EFLBQ was administered pre- and post-program to assess change in young adults' eating and food literacy behaviors.

Additionally, post-program feedback was provided by seven participants who took part in an informal focus group discussion. The researchers asked questions about the students' experiences with the program, its format and content, recipes, and feasibility. Participant feedback, which was mostly positive, included extending the number and length of the sessions and encouraging accountability to prepare the recipes at home. This information was collected to improve the curriculum for future testing and applied to the pilot program study.

4.2.3 Pilot Program

Following the initial test of the curriculum, the *Eating with Ease* program was offered as an intervention to improve young adults' eating and food literacy behaviors. This study consisted of an intervention group compared to a control and used a pre-to-post-program, repeated measures design to assess program effectiveness. Participants included currently enrolled students at a large university in the southeastern United States who were between 18 and 30 years of age and not pregnant. Those who did not meet these criteria were excluded from the study. Researchers separately recruited two samples of students through posted flyers and emails sent with the assistance of departmental staff. The intervention cohort was comprised of students enrolled in the

university's veterinary medicine school, and the control group was comprised of a convenience sample of graduate students in the Colleges of Agriculture and Science. Each group was given a brief study overview where they were allowed to ask the researchers questions before consenting to participate. All study procedures were approved by the Louisiana State University Agricultural Center Institutional Review Board.

The intervention group received the four-week eating behaviors improvement program based on the EFLBQ in February of 2019. The four-lesson program was delivered by a single instructor with the assistance of undergraduate students. Participants completed the online ELFBQ using Qualtrics pre- and post-program. Demographic information was collected with the survey (Qualtrics, Provo, UT). Attendance was taken weekly. The curriculum format was similar to that of the initial program. However, a few changes were made to address feedback provided by the previous students. To encourage accountability for preparing the recipes, students were asked to prepare the recipes provided to them at home and share pictures through the program's GroupMe messaging board. They were told that each shared picture was equivalent to one entry into the drawing. Food preparation videos of each of the eight recipes along with electronic copies of the weekly recipes were shared through the program's GroupMe messaging board. The researchers sent reminders to encourage the students to prepare the recipes at home and monitored who shared pictures through the mobile app. At the end of the program, all entries were entered into the drawing. Three students were selected at random and each received a personal blender. Program-related incentives were given to all participants. Participants were also asked to provide written feedback about the program.

The control group participated in a four-week money management course offered by a campus-affiliated financial institution from February to March 2019. Participants completed the online version of the EFLBQ before the first session. The online version of the EFLBQ asked questions about participant's demographic information. Each participant's BMI was calculated from self-reported height and weight. Attendance was taken at each session. The four sessions (30-minutes per session) were delivered by a representative from the institution and covered topics such as maintaining good credit, saving for the future, budgeting, and home ownership and included complementary activities. Participants were offered refreshments or pizza at each session. At the end of the program, participants completed the online version of the EFLBQ and were given program-related incentives.

4.2.4 Instrumentation

Food literacy behaviors including those influenced by health and nutrition, taste, and convenience as well as food preparation and planning and decision making were measured using the EFLBQ (Rhea, Cater, & Tuuri, 2019). The EFLBQ is one of the few food literacy instruments available and the only known instrument for examining food literacy behaviors and personal factors that influence what young adults eat. Seven questions asked about behaviors influenced by health and nutrition while three questions each asked about the following factors: taste, food preparation, planning and decision making, and convenience. Responses were based on a 4-point Likert-type scale ranging from "Never," "Seldom," "Often," and "Always," which was assigned a numerical score. All responses within each factor were averaged to calculate mean factor scores. Demographic questions asked about each participant's age, gender, race/ethnicity, and

self-reported height and weight. Body mass index was calculated from the respondent's self-reported height and weight.

4.2.5 Statistical Analyses

Demographic information was analyzed. Shapiro-Wilk tests for normality were used to determine data distribution. Due to the study's small sample size (intervention group, n=21 and control group n=12), normally and nonnormally distributed data were examined using nonparametric tests. Wilcoxon Signed Ranks Tests were used to analyze mean factor scores in the intervention group. Possible differences between both groups' mean factor scores were evaluated at baseline using Mann-Whitney U Tests. These tests were also used to explore potential differences between both groups' changes in mean factor scores pre- to post-program. Relationships among variables were explored using Spearman's rho correlation coefficients. Statistical significance was considered to be $p < 0.05$ unless otherwise stated. All analyses were performed using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).

4.3 Results

4.3.1 Initial Test of Curriculum

A group of university graduate students tested the initial version of the curriculum and the feasibility of the *Eating with Ease* program. Eleven students participated in the initial program. Most participants were female (72.7%, n=8) and White (45.5%. n=5). The group had a mean age of 25.3 ± 2.1 years and a mean BMI of 25.8 ± 4.9 kg/m². Nine (81.8%) students completed the EFLBQ pre- and post-program. Participants'

scores for health and nutrition (pre-Mdn= 2.5 to post-Mdn=2.8, $Z= 1.973$, $p= 0.049$, $r=0.658$) significantly improved after participating in the program.

4.3.2 Pilot Program

Sixteen (76.2%) of the 21 students enrolled in the *Eating with Ease* intervention completed all four lessons and program activities while twelve students completed the control program. Most intervention participants were female (93.8%, $n=15$) and White (87.5%, $n=14$). The intervention group's mean age was 23.8 ± 2.3 years and mean BMI was 25.1 ± 4.5 kg/m². Analogous to the intervention group, the largest percent of these participants were female (75.0, $n=9$). The control group included Asian (33%, $n=4$), Black or African American (33%, $n=4$), and White (33%, $n=4$) participants. The control group had a mean age of 27.2 ± 2.4 years and mean BMI of 25.4 ± 5.9 kg/m². No significant differences were observed between the intervention and control groups' gender, age, or BMI. However, there was a significant difference ($p= 0.007$) between the racial and ethnic makeup of both groups.

Participant scores for most of the EFLBQ's five factors improved after participating in the intervention program. Participants' health and nutrition scores (pre-Mdn= 2.9 to post-Mdn=2.9, $Z= 2.222$, $p= 0.026$, $r=0.555$) and food preparation scores (pre-Mdn= 2.8 to post-Mdn=3.0, $Z= 2.155$, $p= 0.031$, $r=0.539$) significantly improved. These results, along with mean factor scores for interpretability, are presented in Table 4.2.

Table 4.2. Change in EFLBQ factors scores after participating in *Eating with Ease* Program (n=16)

Factor	Baseline		Completion		Mean Change in Factor Scores	p-value
	Median Factor Scores	Mean Factor Scores	Median Factor Scores	Mean Factor Score		
F1: Health and Nutrition	2.9	2.8 ± 0.4	2.9	2.9 ± 0.4	0.17 ± 0.30	0.026*
F2: Taste	3.6	3.5 ± 1.5	3.6	3.5 ± 0.5	-0.02 ± 0.45	0.917
F3: Food Preparation	2.8	2.8 ± 0.9	3.0	3.1 ± 0.7	0.35 ± 0.55	0.031*
F4: Planning and Decision Making	3.0	2.9 ± 0.6	3.0	2.8 ± 0.4	-0.02 ± 0.51	0.796
F5: Convenience	3.0	3.2 ± 0.4	3.0	3.2 ± 0.4	0.00 ± 0.24	1.000

Values are reported as Median and Mean ± SD.

Responses ranged from 1-4 and were based on a 4-point Likert-type scale: 1= “Never,” 2= “Seldom,” 3= “Often,” 4= “Always.”

Results were based on Wilcoxon Signed Ranks Tests for scored factors.

*A p-value <0.05 was considered significant.

The intervention groups’ scores were compared to those of the control group at baseline to determine if there were significant differences between the groups prior to the program. At baseline, a significant difference was observed between the intervention (Mdn=3.0) and control groups’ (Mdn=3.0) convenience behaviors ($Z = -2.480, p = 0.013, r = -0.688$). Significant differences were not observed in the other ELFBQ factors at baseline. These results are presented in Table 4.3. Change in the intervention groups’ scores were then compared to those of the control group to evaluate the impact of the *Eating with Ease* Program on participants’ food literacy

behaviors. No significant differences were observed between the groups' change in EFLBQ factor scores. These results are illustrated in Table 4.4.

Table 4.3. Baseline comparisons between *Eating with Ease* Program and a control groups' factor scores

Factor	<i>Eating with Ease</i> (n=16)		Control Group (n=12)		p-value
	Median Factor Scores	Mean Factor Scores	Median Factor Scores	Mean Factor Scores	
<i>F1: Health and Nutrition</i>	2.9	2.8 ± 0.4	2.9	2.9 ± 0.3	0.449
<i>F2: Taste</i>	3.6	3.5 ± 1.5	3.2	3.3 ± 0.5	0.255
<i>F3: Food Preparation</i>	2.8	2.8 ± 0.9	2.3	2.2 ± 0.7	0.140
<i>F4: Planning and Decision Making</i>	3.0	2.9 ± 0.6	3.0	3.0 ± 0.3	0.519
<i>F5: Convenience</i>	3.0	3.2 ± 0.4	3.0	2.8 ± 0.5	0.013*

Values are reported as Median and Mean ± SD.

Responses ranged from 1-4 and were based on a 4-point Likert-type scale: 1= "Never," 2= "Seldom," 3= "Often," 4= "Always."

Results were based on Mann-Whitney U tests for scored factors.

*A p-value <0.05 was considered significant.

Table 4.4. Pre- to post-program comparisons between *Eating with Ease* Program and a control groups' change in factor Scores

Factor	<i>Eating with Ease</i> (n=16)					Control Group (n=12)					<i>p</i> -value
	Baseline		Completion		Mean Change in Factor Scores	Baseline		Completion		Mean Change in Factor Scores	
	Median Factor Scores	Mean Factor Scores	Median Factor Scores	Mean Factor Scores		Median Factor Scores	Mean Factor Scores	Median Factor Scores	Mean Factor Scores		
F1	2.9	2.8 ± 0.4	2.9	2.9 ± 0.4	0.17 ± 0.30	2.9	2.9 ± 0.3	3.0	2.9 ± 0.4	0.01 ± 0.24	0.113
F2	3.6	3.5 ± 1.5	3.6	3.5 ± 0.5	-0.02 ± 0.45	3.2	3.3 ± 0.5	3.0	3.3 ± 0.4	-0.10 ± 0.51	0.427
F3	2.8	2.8 ± 0.9	3.0	3.1 ± 0.7	0.35 ± 0.55	2.3	2.2 ± 0.7	2.5	2.5 ± 0.7	0.28 ± 0.42	0.734
F4	3.0	2.9 ± 0.6	3.0	2.8 ± 0.4	-0.02 ± 0.51	3.0	3.0 ± 0.3	3.0	3.0 ± 0.3	0.00 ± 0.53	0.563
F5	3.0	3.2 ± 0.4	3.0	3.2 ± 0.4	0.00 ± 0.24	3.0	2.8 ± 0.5	3.0	2.9 ± 0.5	0.08 ± 0.35	0.717

Values are reported as Median and Mean ± SD.

Responses ranged from 1-4 and were based on a 4-point Likert-type scale: 1= "Never," 2= "Seldom," 3= "Often," 4= "Always."

Results based on Mann-Whitney U tests for scored factors

*A *p*-value <0.05 was considered significant.

Correlations between changes in the EFLBQ factor scores in the intervention and control groups are presented in Table 4.5. Change in health and nutrition behaviors was positively associated with change in planning and decision making ($r_s=0.47$, $p= 0.012$). Food preparation behavior change was positively correlated with changes in planning and decision making ($r_s=0.52$, $p= 0.005$).

Table 4.5. Correlations among pre-to-post-program changes in factor scores from the Eating and Food Literacy Behaviors Questionnaire (n=28)

Factor	1	2	3	4	5
F1: Health and Nutrition	1.00				
F2: Taste	0.15	1.00			
F3: Food Preparation	0.26	-0.07	1.00		
F4: Planning and Decision Making	0.47*	0.05	0.52**	1.00	
F5: Convenience	0.02	0.28	0.17	-0.24	1.00

Changes in factor scores were calculated by subtracting pre-scores from the post-scores.

Results indicate Spearman's rho correlation coefficients for factors.

* $p < 0.05$, ** $p < 0.01$.

4.4 Discussion

To our knowledge, this formative evaluation of the *Eating with Ease* curriculum using the valid EFLBQ is the first study to demonstrate significant improvements in young adults' food literacy behaviors after participating in a four-week behavior change intervention. These results provide evidence of the EFLBQ's capability to comprehensively measure change in young adult university students' health and nutrition, taste, food preparation, planning and decision making and convenience behaviors (Rhea, Cater, & Tuuri, 2019). The EFLBQ offers researchers a valid survey instrument to evaluate food literacy, a concept known to parallel better diet quality and healthier habits,

and to target specific habits that may need improvement. Testing the instrument with an intervention was the first attempt to apply its components in a practical setting. Ultimately, this study contributes to the generation of scientific knowledge to develop public policies aimed at promoting healthy living by means of the practice of food literacy with this population.

The EFLBQ is one of few, valid food literacy instruments capable of measuring dietary behavior change in young adults. Moreover, it is the only food literacy instrument validated with a young adult population, precisely university students. Other food literacy measurement tools have been used solely in cross-sectional analyses in comparison to dietary intake. These studies have demonstrated that higher food literacy is related to better diet quality and healthier habits; however, these tools have not been applied in a real-world setting (Krause, Beer-Borst, Sommerhalder, Payol, & Abel, 2018; Poelman, Dijkstra, Sponselee, Kamphuis, Battjes-Fries, Gillebaart, & Seidell, 2018). However, food literacy instruments may be useful for designing curricula that reinforce behavior change. The *Eating with Ease* curriculum, which used the EFLBQ's factors as a framework, provide evidence that the EFLBQ is not only practical, but has the ability to measure food literacy behavior change following program participation.

The *Eating with Ease* curriculum offers researchers a program to build food literacy and support behavioral improvements. Most nutrition interventions available for young adults focus on a single nutrition-related concept such as food preparation and cooking (Brown & Richards, 2010). By using the EFLBQ as a framework for a curriculum, the researchers demonstrated how to encourage comprehensive food literacy behavior

change in a short, four-week program. Thus, the Eating with Ease Program should be used as a framework to design more rigorous behavior change interventions.

Formative evaluation of the *Eating with Ease* Program provided viable information detailing the presentation and design of a food literacy behavior change intervention for young adult university students. Similar interventions with this population have focused on changing a single behavior and have utilized one assignment or television series with cooking show episodes to promote behavior change (Brown & Richards, 2010; Clifford, Anderson, Auld, & Champ, 2009). *Eating with Ease* targeted multiple behaviors in a practical and supportive environment that reinforced behavior change in all five areas of food literacy. Recipe handouts and videos that were developed, adapted, and tested to support the programs' objectives supported the improvements in the participants' food preparation and health and nutrition behavior scores. These components offered the participants useful tools that could be incorporated into everyday living and utilized beyond the program. Other useful program components may have included tasting sessions, mobile technology use, and cooking skills development.

This is the first study to incorporate the EFLBQ's five factors into an intervention program focused on changing food literacy behavior. Pre- to post-program evaluation of the *Eating with Ease* curriculum suggests that participating in this intervention supported positive behavioral changes. Changes in participants' factor scores suggested that significant improvements in health and nutrition and food preparation behaviors were achievable in a four-week span. Participants' factor scores for taste, planning and decision making, and convenience behaviors, however, were not significantly different after participating in the program. Taste and convenience behaviors are influenced by

numerous factors, and therefore may be difficult to change in a four-week intervention while planning /decision-making behaviors may take longer to improve.

Participation in the *Eating with Ease* curriculum was successful at increasing some of the students' food literacy behaviors. However, when compared to a control group, the intervention was not as robust. The intervention group's mean change factor scores were greater than the control group's score, but the small sample sizes in both groups may have limited the ability to see significant results. Therefore, additional data will be collected to further validate these findings.

This is a novel attempt to evaluate the EFBLQ's ability to measure change in young adult university students' food literacy behaviors after participating in an eating behavior improvement program. Furthermore, this research made use of a valid instrument to design a curriculum intended to promote food literacy in the study's population. However, several limitations were present. A very small sample was used to test the EFBLQ in an intervention program even though the results appeared promising. Most intervention group participants were white and female. All participants were post-baccalaureate students enrolled in a large public university in the southeastern United States. Therefore, these results may not be applicable to other populations or those with lower educational attainment. Lastly, these findings were also limited by the truthfulness of the subjects' responses.

Improved food literacy in young adults is crucial to attenuating unhealthy dietary habits that track into adulthood, and these findings demonstrate that the EFLBQ is able to measure change in food literacy after participating in an educational intervention. Likewise, these findings provide evidence supporting the EFLBQ's usefulness when

developing effective programs that promote behavior change in as short as four weeks. Future studies should include larger sample sizes and more diverse populations to confirm these results. Additional research should consider the length of time needed to alter behaviors that may be more difficult to change and evaluate the impact of these programs on knowledge and attitudes towards food literacy behaviors.

CHAPTER 5. SUMMARY AND CONCLUSIONS

These studies were conducted to develop a comprehensive food literacy questionnaire that has adequate construct validity and reliability and is capable of measuring change in its factors. Development of the EFLBQ, based on Vidgen and Gallegos' definition of food literacy, in a sample of young adult university students revealed that the domains of food literacy and behaviors related to each differed from those originally proposed. Vidgen and Gallegos (2014) hinted at the highly-contextual nature of food literacy in previous studies. However, this idea had not been widely explored with food literacy measurement tools that focused on the original domains.

Validity studies, conducted using students' responses to the questionnaire, suggested that the EFLBQ had adequate construct validity, was internally consistent, and was reliable. The EFA returned five factors: health and nutrition, taste, food preparation, planning /decision-making, and convenience. These constructs were related to previously established, food literacy domains (i.e. health and nutrition, food preparation and planning/decision-making) and to personal factors that may influence eating behavior (i.e. taste and convenience). Similar to the Self-Perceived Food Literacy Scale, a comprehensive survey, the identification of personal elements related to food literacy, supports the notion that the concept varies and should acknowledge outside factors that can influence food literacy (Poelman et al., 2010). Moreover, each construct demonstrated acceptable internal consistency based on Cronbach's alpha coefficients. Test-retest analysis, separated by two weeks, established the EFLBQ's ability to remain stable over time. The CFA confirmed the five-factor model returned by the EFA. Evidence of an adequate fit for the hypothesized model was supported by acceptable RMSEA and

SRMR values and CFI and TLI fit indices (Hu & Bentler, 1999). While the large sample size was a strength of these analyses, additional testing with more diverse populations is required to further validate these findings.

While the results of these studies are promising, additional studies are needed to further validate the EFLBQ and test its ability to predict diet-related outcomes. The EFLBQ should undergo additional multivariate analysis such as structural equation modeling to examine theoretical relationships between constructs. Secondly, the EFLBQ needs to be evaluated for convergent validity. For example, food preparation behavior scores should be compared to at-home food preparation frequency and health and nutrition behavior scores should be compared to diet quality.

As expected, the EFLBQ was capable of measuring change in participants eating and food literacy behaviors following participation in the four-week *Eating with Ease* Program. Young adult university students reported significant improvements in health and nutrition and food preparation behavior scores after participating in the program. To our knowledge only three food literacy measurement tools have been used to evaluate interventions that support improved dietary habits (Amuta-Jimenez, Lo, Talwar, Khan, & Barry, 2018; Mejean et al., 2017; Wijayarathne, Reid, Westberg, Worsley, & Mavondo, 2018). None of these studies have focused on young adults, a group that may be more willing to make healthy behavior change (Laska, Larson, Neumark-Sztainer, & Story, 2012; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008).

Significant improvements were not observed in the participants' taste, convenience, and planning/decision-making behaviors. Taste and convenience may have been more difficult to change because of their complexity or environmental limitations

(Casey & Rozin, 1989; Rundle et al., 2008). Another consideration is changing individuals' taste and convenience behaviors may be more difficult to modify as a result of participating in an intervention. Additionally, it may take more time to improve an individuals' planning and decision-making behaviors. When compared to a control group, there were no significant differences in change in EFLBQ factor scores from pre- to post-program which was likely because of the study's small sample size. These findings suggest that the EFLBQ has the capacity to evaluate change in food literacy and that the *Eating with Ease* curriculum supports positive dietary behavior change.

The EFLBQ offers researchers a valid instrument to assess change in eating behaviors as a result of participating in programs that promote food literacy. The EFLBQ factors can be used to guide curriculum development for these programs. Because food literacy is a novel concept, valid food literacy measurement tools capable of evaluating behavior change and interventions targeting food literacy behaviors are limited. Hence, the EFLBQ can be used to determine the effectiveness of these programs by offering a consistent measure of food literacy that allows for stronger conclusions to be made about program efficacy.

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APPENDIX A. INSTITUTIONAL REVIEW BOARD APPROVALS



LSU AgCenter Institutional Review Board (IRB)
Dr. Michael J. Keenan, Chair
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225-578-1708
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Application for Exemption from Institutional Oversight

All research projects using living humans as subjects, or samples or data obtained from humans must be approved or exempted in advance by the LSU AgCenter IRB. This form helps the principal investigator determine if a project may be exempted, and is used to request an exemption.

- Applicant, please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the LSU AgCenter IRB. Once the application is completed, please submit the original and one copy to the chair, Dr. Michael J. Keenan, in 209 Knapp Hall.
- A Complete Application Includes All of the Following:
 - (A) The original and a copy of this completed form and a copy of parts B through E.
 - (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1 & 2)
 - (C) Copies of all instruments and all recruitment material to be used.
 - If this proposal is part of a grant proposal, include a copy of the proposal.
 - (D) The consent form you will use in the study (see part 3 for more information)
 - (E) Beginning January 1, 2009: Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing and handling data, unless already on file with the LSU AgCenter IRB.
Training link: (<http://grants.nih.gov/grants/policies/hs/training.htm>)

1) Principal Investigator:

Georgianna Tuuri, PhD, LDN, RD
Associate Professor
School of Nutrition and Food Sciences
225-578-1722
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2) Co-Investigator(s): please include department, rank, phone and e-mail for each

Kwadernica Rhea
Doctoral Student
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3) Project Title: "Validation of a Survey to Assess Young Adults' Food Literacy Behaviors"

4) Grant Proposal?(yes or no) No If Yes, Proposal Number and funding Agency _____

Also, if Yes, either: this application completely matches the scope of work in the grant Y/N ___
OR
more IRB applications will be filed later Y/N ___

5) Subject pool (e.g. Nutrition Students) Approximately 350 university students aged 18 to 30 years.

- Circle any "vulnerable populations" to be used: (children<18, the mentally impaired, pregnant women, the aged, other). Projects with incarcerated persons cannot be exempted.

6) PI signature Georgianna Tuuri **Date 2/15/18 (no per signatures)

**I certify that my responses are accurate and complete. If the project scope or design is later changed I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-

LSU AgCenter institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at the LSU AgCenter for three years after completion of the study. If I leave the LSU AgCenter before that time the consent forms should be preserved in the Departmental Office.

Committee Action: Exempted Not Exempted IRB# HER-4
Reviewer Michael Keenan Signature Michael Keenan Date 2-20-2018

Part I: Determination of "Research" and Potential for Risk

- This section determines whether the project meets the Department of Health and Human Services (HHS) definition of research involving human subjects, and if not, whether it nevertheless presents more than "minimal risk" to human subjects that makes IRB review prudent and necessary.

1. Is the project involving human subjects a systematic investigation, including research, development, testing, or evaluation, designed to develop and contribute to generalizable knowledge?

(Note some instructional development and service programs will include a "research" component that may fall within HHS' definition of human subject research)

Yes

No

2. Does the project present physical, psychological, social or legal risks to the participants reasonably expected to exceed those risks normally experienced in daily life or in routine physical or psychological examination or testing?

You must consider the consequences if individual data inadvertently become public.

Yes Stop. This research cannot be exempted—submit application for full IRB review.

No Continue to see if research can be exempted from IRB oversight.

3. Are any of your subjects incarcerated?

Yes Stop. This research cannot be exempted—submit application for full IRB review.

No Continue to see if research can be exempted from IRB oversight.

4. Are you obtaining any health information from a health care provider that contains any of the identifiers listed below?

A. Names

B. Address: street address, city, county, precinct, ZIP code, and their equivalent geocodes. Exception for ZIP codes: the initial three digits of the ZIP code may

be used, if according to current publicly available data from the Bureau of the Census: (1) The geographic unit formed by combining all ZIP codes with the same three initial digits contains more than 20,000 people; and (2) the initial three digits of a ZIP code for all such geographic units containing 20,000 or fewer people is changed to '000.' (Note: The 17 currently restricted 3-digit ZIP codes to be replaced with '000' include: 036, 059, 063, 102, 203, 556, 692, 790, 821, 823, 830, 831, 878, 879, 884, 890, and 893.)

- C. Dates related to individuals
 - a. Birth date
 - b. Admission date
 - c. Discharge date
 - d. Date of death
 - e. And all ages over 89 and all elements of dates (including year) indicative of such age. Such ages and elements may be aggregated into a single category of age 90 or older
- D. Telephone numbers;
- E. Fax numbers;
- F. Electronic mail addresses;
- G. Social security numbers;
- H. Medical record numbers (including prescription numbers and clinical trial numbers);
- I. Health plan beneficiary numbers;
- J. Account numbers;
- K. Certificate/license numbers;
- L. Vehicle identifiers and serial numbers including license plate numbers;
- M. Device identifiers and serial numbers;
- N. Web Universal Resource Locators (URLs);
- O. Internet Protocol (IP) address numbers;
- P. Biometric identifiers, including finger and voice prints;
- Q. Full face photographic images and any comparable images;
- R. Any other unique identifying number, characteristic, or code; except a code used for re-identification purposes and;
- S. The facility does not have actual knowledge that the information could be used alone or in combination with other information to identify an individual who is the subject of the information

Yes Stop. This research cannot be exempted—submit application for full IRB review.

No Continue to see if research can be exempted from IRB oversight.

**Part 2: Exemption Criteria for Research Projects Can
be found on the Next Page.**

Part 2: Exemption Criteria for Research Projects

Please select any and all categories that relate to your research. Research is exemptible when all research methods are one or more of the following five categories. Check statements that apply to your study:

 1. In education setting, research to evaluate normal educational practices.

 2. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: that observes public behavior (including participatory observation), or with interviews or surveys or educational tests:

The research must also comply with ONE of the following:

a) The participants cannot be identified, directly or statistically;

or that

b) The responses/observations could not harm participants if made public;

or that

c) Federal statute(s) completely protect all participants' confidentiality.

 3. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: that observes public behavior (including participatory observation), or with interviews or surveys or educational tests:

All respondents are elected, appointed, or candidates for public offices.

 4. Uses only existing data , documents, records, or specimens properly obtained.

The research must also comply with ONE of the following:

a) Subjects cannot be identified in the research data directly or statistically, and no one can trace back from research data to identify a subject;

or that

b) The sources are publicly available

.....
___ 5. Research or demonstration service/care programs, e.g. health care delivery.

The research must also comply with ALL of the following:

___ a) It is directly conducted or approved by the head of a US Government department or agency;

and that

___ b) It concerns only issues under usual administrative control (48 Fed Reg 9268-9), e.g. regulations, eligibility, services, or delivery systems;

and that

___ c) Its research/evaluation methods are also exempt from IRB review.

.....
___ 6. For research not involving vulnerable people [prisoner, fetus, pregnancy, or mentally impaired; Note that children can participate for an exempt study]: with food to evaluate quality, taste, or consumer acceptance.

The research must also comply with ONE of the following:

___ a) The food has no additives;

or that

___ b) The food is certified safe by the USDA, FDA or EPA.

**Part 3: Consent Form Information
Can be Found on the Next Page.**

Part 3: Information on Consent Forms

- The consent form must be written in non-technical language which can be understood by the subjects. It should be free of any exculpatory language through which the subject is made to waive, or appears to be made to waive any legal rights, including any release of the investigator(s), sponsor, institution or its agents from liability for negligence. (Note: the consent form is not a contract)
- For example consent forms, please refer to the LSU campus IRB website, <http://www.lsu.edu/irb/researchers.shtml>
- The LSU AgCenter IRB prefers using signed informed consent. However, if that is impractical, an application to waive signed consent can be requested below: When this waiver is requested, the **LSU AgCenter IRB must be provided with the consent script** that will present the information about consent to human subjects regarding the study/research. All consent forms or scripts must include a statement that the study was approved by the LSU AgCenter IRB and provide LSU AgCenter IRB contact information to participants: Dr. Philip Elzer at 225-578-4161. **Note: Parental consent usually cannot be waived for studies with children as subjects.**

I am requesting waiver of SIGNED Informed Consent because:

(a) Having a participant sign the consent form would create the **principal risk** of participating in the study

or that

(b) The research presents **no more than minimal risk** of harm to subjects and involves no procedures for which having signed consent is normally required outside of the research environment.

Now that your application is complete, please send two copies of it to the LSU AgCenter IRB for review, at the address listed below.



LSU AgCenter Institutional Review Board
Dr. Michael J. Keenan, Chair
209 Knapp Hall
Baton Rouge, LA 70803
Ph: 225-578-1708
Fax: 225-578-4443
E-mail: mkeenan@agctr.lsu.edu

IRB# APPROVED BY
LSU AG CENTER
IRB AS HE18-4
ON 2-20-2018

INFORMED CONSENT TO TAKE A QUESTIONNAIRE
Adult Consent Form

We would like to better understand young adults' food literacy behaviors as it relates to planning/managing, selecting, preparing, and eating foods. If you agree to help us, we will ask you to complete a questionnaire and food preference survey by filling in the appropriate circles for your responses. The questionnaire will take ten to fifteen minutes to complete. Your participation is voluntary, and there is no cost to you.

If you have any questions you can contact either one of the following investigators:

Georgianna Tuuri, PhD, LDN, RD
Associate Professor
School of Nutrition and Food Sciences
Phone: 225-578-1722
gtuuri@lsu.edu

Kwadernica Rhea, BS
Doctoral Student
School of Nutrition and Food Sciences
krhea4@lsu.edu

The questionnaire has been explained to me and all of my questions have been answered. I may direct additional questions regarding program specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Dr. Phil H. Elzer, Associate Vice Chancellor & Associate Director, LSU AgCenter, (225) 578-4182. I consent to participate as described on the back of this page and acknowledge the investigators' obligation to provide me with a signed copy of this consent form.

Name: _____ (please print)

Signature: _____ Date: _____

Please provide us with your email address in case we need to contact you:

Email: _____

APPROVED BY
LSU AG CENTER
IRBA RB-AS HE 18-4
ON 2-20-2018

Description of the Study

Project Title: "Validation of a Survey to Assess Young Adults' Food Literacy Behaviors"

Investigators: The following investigators are available for questions, M-F 8:00 am-4:30 p.m.

Georgianna Tuuri, PhD, LDN, RD
Associate Professor
School of Nutrition and Food Sciences
Phone: 225-578-1722
gtuuri@lsu.edu

Kwadernica Rhea, BS
Doctoral Student
School of Nutrition and Food Sciences
krhea4@lsu.edu

Purpose of the Program: To evaluate young adults' food literacy behaviors as it relates to planning/managing, selecting, preparing, and eating foods.

Inclusion Criteria: Adults 18 to 30 years of age.

Exclusion Criteria: Children under 18 or adults older than 30 years of age.

Description of the Program: Before participating, adults 18 to 30 years of age will complete a consent form. After the appropriate, required form is completed, they will complete the questionnaire. The questionnaire will take approximately ten to fifteen minutes to complete.

Benefit: You will help researchers learn more about food literacy behaviors.

Risks: There are no known risks involved.

Right to Refuse: Participation is voluntary. You may withdraw yourself from the study at any time.

Privacy: Survey results may be published; however, no names or identifying information will be included for publication. A person's identity will remain confidential unless disclosure is required by law.

Financial Information: There is no cost to participate in this study.

Name: _____

Pre Post

Food Literacy Behaviors Questionnaire (FLBQ) for Young Adults

Please completely fill in the appropriate circle for your response, using a #2 pencil or black ink pen. ●

For the purposes of this survey, fruits, vegetables, low-fat milk and fat-free milk and dairy products, protein foods and whole grains are considered healthy foods while foods high in sodium (salt), solid fats, and added sugars are considered less healthy.

Instructions: The following sentences ask about planning and managing food. Using the 4-point scale below, please indicate the extent to which you identify with statements by completely filling in your response. If the statement does not apply to you, fill in the circle under "Does not apply."

	Never	Seldom	Often	Always	Does not apply
1. I plan what I eat for each meal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I prioritize money for food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I can make a plan of what intend to eat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I am able to obtain food through some source on a consistent basis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I prioritize time for eating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I manage my food intake so that I am consuming a healthy diet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I am skilled enough to properly manage my food intake.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: The following sentences ask about selecting foods. Please read each statement carefully. Using the 4-point scale below, please indicate the extent to which you identify with each statement by completely filling in your response. If the statement does not apply to you, fill in the circle under "Does not apply."

	Never	Seldom	Often	Always	Does not apply
8. I can judge the quality of food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I know what foods to select to maintain a healthy diet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I select foods to purchase by checking what stores have on sale.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I understand how to read a food label.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I can determine where a food product comes from.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I choose foods that are easy to prepare.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. I can determine if a food is healthy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: The following sentences ask about preparing foods. Please read each statement carefully. Using the 4-point scale below, please indicate the extent to which you identify with each statement by completely filling in your response. If the statement does not apply to you, fill in the circle under "Does not apply."

	Never	Seldom	Often	Always	Does not apply
15. I follow recipes when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. I wash my hands before preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. I practice safety when cooking.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. I have the skills to prepare a good tasting meal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. I accurately measure dry food ingredients when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. I accurately measure liquid ingredients when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. I properly store foods that I prepare.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: The following sentences ask about eating foods. Please read each statement carefully. Using the 4-point scale below, please indicate the extent to which you identify with each statement by completely filling in your response. If the statement does not apply to you, fill in the circle under "Does not apply."

	Never	Seldom	Often	Always	Does not apply
22. I eat healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. I consume foods that will positively impact my health.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. I eat a variety of foods (i.e. fruits, vegetables, grains, protein, and dairy).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. I join others to eat socially.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. I consume appropriate portion sizes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. I avoid eating less healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. I stop eating when I am full.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: Please answer the following questions about yourself.

What is your date of birth? _____
(MM-DD-YYYY)

What is your age in years? _____

What is your height? _____ feet _____ inches

What is your weight? _____ pounds

What is your gender? MALE FEMALE Other: _____

What is your race/ethnicity?

American Indian or Alaska Native	<input type="radio"/>
Asian	<input type="radio"/>
Black or African American	<input type="radio"/>
Hispanic or Latino	<input type="radio"/>
Native Hawaiian or Pacific Islander	<input type="radio"/>
White	<input type="radio"/>
Other Please explain: _____	<input type="radio"/>

Please check all that apply

I live: Alone
 With a roommate
 With a spouse or significant other
 With children
 With a parent or grandparent
 Other
Please explain: _____

I live in:
 A dorm
 An apartment
 A house
 Other
Please explain: _____

To: Dr. M. Keenan
From: Kwadernica Rhea

Date: June 04, 2018
Subject: Amendment to IRB HE18-04

Hello Dr. Keenan,

I hope this message finds you well. I am writing you to amend the survey for IRB document **HE18-04**. Attached are the updated survey.

Thank you. Please let me know if you have any additional questions or concerns.

Take care,
Kwan

Name: _____

Pre Post

Eating Literacy Survey for Young Adults (ELS)

Please completely fill in the appropriate circle for your response, using a #2 pencil or black ink pen. ●

For the purposes of this survey, fruits, vegetables, low-fat milk and fat-free milk and dairy products, protein foods, and whole grains are considered healthy foods, while foods high in sodium (salt), solid fats, and added sugars are considered less healthy.

Instructions: Please read the statements below. Using the 4-point scale below, please indicate the extent to which you identify with statements by completely filling in your response.

	Never	Seldom	Often	Always
1. Based on my budget, I spend an appropriate amount of money on food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I decide what I want to eat before a meal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I buy foods that are healthy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I consume appropriate amounts of food for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I follow recipes when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I accurately measure liquid ingredients when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I choose nutritionally balanced meals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I stop eating when I am full.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I have money in my budget for food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I eat foods that are convenient for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I choose appropriate portion sizes for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I cook healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I plan what I will eat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. I accurately measure dry food ingredients when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. I select foods that are healthy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. I decide how much I will eat before a meal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. I eat foods that I have previously planned to eat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. I purchase foods that I consider low-cost.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. I prepare foods that can be made quickly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. I eat a balanced diet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. I use the nutrition information provided to decide what I will eat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. I read nutrition information before purchasing foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. I consume healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. I buy foods that are priced within my budget.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. I eat foods that taste good to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. I prepare good tasting meals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. I purchase foods that are convenient for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: Please answer the following demographic questions.

What is your date of birth? _____ - _____ - _____
(MM-DD-YYYY)

What is your age in years? _____

What is your height in feet and inches? _____

What is your weight in pounds? _____

What is your gender? MALE FEMALE Other: _____

What is your race/ethnicity?

American Indian or Alaska Native	<input type="radio"/>
Asian	<input type="radio"/>
Black or African American	<input type="radio"/>
Hispanic or Latino	<input type="radio"/>
Native Hawaiian or Pacific Islander	<input type="radio"/>
White	<input type="radio"/>
Other: _____	<input type="radio"/>



LSU AgCenter Institutional Review Board (IRB)
 Dr. Michael J. Keenan, Chair
 School of Human Ecology
 209 Knapp Hall
 225-578-1708
 mkeenana@agctr.lsu.edu

Application for Exemption from Institutional Oversight

All research projects using living humans as subjects, or samples or data obtained from humans must be approved or exempted in advance by the LSU AgCenter IRB. This form helps the principal investigator determine if a project may be exempted, and is used to request an exemption.

- Applicant, please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the LSU AgCenter IRB. Once the application is completed, please submit the original and one copy to the chair, Dr. Michael J. Keenan, in 209 Knapp Hall.
- A Complete Application Includes All of the Following:
 - (A) The original and a copy of this completed form and a copy of parts B through E.
 - (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1 & 2)
 - (C) Copies of all instruments and all recruitment material to be used.
 - If this proposal is part of a grant proposal, include a copy of the proposal.
 - (D) The consent form you will use in the study (see part 3 for more information)
 - (E) Beginning January 1, 2009: Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing and handling data, unless already on file with the LSU AgCenter IRB.
 Training link: (http://grants.nih.gov/grants/policy/hs_training.htm)

1) Principal Investigator: Georgianna Tuuri Rank: Professor Student? Y/N
 Dept: School of Nutrition and Food Sciences Ph: 8-1722 E-mail: gtuuri@agcenter.lsu.edu

2) Co-Investigator(s): please include department, rank, phone and e-mail for each

- If student as principal or co-investigator(s), please identify and name supervising professor in this space

Kwan Rhea, Graduate Student
 School of Nutrition and Food Sciences
krhea4@lsu.edu Ph: 225-578-1722

3) Project Title: Eating with Ease: An Eating Behaviors Improvement Program
 4) Grant Proposal? (yes or no) No If Yes, Proposal Number and funding Agency _____

Also, if Yes, either: this application completely matches the scope of work in the grant Y/N _____
 OR
 more IRB applications will be filed later Y/N _____

5) Subject pool (e.g. Nutrition Students) Graduate-level students between 18-30 years of age

- Circle any "vulnerable populations" to be used: (children < 18, the mentally impaired, pregnant women, the aged, other). Projects with incarcerated persons cannot be exempted.

6) PI signature Georgianna Tuuri **Date 10/1/18 (no per signatures)
 **I certify that my responses are accurate and complete. If the project scope or design is later changed I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU AgCenter institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at the LSU AgCenter for three years after completion of the study. If I leave the LSU AgCenter before that time the consent forms should be preserved in the Departmental Office.

Committee Action: Exempted Not Exempted _____ IRB# HF18-23

Reviewer Michael Keenan Signature Michael Keenan Date 10-9-2018

Part 1: Determination of “Research” and Potential for Risk

- This section determines whether the project meets the Department of Health and Human Services (HHS) definition of research involving human subjects, and if not, whether it nevertheless presents more than “minimal risk” to human subjects that makes IRB review prudent and necessary.

1. Is the project involving human subjects a systematic investigation, including research, development, testing, or evaluation, designed to develop and contribute to generalizable knowledge?

(Note some instructional development and service programs will include a “research” component that may fall within HHS’ definition of human subject research)

Yes

No

2. Does the project present physical, psychological, social or legal risks to the participants reasonably expected to exceed those risks normally experienced in daily life or in routine physical or psychological examination or testing?

You must consider the consequences if individual data inadvertently become public.

Yes Stop. This research cannot be exempted—**submit application for full IRB review.**

No Continue to see if research can be exempted from IRB oversight.

3. Are any of your subjects incarcerated?

Yes Stop. This research cannot be exempted—**submit application for full IRB review.**

No Continue to see if research can be exempted from IRB oversight.

4. Are you obtaining any health information from a health care provider that contains any of the identifiers listed below?

A. Names

B. Address: street address, city, county, precinct, ZIP code, and their equivalent geocodes. Exception for ZIP codes: the initial three digits of the ZIP code may be used, if according to current publicly available data from the Bureau of the Census: (1) The geographic unit formed by combining all ZIP codes with the same three initial digits contains more than 20,000 people; and (2) the initial three digits of a ZIP code for all such geographic units containing 20,000 or fewer people is changed to ‘000.’ (Note: The 17 currently restricted 3-digit ZIP codes to be replaced with ‘000’ include: 036, 059, 063, 102, 203, 556, 692, 790, 821, 823, 830, 831, 878, 879, 884, 890, and 893.)

- C. Dates related to individuals
 - a. Birth date
 - b. Admission date
 - c. Discharge date
 - d. Date of death
 - e. And all ages over 89 and all elements of dates (including year) indicative of such age. Such ages and elements may be aggregated into a single category of age 90 or older
- D. Telephone numbers;
- E. Fax numbers;
- F. Electronic mail addresses;
- G. Social security numbers;
- H. Medical record numbers (including prescription numbers and clinical trial numbers);
- I. Health plan beneficiary numbers;
- J. Account numbers;
- K. Certificate/license numbers;
- L. Vehicle identifiers and serial numbers including license plate numbers;
- M. Device identifiers and serial numbers;
- N. Web Universal Resource Locators (URLs);
- O. Internet Protocol (IP) address numbers;
- P. Biometric identifiers, including finger and voice prints;
- Q. Full face photographic images and any comparable images;
- R. Any other unique identifying number, characteristic, or code; except a code used for re-identification purposes and;
- S. The facility does not have actual knowledge that the information could be used alone or in combination with other information to identify an individual who is the subject of the information

Yes Stop. This research cannot be exempted—submit application for full IRB review.

No Continue to see if research can be exempted from IRB oversight.

Part 2: Exemption Criteria for Research Projects Can be found on the Next Page.

Part 2: Exemption Criteria for Research Projects

Please select any and all categories that relate to your research. Research is exemptible when all research methods are one or more of the following five categories. Check statements that apply to your study:

1. In education setting, research to evaluate normal educational practices.

2. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: that observes public behavior (including participatory observation), or with interviews or surveys or educational tests:

The research must also comply with ONE of the following:

- a) The participants cannot be identified, directly or statistically;
or that
- b) The responses/observations could not harm participants if made public;
or that
- c) Federal statute(s) completely protect all participants' confidentiality.

3. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: that observes public behavior (including participatory observation), or with interviews or surveys or educational tests:

All respondents are elected, appointed, or candidates for public offices.

4. Uses only existing data , documents, records, or specimens properly obtained.

The research must also comply with ONE of the following:

- a) Subjects cannot be identified in the research data directly or statistically, and no one can trace back from research data to identify a subject;
or that
- b) The sources are publicly available

____ 5. Research or demonstration service/care programs, e.g. health care delivery.

The research must also comply with ALL of the following:

___ a) It is directly conducted or approved by the head of a US Government department or agency;

and that

___ b) It concerns only issues under usual administrative control (48 Fed Reg 9268-9), e.g. regulations, eligibility, services, or delivery systems;

and that

___ c) Its research/evaluation methods are also exempt form IRB review.

____ 6. For research not involving vulnerable people [prisoner, fetus, pregnancy, or mentally impaired; Note that children can participate for an exempt study]: with food to evaluate quality, taste, or consumer acceptance.

The research must also comply with ONE of the following:

___ a) The food has no additives;

or that

___ b) The food is certified safe by the USDA, FDA or EPA.

**Part 3: Consent Form Information
Can be Found on the Next Page.**

Part 3: Information on Consent Forms

- The consent form must be written in non-technical language which can be understood by the subjects. It should be free of any exculpatory language through which the subject is made to waive, or appears to be made to waive any legal rights, including any release of the investigator(s), sponsor, institution or its agents from liability for negligence. (Note: the consent form is not a contract)
- For example consent forms, please refer to the LSU campus IRB website, <http://www.lsu.edu/irb/researchers.shtml>
- The LSU AgCenter IRB prefers using signed informed consent. However, if that is impractical, an application to waive signed consent can be requested below. When this waiver is requested, the **LSU AgCenter IRB must be provided with the consent script** that will present the information about consent to human subjects regarding the study/research. All consent forms or scripts must include a statement that the study was approved by the LSU AgCenter IRB and provide LSU AgCenter IRB contact information to participants: Dr. Philip Elzer at 225-578-2080. **Note: Parental consent usually cannot be waived for studies with children as subjects.**

I am requesting waiver of SIGNED Informed Consent because:

___ (a) Having a participant sign the consent form would create the **principal risk** of participating in the study

or that

___ (b) The research presents **no more than minimal risk** of harm to subjects and involves no procedures for which having signed consent is normally required outside of the research environment.

Now that your application is complete, please send two copies of it to the LSU AgCenter IRB for review, at the address listed below.



LSU AgCenter Institutional Review Board
Dr. Michael J. Keenan, Chair
209 Knapp Hall
Baton Rouge, LA 70803
Ph: 225-578-1708
Fax: 225-578-4443
E-mail: mkeenan@agctr.lsu.edu

“Eating with Ease: An Eating Behaviors Improvement Program”

Abstract

Food literacy is a new concept that offers a promising approach to improve dietary intake and reduce public health concerns, such as obesity and type 2 diabetes mellitus (T2DM), particularly in young adults. It is described as having a healthy relationship with food and includes ability to plan and manage, select, prepare and eat food. Being food literate is a useful skill to maintain nutritional health and requires performance of healthful dietary behaviors. Therefore, the purpose of this study is to offer a four-week, eating behaviors improvement program for young adults 18 to 30 years of age. The program, “Eating with Ease,” will be offered once a week for 30 minutes. The program will be pilot tested with up to 20 participants, and up to 50 participants will participate in the intervention. Written informed consent will be required to participate. Participants will complete an evaluation of the pilot program to determine its feasibility as well as a nutrition knowledge survey, the Self-Perceived Eating Behaviors Questionnaire, and a short survey to determine effective program delivery methods (i.e. electronic vs paper) pre- and post-program.

“Eating with Ease: An Eating Behaviors Improvement Program”

A Brief Study Description

Food literacy is a new concept that offers a promising approach to improve dietary intake and reduce public health concerns, such as obesity and type 2 diabetes mellitus (T2DM), particularly in young adults. It is described as having a healthy relationship with food and includes the ability to plan and manage, select, prepare and eat food. Being food literate is a useful skill to maintain nutritional health and requires performance of healthful dietary behaviors. Therefore, the purpose of this study is to offer a four-week, eating behaviors improvement program for young adults 18 to 30 years of age.

“Eating with Ease” is an eating behaviors improvement program designed to promote factors that encourage healthy eating and food literacy-related behaviors in graduate-level students. The pilot program will consist of four, 30-minute lessons taught over four weeks. Each lesson will include interactive modules to reinforce healthy eating and food literacy-related behaviors. Participants will gain nutrition knowledge, practice basic food preparation (i.e. knife skills, measuring, food washing, etc.), sample recipes, and participate in hands-on activities.

A convenience sample of graduate-level students between 18 and 30 years of age will be recruited for the pilot (n=20) and intervention programs (n=50). Participants enrolled in the program will complete an evaluation of the program to determine its feasibility. These results will be used to improve subsequent programs. In addition, participants will complete a nutrition knowledge survey, the Self-Perceived Eating Behaviors Questionnaire, and a short survey to determine effective program delivery methods (i.e. electronic vs paper) pre- and post-program.

To participate in the program, written informed consent will be required. There are minimal physical, psychological, or social risks associated with participating in a program to help young adults improve their eating behaviors. To minimize risks, the researchers will create a supportive environment for participants and have a first aid kit available at all times. Moreover, if a participant chooses to report any alcoholic beverage intake or any illegal behaviors, the researchers are obligated to share this information with the proper authorities. The participant reserves the right to withdraw from the study at any point. Lastly, the researchers reserve the right to remove any participant from the study at any time.

Participants will be informed that findings from the study may be published; however, no identifiable information will be included for publication. Participants' identities will remain confidential unless the law requires disclosure. All information provided by the participants will be kept secure and private by the researchers.

APPROVED BY
LSU AG CENTER
IRB# HEB-23
ON 10-9-2018

CONSENT TO PARTICIPATE IN A RESEARCH STUDY
Adult Consent Form

Dear Potential Participant,

Would you like to learn how to make healthier food choices with ease?

We will offer a four-week, eating behaviors improvement program to young adults 18 to 30 years of age. During the program, participants will have the opportunity to engage in hands-on learning, apply nutrition knowledge to real-life situations, improve eating behaviors, and sample healthy, tasty, and quick recipes. We will ask for your feedback about the program and have participants complete a few questionnaires.

You can read more about the study on the back of this page. Please be aware that the information you provide will be kept confidential.

Georgianna Tuuri, PhD, LDN, RD
Professor of Nutrition
School of Nutrition and Food Sciences
Phone: 225-578-1722

Kwadernica Rhea
Graduate Student
School of Nutrition and Food Sciences
Phone: 225-578-1722

This study has been explained to me and all of my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Dr. Phil H. Elzer, IRB Administrator, LSU AgCenter, (225) 578-2080. I will participate in the focus group interview described on the back of this page and acknowledge the investigators' obligation to provide me with a signed copy of this consent form.

Your Signature: _____ Date: _____

Personal Information

Full Name (Please Print): _____

Age: _____ Gender: Male OR Female

Race/Ethnicity: _____

Do you have any food allergies? If yes, please explain. _____

Please provide us with your contact information:

E-mail Address: _____ Phone Number: _____

APPROVED BY
LSU AG CENTER
IRB AS HEK-23
ON 10-9-2018

IRB# _____

Description of the Study

Project Title: "Eating with Ease: An Eating Behaviors Improvement Program"

Investigators: The following researchers are available for questions, M-F 8:00 am-4:30 p.m.

Georgianna Tuuri, PhD, LDN, RD Professor of Nutrition School of Nutrition and Food Sciences (225) 578-1722	Kwadernica Rhea Graduate Student School of Nutrition and Food Sciences (225) 578-1722
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Purpose of the Study: To offer a four-week, eating behaviors improvement program for young adults 18 to 30 years of age.

Inclusion Criteria: Graduate-level students who are between 18 and 30 years of age.

Exclusion Criteria: Graduate-level students who are not between 18 and 30 years of age and/or are pregnant.

Description of the Study: The program is designed to improve young adults' eating behaviors. The program will consist of four, 30-minute lessons taught over four weeks. Each lesson will include interactive modules to reinforce healthy eating behaviors. Participants will engage in hands-on learning and apply it to real-life situations, develop useful planning and food preparation skills, sample healthy, tasty, and quick food samples, and thrive in a supportive environment that encourages healthy eating.

Benefits: If fully engaged in the program, participants will learn how to improve their eating behaviors and help the researchers to develop effective intervention programs.

Risks: There are minimal physical, psychological, or social risks associated with participating in this program.

Right to Refuse: Participation is voluntary. A participant may withdraw from the study any time. The researchers also reserve the right to remove a subject from the study.

Privacy: Results of this study may be published; however, identifiable information will not be included for publication. Participants' identities will remain confidential unless the law requires disclosure.

Financial Information: If you decide to participate, you will receive program-related incentives.

To: Dr. M. Keenan

From: Kwadernica Rhea

Date: January 30, 2019

Subject: Amendment to IRB HE18-23

Good afternoon Dr. Keenan,

I hope this message finds you well. I am writing you to amend some information indicated on IRB document HE18-23. To better evaluate our program, we have decided to add a control group to our study. The control group will consist of young adults (aged 18 to 30 years) who are graduate-level students and are not pregnant. We will offer the control group a four-week money management course. Four, 30 minute sessions will be taught by a representative from Campus Federal. This group will complete the same questionnaire as the intervention group. A copy of the adult consent form for the control group is attached.

Thank you. Once the consent has been approved, please let me know. If you have any questions or concerns, please do not hesitate to ask.

Take care,

Kwan

APPROVED BY
LSU AG CENTER
IRB AS HE18-23a
ON 10-9-2018

CONSENT TO PARTICIPATE IN A RESEARCH STUDY
Adult Consent Form

Dear Potential Participant,

Would you like to learn how to better manage your money and become a financially responsible adult?

We are looking for graduate students between 18 and 30 years of age to serve as controls for a nutrition program. As a part of the control group, you will have the opportunity to participate in a four-week, money management program where you will learn how to manage your money, save, budget, and more. We will ask for you to complete a couple of questionnaires.

You can read more about the study on the back of this page. Please be aware that the information you provide will be kept confidential.

If you have questions you can contact the following researchers:

Georgianna Tuuri, PhD, LDN, RD
Professor of Nutrition
School of Nutrition and Food Sciences
Phone: 225-578-1722

Kwadernica Rhea
Graduate Student
School of Nutrition and Food Sciences
Phone: 225-578-1722

This study has been explained to me and all of my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Dr. Phil H. Elzer, IRB Administrator, LSU AgCenter, (225) 578-2080. I will participate in the study described on the back of this page and acknowledge the investigators' obligation to provide me with a signed copy of this consent form.

Your Signature: _____ Date: _____

Personal Information

Full Name (Please Print): _____

Age: _____ Gender: Male OR Female

Race/Ethnicity: _____

Do you have any food allergies? If yes, please explain. _____

Please provide us with your contact information:

E-mail Address: _____ Phone Number: _____

Description of the Study

Project Title: "Eating with Ease: An Eating Behaviors Improvement Program (Control Group)"

Investigators: The following researchers are available for questions, M-F 8:00 am-4:30 p.m.

Georgianna Tuuri, PhD, LDN, RD Professor of Nutrition School of Nutrition and Food Sciences (225) 578-1722	Kwadernica Rhea Graduate Student School of Nutrition and Food Sciences (225) 578-1722
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Purpose of the Study: To determine the impact of participating in a nutrition program on young adult students' food literacy behaviors.

Inclusion Criteria: Graduate-level students who are between 18 and 30 years of age.

Exclusion Criteria: Graduate-level students who are not between 18 and 30 years of age and/or are pregnant.

Description of the Study: The researchers are interested in whether or not participation in a nutrition program will have an impact on young adult students' food literacy behaviors. To evaluate the impact of participation on young adult students' food literacy behaviors, the researchers would like to offer a money management program to graduate students who will serve as the control group. The control group will be offered four, 30-minute money management sessions taught once a week for four weeks. Participants will learn how to manage their money, save, budget, and more.

Benefits: If fully engaged in the program, participants will learn how to better manage their money and help the researchers effectively evaluate an intervention program.

Risks: There are minimal physical, psychological, or social risks associated with participating in this program.

Right to Refuse: Participation is voluntary. A participant may withdraw from the study at any time. The researchers also reserve the right to remove a subject from the study.

Privacy: The results from this study may be published; however, identifiable information will not be included for publication. Participants' identities will remain confidential unless the law requires disclosure.

Financial Information: If you decide to participate, you will receive program-related incentives.

APPENDIX B. EATING AND FOOD LITERACY BEHAVIORS QUESTIONNAIRE

Name: _____

Pre Post

Eating and Food Literacy Behaviors Questionnaire

Please completely fill in the appropriate circle for your response, using a #2 pencil or black ink pen. ●

For the purposes of this survey, fruits, vegetables, low-fat milk and fat-free milk and dairy products, protein foods, and whole grains are considered healthy foods, while foods high in sodium (salt), solid fats, and added sugars are considered less healthy.

Instructions: Please read the statements below. Using the 4-point scale below, please indicate the extent to which you identify with statements by completely filling in your response.

	Never	Seldom	Often	Always
I buy foods that are tasty.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I decide what I want to eat before a meal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I buy foods that are healthy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I follow recipes when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I accurately measure liquid ingredients when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I choose nutritionally balanced meals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I choose foods that taste good to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat foods that are convenient for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I cook healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I plan what I will eat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I accurately measure dry food ingredients when preparing food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I select foods that are healthy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat foods that I have previously planned to eat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prepare foods that can be made quickly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat a balanced diet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I read nutrition information before purchasing foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consume healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Never	Seldom	Often	Always
I prepare good tasting meals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I purchase foods that are convenient for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: Please answer the following demographic questions.

What is your date of birth? _____
(MM-DD-YYYY)

What is your age in years? _____

What is your height in feet and inches? _____

What is your weight in pounds? _____

What is your gender? MALE FEMALE Other: _____

What is your race/ethnicity?

American Indian or Alaska Native	<input type="radio"/>
Asian	<input type="radio"/>
Black or African American	<input type="radio"/>
Hispanic or Latino	<input type="radio"/>
Native Hawaiian or Pacific Islander	<input type="radio"/>
White	<input type="radio"/>
Other: _____	<input type="radio"/>

VITA

Kwadernica (Kwan) Rhea is a native of LaPlace, Louisiana. In May of 2010, Kwan graduated in the Top 10 of her senior class from East Saint John High School in Reserve, Louisiana. She went on to pursue a degree in Chemistry at Spelman College in Atlanta, Georgia. She received her Bachelor of Science *cum laude* in May of 2014. Soon after in August of 2014, Kwan enrolled in the doctoral program in the School of Nutrition and Food Sciences at Louisiana State University in Baton Rouge, LA. During her tenure, she was awarded the National Science Foundation Louis Stokes Alliance for Minority Participation (NSF-LSAMP) Bridge to the Doctorate Fellowship in 2014 to 2016. In January 2016, she joined Prof. Georgianna Tuuri's research group. She anticipates receiving her Doctor of Philosophy in Nutrition and Food Sciences at the summer 2019 commencement exercises.