UGA EFNEP YOUTH PROGRAMMING: *TEEN CUISINE* AND THE ADDITION OF GOAL SETTING

by

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ABSTRACT

UGA EFNEP delivers community nutrition education to adolescents, grades 9-12, using two curricula: *Food Talk Teen* and *Teen Cuisine*. A secondary analysis was performed to assess pre/post behavior change among and between the two curricula. A separate group of adolescents participating in *Teen Cuisine* completed additional questions to measure goal setting feasibility and pre/post readiness to change. The curricula were comparable in promoting behavior change. Behavior areas, diet quality, physical activity, and food safety, improved significantly in each curriculum ($P<.001$). For goal setting feasibility, 100% of participants reported setting health and nutrition goals. Reported readiness to change significantly increased for physical activity and food safety behaviors ($P<.05$). Future research can assess the effects of goal setting and readiness to change on EFNEP youth health behaviors. This study establishes that both UGA EFNEP curricula promote nutrition and health behavior change for adolescents and goal setting is a feasible curriculum addition.

INDEX WORDS: EFNEP, Adolescents, Nutrition education, Behavior change, Goal Setting Readiness to change

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B.S., University of Florida, 2021

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

MASTER OF SCIENCE

ATHENS, GEORGIA

2023

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August 2023

TABLE OF CONTENTS

Page

LIST OF TABLES ..... vi

CHAPTER

1 INTRODUCTION ..... 1

Significance ..... 2

Purpose and Research Aims ..... 3

2 LITERATURE REVIEW ..... 4

Introduction ..... 4

Influences on Adolescent Food Choice and Nutrition Behavior ..... 5

Adolescent Nutrition Intervention Strategies ..... 9

EFNEP Background ..... 12

UGA EFNEP Youth Programming ..... 15

Goals and Behavior Theories ..... 20

Goal Setting Adolescent Nutrition and Health Interventions ..... 24

The Transtheoretical Model ..... 27

Rationale ..... 30

Specific Aims and Hypotheses ..... 33

3 METHODOLOGY ..... 34

Research Design ..... 34

Curricula Descriptions ..... 34

Study Design....36
Measurable Outcomes....37
Statistical Analysis....40
4 RESULTS....42
UGA EFNEP Youth Programming Behavior Change....42
Goal Setting and Readiness Rulers....47
5 DISCUSSION....51
UGA EFNEP Youth Programming Behavior Change....52
Goal Setting and Readiness Rulers....57
Strategies for Adolescent Nutrition and Health Behavior Change....60
Strengths and Limitations....61
Future Directions....63
6 CONCLUSION....65
REFERENCES....67
APPENDICES
1 *Teen Cuisine* 45-minute vs. 90-minute Session 1 Overviews....78
2 *Teen Cuisine* Goal Setting Activity (Session 1 Example)....79
3 EFNEP Youth 9th-12th Nutrition Education Survey....80
4 Additional Pre-Intervention Survey Page....82
5 Additional Post-Intervention Survey Page....83

# LIST OF TABLES

Page

Table 1: *UGA EFNEP Participant Demographic Statistics of FY22* .....42

Table 2: *Behavior Area Scores per Curriculum* .....44

Table 3: *Behavior Question Scores Before and After* Teen Cuisine.....45

Table 4: *Behavior Question Scores Before and After* Food Talk Teen .....45

Table 5: *Comparison of Behavior Changes Between Curricula* .....46

Table 6: *UGA EFNEP Participant Demographic Statistics of High School in Houston County* ..47

Table 7: *Readiness to Change and Composite Readiness Ruler* .....49

Table 8: *Behavior Question Scores Related to Readiness Rulers*.....49

# CHAPTER 1

## INTRODUCTION

Adolescence is a significant stage of growth involving autonomy, self-efficacy, and the development of habits that continue into adulthood [1, 2]. These factors make adolescence a crucial time for education about nutrition and health behaviors to help reduce risk of chronic disease, such as obesity and type II diabetes [2]. Compared to recommendations, adolescents' diets lack adequate amounts of fruits, vegetables, whole grains, and dairy, while being excessive in added sugars, sodium, and saturated fat [3]. Behavior-focused nutrition and health education interventions are often used to target diet quality in this age group [4, 5]. One example is the Expanded Food and Nutrition Education Program (EFNEP). EFNEP delivers nutrition, physical activity, food safety, food security, and food resource management education to families and youth in low-income communities [6]. EFNEP is federally funded through NIFA (National Institute of Food and Agriculture) and has been delivered through the Land-grant Universities (LGU)/Cooperative Extension system since 1969 [6]. Nationwide, EFNEP reaches approximately 450,000 limited resource youth in both urban and rural communities [7]. EFNEP peer educators deliver a series-based nutrition education program in their communities and this model helps to better to identify with families in the community and aid the communication of health and nutrition education [6].

EFNEP at the University of Georgia (UGA EFNEP) started youth programming (9th-12th grade) in 2018 using the *Food Talk* curriculum. Originally designed for adult caregivers, *Food Talk* provides nutrition education and resources through interactive lessons. The adult

curriculum was adapted for UGA EFNEP youth programming and initiated in eligible Georgia high schools as *Food Talk Teen*. In 2022, while UGA EFNEP continues to adapt *Food Talk Teen* to address EFNEP youth behavior change outcomes, *Teen Cuisine* was adapted and launched. *Teen Cuisine* is a hands-on, practical learning adolescent nutrition education curriculum developed by Registered Dietitians and nutrition educators at Virginia Tech, part of Virginia Cooperative Extension [8]. The curriculum aims to support health and nutrition behavior change, self-efficacy, and sustainable positive habits among adolescent participants in grades 6-12 [8]. Before its implementation in Georgia, UGA EFNEP adaptations included physical appearance, recipe alterations, updated nutrition information and nutrition facts labels, additional virtual learning tools, and SMART (Specific, Measurable, Achievable, Realistic, Timely) goal setting pages. The SMART goal setting pages were not included in the original Virginia Tech *Teen Cuisine* curriculum. This project is the first time the adapted *Teen Cuisine* has been studied with UGA EFNEP youth programming. Both *Food Talk Teen* and *Teen Cuisine* are currently used for UGA EFNEP youth programming.

**Significance**

Development of positive health behaviors is crucial during adolescence [2]. *Teen Cuisine* is an evidence-based curriculum used by Land-grant University Cooperative Extension nutrition education programs to educate and encourage nutrition and health behavior changes in adolescents [8]. This project will establish if *Teen Cuisine* improves EFNEP measured health behaviors in eligible Georgia adolescents compared to *Food Talk Teen*. The findings may also reveal whether goal setting is a feasible addition to *Teen Cuisine*. On a larger scale, this research can help contribute to effective EFNEP youth programming for adolescent behavior change.

**Purpose**

This project explores the impact of an adapted *Teen Cuisine* curriculum on lifestyle behaviors, readiness to change, and goal setting among UGA EFNEP youth participants. This research project has three aims:

1. To examine health behavior changes related to diet quality, physical activity, food safety, and food security in 9th – 12th grade adolescents participating in UGA EFNEP youth programming via *Teen Cuisine* or *Food Talk Teen.* The hypothesis is UGA EFNEP youth participating in *Teen Cuisine* will demonstrate comparable improvements in measured health behaviors to those participating in *Food Talk Teen* as evidenced by a validated, federally mandated pre/post EFNEP Youth $9^{th}$-$12^{th}$ Nutrition Education Survey.
2. To assess the feasibility of implementing goal setting in the adapted *Teen Cuisine* curriculum with UGA EFNEP youth participants. The hypothesis is at least 50% of participants will report setting nutrition and/or health goals during *Teen Cuisine* as evidenced by a post-intervention survey question.
3. To measure changes in readiness for goal setting, diet quality, physical activity, and food safety behaviors among UGA EFNEP youth participating in the adapted *Teen Cuisine*. The hypothesis is participants will identify with greater readiness for health and nutrition behavior change as evidenced by pre/post Readiness Rulers.

# CHAPTER 2

# LITERATURE REVIEW

## Introduction

Adolescents consume inadequate quantities of fruits, vegetables, whole grains, and dairy, and excessive amounts of added sugars, saturated fat, and sodium compared to recommendations for healthy diets [3]. Poor diet quality along with low levels of physical activity in an increasingly sedentary environment contribute to the high prevalence of obesity in this population [9]. Additionally, adolescents from low-income families tend to face more barriers to healthy lifestyles [10, 11]. Helping adolescents establish positive nutrition and health behaviors at a young age can have a lasting impact on their health trajectories [12]. Therefore, behavior-focused adolescent nutrition and health interventions often target excess calorie consumption, diet quality, and physical activity [13].

Discussion on how to achieve and measure sustainable positive behavior changes in adolescent health-related interventions prevails in the literature [4, 5, 10]. Behavior theory-based programs that combine nutrition and physical activity education for adolescents result in positive health behavior change and reduce risk for obesity [4, 5]. Goal setting, recognized as an important factor in behavior change by multiple behavior theories, has been used to promote dietary behavior change in adolescents [14-16]. Finally, behavior change is seen as a sequential experience according to the Transtheoretical Model [17]. Evaluating the effectiveness of adolescent nutrition and health interventions via participant readiness to achieve target behaviors may offer insight into their progression toward change [18, 19].

The Expanded Food and Nutrition Education Program (EFNEP) was established in 1969 and is a federally funded program that provides community nutrition education for and addresses nutrition insecurity among low-income families and youth [6]. The program's target populations are adult caregivers of children, pregnant women and teens, and youth from low-income households [6]. EFNEP is delivered through Cooperative Extension programs at Land-grant Universities throughout the US and its six territories [6]. EFNEP's four core areas of behavior are the focus of series-based, interactive nutrition education curricula: diet quality and physical activity, food resource management, food safety, and food security [6].

The following literature review will address influences of adolescent food choice and health behaviors, behavior theories and strategies used in adolescent nutrition interventions, EFNEP and youth programming specifically through the University of Georgia, and goal setting as a potential impactful addition to EFNEP youth programming.

**Influences on Adolescent Food Choice and Health Behavior**

Research suggests diet quality decreases from childhood to adolescence [20]. National Health and Nutrition Examination Survey 24-hour dietary recall data from US youth ages 2-19 revealed percentages of youth with poor diets (defined as less than 40% adherence to American Heart Association diet recommendations) is greater in ages 12 to 19 (66.6%) compared to ages 2 to 5 (39.8%) and 6 to 11 (52.5%) [20]. Furthermore, the United States Department of Agriculture reports adolescent (ages 14-18) consumption of fruits, vegetables, whole grains, and dairy as lower than recommended [3]. Specific to Georgia, the CDC Division of Nutrition, Physical Activity, and Obesity reports about 50% of adolescents consume fruits and vegetables less than once a day [21].

In terms of physical activity, the US government recommends that children and adolescents get 60 minutes or more of daily physical activity with vigorous-intensity activity at least three days per week [22]. In Georgia, only 24% of adolescents reported being physically active at least 60 minutes per day over the span of a week [23]. This section addresses factors that play a role in adolescent food choice and health behaviors.

Adolescence is defined as ages 10-19 years; during this time, youth undergo major physical and neurological development [24]. In puberty, adolescents experience linear growth and development of biological systems that changes their energy and nutrient needs from childhood [25]. The part of the brain associated with decision-making, planning, reflection, impulse, and risk-taking also develops significantly [24]. Growing desire for autonomy, social status, and identity, in part, dictates behavior and food choice [1]. Aside from individual factors, adolescents are extremely sensitive to environmental and social influences that can either support or undermine adequate nutrient intake and healthful food choices [1]. Understanding adolescent thought processes, behaviors, and external influences is crucial when assessing intervention effectiveness for health and nutrition behavior change [26].

Growing autonomy facilitates peer influence on adolescent health behavior and food choice [1, 27]. Peer influence can be especially powerful in the school setting; high school-aged students reported peer pressure as the top reason it is hard to eat healthfully at school in a qualitative study using focus groups [28]. Surprisingly, the same focus groups identified peer role models as a positive influence of food choice in schools [28]. Studies have also looked at adolescent trends towards homophilic social selection or spending time with peers that exhibit similar beliefs and behaviors [29]. For example, a teen's friend groups' and best friends' positive eating behaviors, such as eating breakfast, whole grains, and dairy foods, are significantly

associated with the teen practicing these behaviors [29]. Group school nutrition interventions may be a way to encourage positive peer influence in adolescent food choice.

Social media also plays an increasingly significant role in adolescent nutrition behaviors [27]. One study revealed that youth actively seek out nutrition and health information on social media platforms, resulting in positive and negative impacts on health-related behaviors [30]. Programs delivering evidence-based nutrition education to adolescents could answer health questions they may otherwise search for online.

Familial interactions continue to influence youth diet-related behaviors from childhood to adolescence [31]. A systematic review found that family mealtime was commonly predictive of positive dietary behaviors among adolescents [32], specifically greater consumption of fruits and vegetables [33]. Adolescent children involved in food preparation with the family may have improved diet quality [34]. Interventions that facilitate food preparation and kitchen literacy, such as UGA EFNEP *Teen Cuisine* and *Food Talk Teen* may improve adolescent self-efficacy for positive nutrition behaviors.

The role of home food environment is another crucial factor in adolescent in diet behaviors [31]. A healthy home food environment is associated with increased fruit and vegetable intake and less sugar-sweetened beverage intake [31]. The home food environment cannot be properly discussed without mentioning a key factor, food insecurity. One study took the novel approach of using middle school and high school-aged adolescents' reports, rather than surveying caretakers, to examine the relationship between reported food insecurity, dietary intake, and school lunch behavior [35]. Data was from the 2019 Minnesota Student Survey and researchers analyzed relationships between the three measured outcomes using logistic regression. They found student-reported past-month food insecurity was significantly

associations with less consumption of fruits (adjusted odds ratio [AOR]: 0.76, 95% confidence interval [CI]: 0.69-0.82), vegetables (AOR: 0.86, CI: 0.75-0.98), milk (AOR: 0.79, CI: 0.73-0.84) and greater consumption of fast food four or more times per week (AOR: 1.62, CI: 1.49-1.76) and daily sugar sweetened beverage intake (AOR: 1.21, CI: 1.12-1.30) [35]. These results support previous research that demonstrates a negative relationship between food insecurity severity and diet quality [36].

Furthermore, the COVID-19 pandemic has resulted in increased food insecurity compared to pre-pandemic [37]. Adams et al. examined how food security status before and during the pandemic impacted home food environment and parent feeding practices [37]. US parents qualified to participate in the study if they were 18 years of age or older and had at least one child between 5 and 18 years old. Participants provided retrospective reports of pre-pandemic food security, home food availability, and feeding practices that were compared to current (during pandemic in spring of 2020) reports. The study suggests levels of food insecurity had increased by 20% during COVID-19 compared to pre-pandemic levels ($P < 0.01$) [37]. The result is greater household consumption of low-cost, nutrient-poor, non-perishables [37]. Parents also expressed increased concern for child weight gain and obesity, and there was a greater increase in concern with food-insecure parents compared to food-secure [37]. Authors suggest the findings can help inform initiatives that aim to support positive parent feeding practices and reduce childhood obesity risk post-pandemic [37].

In general, socioeconomic status is a large contributor to nutrition behaviors [10, 11]. Poorer diet quality among youth is  associated with lower household income [20]. Furthermore, stress in the home environment is another factor positively correlated with inadequate adolescent eating habits [10]. Evidence shows financial concerns and access to food have been sources of increased

stress for parents during COVID-19 that, in turn, negatively influence their children's health behaviors [38]. Interventions that educate adolescents on how to make healthy food choices may help promote behavior change in the face of unfavorable home food environments.

The transition from full dependence on caregivers in childhood to increased autonomy alongside varied food and social environments during adolescence impacts nutrition behaviors [1]. Development of unfavorable nutrition and health behaviors, such as poor food choice and sedentary lifestyle, position adolescents for risk of obesity and comorbidities during youth and adulthood, since habits developed during youth can continue into adulthood [2]. Rates of overweight and obesity have drastically increased in children and adolescents aged 5-19 years, leading to increased risk of premature onset of related illnesses [39]. In 2016, over 30% of adolescents aged 10-19 years in the U.S. were estimated to be overweight [39]. Previous research reveals that adolescents may not prioritize the importance of nutrition and disease prevention [40]. In adolescence, immediate gratification tends to outweigh the importance of long-term health [40].

A large body of literature on obesity and adolescence highlights the importance of intervening early to aid teens in navigating an obesogenic environment and establishing healthy behaviors [2, 4, 10, 25]. These circumstances create a need for more research on effective age-appropriate strategies to improve adolescent diet quality, nutrition, and health behaviors.

**Adolescent Nutrition Intervention Strategies**

A need has been identified for multifaceted and nutrition-focused adolescent interventions in tackling relevant issues such as youth overweight and obesity [26]. In the previous section, influences of adolescent nutrition and health behaviors, such as autonomy and the social environment, were reviewed. Nutrition interventions that recognize and utilize these factors have greater success at achieving their health-related objectives [26]. Successful intervention strategies

have been used among various settings such as schools [41-44], personal healthcare [26, 45], community sites [46], digital/social media platforms [47, 48], and home and commercial food environments [26]. Effective community-based interventions have been supported by various government organizations [26, 49]. EFNEP is an example of a community-based nutrition education program that serves youth, including high school adolescents, and it will be further defined in the following section.

The heterogeneity of youth nutrition education and behavior change studies makes it difficult to pinpoint one ideal intervention [4, 5]. However, recent systematic reviews have identified various strategies used in such interventions that promote positive food choice and nutrition behavior change in youth, including adolescents [4, 5, 50]. These strategies are like various tactics or characteristics used in interventions to achieve target nutrition and health outcomes, for example peer discussions and theory-based design.

The current literature indicates that effective nutrition education interventions for adolescents target both diet and physical activity behaviors [4, 5] and use behavioral theory in their design [5]. A focus on behavior change outcomes is common among effective adolescent nutrition programs [4, 5, 51]. Nutrition education is also common and associated with significant nutrition and health behavior change and other positive outcomes, such as improved attitudes about health and better health literacy [5, 50]. Educating adolescents directly is identified as valuable in supporting teen autonomy, decision-making, and intrinsic motivation that can all dictate health behaviors [1, 4].

One example of an effective behavior-based nutrition education intervention for adolescents was conducted in New Zealand [52]. Bay et al. targeted positive nutrition and lifestyle behavior change in participants, youth ages 11-14 years, through improved science literacy, in

this case, greater knowledge of overweight/obesity risks and associated noncommunicable diseases [52]. The researchers recognized that by providing relevant nutrition education they can help adolescents make diet-related changes for a healthy life trajectory [52]. Learning modules in the three-month intervention concentrated on the importance of nutrition through the lifecycle and its relevance in noncommunicable disease risk [52]. All participating adolescents who practiced high risk behaviors for overweight/obesity prior to the interventions showed significant behavior changes post-intervention and at a 12 week follow up ($P < .001$) [52]. A qualitative assessment was conducted via interviews at 6 months post-intervention [52]. Reports from these interviews suggest the significant behavior change was associated with evidence-based thinking skills developed during the nutrition education intervention [52]. In conclusion, the study demonstrates that building upon adolescents' scientific literacy through a nutrition education intervention effectively promotes sustained positive health behaviors [52].

Other components associated with successful outcomes among adolescent nutrition interventions are age-appropriate, practical/ "hands-on" learning and peer support/peer-led approaches [5, 51]. Specific examples include the practical uses of technology [48], peer led discussions, food preparation and tasting, and group activities [5, 51]. Other features of successful nutrition interventions for adolescents were goal setting and self-monitoring, family involvement [50], and adequate program duration and frequency (considered to be at least 6 months and weekly/biweekly) [51].

Adolescence is a critical time for nutrition and health promotion that can shape health trajectory into adulthood [12]. Behavior-based nutrition interventions with educational components are common means for reaching adolescents in school and community settings [4]. Other potential impactful strategies in adolescent nutrition interventions include peer interaction, hands-on

learning, and goal setting [5, 50, 51]. Adolescents are exposed to obesogenic environments that can counter efforts to improve health behaviors [4]. Improving nutrition behaviors is even more challenging for youth from disadvantaged backgrounds compared to their peers [5]. The next section defines the role of the Expanded Food and Nutrition Education Program, EFNEP, in the health promotion of low-income households.

**EFNEP Background**

EFNEP is a federally funded program with the mission to provide community-based nutrition education and reduce nutrition insecurity in low-income families and youth [6]. Nutrition insecurity is defined by inadequate nutrition, restricted physical activity, and unsafe food preparation [6]. The EFNEP audiences include adult caregivers of children, pregnant women and teens, and youth, and children from low-income households [6]. EFNEP serves low-income households due to higher risk of chronic disease and poor health of lower socioeconomic and minority populations [6].

EFNEP operates through Land-grant Universities in each state, the District of Columbia, and six U.S. territories, to reach rural and urban participants through programming [6]. There are 76 Land-grant Universities providing Cooperative Extension programs that together reach approximately 200,000 low-income adults and 450,000 low-income youth, yearly [7]. The peer educator (paraprofessional) model is used to deliver EFNEP. Program educators, known as Program Assistants (PAs), are often familiar with communities which they serve [6]. This may aid EFNEP recruitment, partnerships with local organizations and agencies, and integration into the community [6]. Land-grant Universities support all roles in the paraprofessional model; multiple PAs work closely with a supervisor that is guided by state EFNEP leadership [6].

Program evaluation is conducted annually to assess health behaviors among EFNEP participants before and after the program [53]. Four core behavior areas are evaluated: diet quality and physical activity, food resource management, food safety, and food security [53]. Therefore, nutrition education curricula utilized in EFNEP target participant behavior change in these core areas [53]. Behavior changes are measured using self-reported behavior questions developed and mandated for use by NIFA [53]. Despite difficulties reaching audiences due to the global pandemic, EFNEP national impacts for 2021 revealed improvements in adult diet quality (95% of participants), food resource management (92% of participants), food safety (77% of participants), and physical activity (73% of participants) practices [54]. Room for growth in youth programming is evident by smaller national outcome improvements, particularly in knowledge and preparation of low-cost, nutritious foods (51%), food safety (58%), and physical activity practices (51%) [54]. Ongoing EFNEP initiatives work towards maintaining and improving upon successful programs.

EFNEP provides in-person delivery of nutrition and health focused, research- and evidence-based, interactive lessons [6]. The learner-centered approach places the needs and learning styles of the participants at the forefront of program content and delivery [6]. Hands-on interactions during lessons are also used to enrich participant education. Program delivery across different states may involve additional or complementary methods to direct teaching of approved EFNEP curricula [6].

In Georgia, EFNEP is offered through The University of Georgia (UGA) Cooperative Extension and is referred to as UGA EFNEP [55]. UGA EFNEP provides programming for limited resource adults and teens in approximately 50 counties across Georgia. Adult programming uses a nutrition education curriculum developed by UGA EFNEP titled *Food Talk* [55].

*Food Talk* is an eight-session nutrition and healthy lifestyle education series aimed at improving nutrition and health behaviors for limited resource adults/care-givers of children in EFNEP's four core behavior areas: diet quality/physical activity, food resource management, food security and food safety. [56]. The curriculum is informed by the Dietary Guidelines for Americans and DASH diet principles [3, 57]. PAs read from scripted sessions, each session lasting approximately an hour long [56]. Based on the Health Belief model, *Food Talk* addresses self-efficacy, motivation, and perceived benefits and barrier in each session [56, 58].

For example, *Food Talk* session two is titled "Keep Your Pressure in Check" and focuses on nutrition education for sodium intake. Students learn how excess sodium can contribute to high blood pressure (motivation for disease prevention), the health benefits of limiting excess salt intake (perceived benefits), and how to overcome barriers to consuming less salt (reducing perceived barriers). In this session, hands-on activities are designed to increase self-efficacy for planning ahead and learning an easy low sodium recipe to make mealtime less stressful.

According to the Health Belief model, the curriculum emphasizes the importance of nutrition in disease prevention, such as dietary patterns to reduce risk of hypertension (the DASH diet). PAs lead recipe demonstration and skill-building activities related to nutrition education content to help promote behavior change among participants [56]. Cooking demonstrations in each session incorporate recipes from "Meals in Minutes", a booklet with simple and affordable recipes provided to participants at the end of the series.[56]. Other educational extenders, such as cutting boards and other cooking equipment, are also handed out at the end of each session and are intended for participants to practice skills learned during the sessions [56].

**UGA EFNEP Youth Programming**

The target audience for UGA EFNEP youth programming is low-income, high school-aged adolescents, 13-18 years old [6]. The Youth 9th-12th Nutrition Education Survey is used to measure youth improvements in the core EFNEP areas (diet quality and physical activity, food safety, and food security) [59]. This a 14-question self-report behavior survey completed by youth, with PA supervision, before and after participation in programming [59]. Food resource management is not measured by the Youth 9th-12th Nutrition Education Survey and only one food security behavior is measured: using free or low-cost resources when the family did not have enough food. The survey was developed and mandated by NIFA to be used for all youth EFNEP youth programming. An older version of the survey was validated and published in 2010 [60]. The youth survey has since been updated and is like the current validated adult evaluation survey [61]. Research and validation on the current EFNEP Youth 9th-12th Nutrition Education Survey is not available for reference.

To target youth behavior changes, UGA EFNEP used *Food Talk Teen*, a modified *Food Talk* curriculum, with high school-aged adolescents. UGA EFNEP fiscal year 2021 Youth 9th-12th Nutrition Education Survey data reveals 86% of high school-aged youth programming graduates (from participating Georgia counties) adopt or practice at least one recommended diet behavior, 68% of youth adopt or practice at least one recommended physical activity behavior, 61% of youth adopt or practice at least one recommended food safety behavior, and 29 % of youth adopt or practice one recommended food security behavior. The most common improved diet, physical activity, and food safety behaviors were vegetable intake (in 40% of youth), physical activity frequency (in 38% of youth), handwashing (in 26% of youth), respectively.

*Food Talk Teen*

Since 2018, *Food Talk Teen* has been taught to adolescents in grades 9-12 in UGA EFNEP eligible high schools and in other eligible community agencies, such as Boys and Girls clubs, public libraries, and other youth education sites. The *Food Talk Teen* curriculum, like *Food Talk*, is a scripted eight-session interactive nutrition education series based on the Health Belief Model [62]. The curriculum also includes recipes based on the Dietary Guidelines for Americans; each recipe has at least three of the food groups from MyPlate. Peer educators provide cooking demonstrations using these recipes, and participants are encouraged to sample the meals [62].

A UGA thesis project by Emily Unwin (unpublished) measured the content coverage and effectiveness of *Food Talk* at improving target behavior outcomes in an older adolescent UGA EFNEP population[62]. Unwin found that the curriculum covered all but four (washing produce, moderate to vigorous PA, screen time, and checking expiration dates) of the 14 target behaviors measured by EFNEP youth programming evaluation. Participants demonstrated significant behavior improvements in three measured behaviors: fruit consumption, washing produce, and resource use. Behavior improvements and content coverage were not significantly associated [62]. A qualitative assessment for curriculum acceptability among a subgroup of participants was also performed [62]. These adolescents reported the curriculum was acceptable, and they enjoyed feeling accomplished after receiving a certificate of completion at the end of the program. They also expressed wanting more engagement and hands-on activities, educational extenders, and teenage-friendly recipes [62]. The Health Belief Model is used in *Food Talk* to address the importance of nutrition through a disease prevention perspective [62]. Unwin states that adolescents are motivated through short-term goals and instant gratification [63], and the Health

Belief Model may not be appropriate for immediate behavior change in this age group [62].Providing UGA EFNEP adolescents with more opportunities for measurable achievement and instant gratification, such as goal setting, may improve curriculum acceptability[62]. Participant knowledge improvements relevant to nutrition education in *Food Talk* was indicated in the qualitative data [62]. Survey tools to capture cognitive changes that may precede behavior change, such as knowledge or motivation, could be an additional way to measure effectiveness of EFNEP youth programming.

Unwin's project was helpful in identifying areas to better adapt the adult curriculum to UGA EFNEP youth participants. UGA EFNEP continues to use *Food Talk Teen*. It is being adapted by UGA EFNEP leadership to better align with adolescent acceptability and effectively target behavior change for EFNEP youth programming.

*Teen Cuisine*

The *Teen Cuisine* curriculum was launched in Spring 2022 as an additional youth curriculum for UGA EFNEP youth programming. The curriculum was originally developed and evaluated for adolescents (grades 6-12) by Virginia Cooperative Extension (VCE) through partnerships with Virginia Family Nutrition Program, 4-H Healthy Living, and the Family and Consumer Sciences programming areas [8]. Cooperative Extension university programs, such as EFNEP, SNAP-Ed, and 4-H, in other states have incorporated this curriculum, as well. To date, there are no studies that describe the effectiveness of *Teen Cuisine* in meeting specifically EFNEP youth behavior outcomes. This study fills the gap by assessing *Teen Cuisine* with UGA EFNEP youth in grades 9-12 via EFNEP Youth 9$^{th}$-12$^{th}$ Nutrition Education Surveys.

*Teen Cuisine* consists of six sessions: Eat Smart, You Are What You Eat, Power Up with Breakfast, Find the Fat, The Whole Truth on Grains, and Snack Attack [8]. Sessions were

originally designed to be 90 minutes. *Teen Cuisine* prioritizes activities and limits "lecture time". Accordingly, there is no script to follow [8]. This differs from the *Food Talk* curriculum wherein each session is scripted [56].

In *Teen Cuisine*, Leader's Guides are used as a planning tool prior to teaching. The Leader's Guides include "For Your Information" sections with useful background information for the PAs to teach the lessons, encourage discussion, and answer students' questions. The Leader's Guides offer an outline for each session and provide detailed instructions for activities. Student workbooks are used by students to follow along, participate in activities, and read reference material related to session content. Both the Leader's Guides and student workbooks contain two nutritious and low-cost recipes per session intended to appeal to adolescent food preferences. Food preparation is a key *Teen Cuisine* concept, and educators perform a teen-friendly recipe demonstration each class and invite students to assist and taste samples. Additional recipes not used in the sessions are included at the end of the student workbooks. Students can take their workbooks home after the last session to share the content with their families.

The *Teen Cuisine* curriculum includes four topics: nutrition education, food preparation, food safety, and physical activity [8]. The six sessions address each of these topics with hands-on activities, group work, and a variety of learning tools to promote education and behavior change [8]. Teen empowerment and self-efficacy are also a focus of *Teen Cuisine* [8]. In addition to food preparation, the program intends to strengthen other healthy lifestyle skills like meal planning, label reading, and incorporating daily physical activity [8].

The curriculum uses a learner-centered lens and is based on the Experiential Learning Model (ELM) [8]. The learner-centered approach is an effective method for teaching community

nutrition education [64]. The teaching style places emphasis on the students as active agents in their education and teachers are facilitators of students' experiences [64]. *Teen Cuisine* aims to understand teens' beliefs and how they process new information. The curriculum involves open-ended questions to stimulate discussion with peers, teaching practical skills and allowing time for practice, and using goal setting to assist in adopting new behaviors [8]. Ideally, this approach can help students identify more value, importance, and relevance of nutrition information and practicing healthy behaviors [65].

ELM was also used as a framework of *Teen Cuisine* [8]. This model is a learning theory developed in 1984 by David Kolb [66]. ELM is built upon the idea that people gain knowledge and acquire skills through practical, hands-on experiences [66]. Each *Teen Cuisine* session addresses the core principles of ELM: Do, Generalize, Apply. For example, adolescents participate in activities, share experiences with peers, and discuss the purpose of the content [8]. The students are encouraged to apply what they learned to their lives and reflect on their behavior at the beginning of the next session [8].

The design of *Teen Cuisine* was proven impactful in a program evaluation study of the original Virginia Tech curriculum [67]. The study used a posttest with select question from the *4-H Healthy Living Common Measures* among California 4-H youth, grades 8-12 [67]. Of the teens that completed the program, 76.4% reported positive changes in food choices, 80.9% improved knife skills self-efficacy, 74.1% accurately used recipes during food preparation, and 84% cooked more overall [67]. The program's success is promising for filling the gap between adolescent and adult EFNEP behavior outcomes mentioned previously.

The *Teen Cuisine* curriculum was adopted and modified by UGA EFNEP for youth programming in Georgia. Adaptations included recipe alterations, updated nutrition information

and facts labels, and physical appearance of leader guides, student workbooks and learning materials. The original 90-minute sessions were also adapted to meet a 45-minute class schedule which is often a need for high schools in Georgia (Appendix 1). Another modification was the addition of SMART goal setting pages to the end of each *Teen Cuisine* session (Appendix 2).

SMART goals were developed in the business culture by Georgia Doran, Arthur Miller, and James Cunningham [68] and have since emerged in health promotion techniques for setting goals around health and nutrition behavior change [14]. The acronym SMART stands for Specific, Measurable, Achievable, Realistic, and Timely, and provides a framework for writing goals [68]. The goal setting pages added to UGA *Teen Cuisine* were adapted by UGA EFNEP from the *Eating Smart, Being Active (ESBA)* curriculum, another evidence-based curriculum used in various Cooperative Extension nutrition education programs across the country [69]. The purpose of adding SMART goals is to encourage adolescents to set relevant health and nutrition goals and to encourage behavior change. The following sections in this review support the addition of goal setting to *Teen Cuisine* and the potential for improved UGA EFNEP youth programming outcomes.

**Goal Setting and Behavior Theories**

Goal setting activities were added to the *Teen Cuisine* curriculum with the intention to support nutrition and health behavior changes of participating adolescents. UGA EFNEP adapted goal setting activities from *Eating Smart, Being Active (ESBA)*, an evidence-based, widely adopted healthy eating and active living curriculum for adults written by Colorado State University (CSU) [70]. *ESBA* utilizes the Socio-ecological Model, Adult Learning theory, and Social Cognitive Theory (SCT) through dialogue-based activities and experiential learning [69]. Goal setting in *ESBA* aligns with SCT constructs [69]. SCT and other behavior theories, such as the

Self-Determination Theory (SDT), recognize the role of setting goals in behavior change [15, 16]. These two theories are commonly used as frameworks in adolescent behavior-focused nutrition education interventions [5, 71]. The importance of goal setting in SCT and SDT suggest the addition of goal setting to *Teen Cuisine* may be an impactful tool for behavior change.

Social Cognitive Theory

SCT [72] outlines five core factors that can serve as determinants of health behaviors: knowledge of health risks and benefits, perceived self-efficacy of one's health habits, outcome expectations of health habits' costs and benefits, health goals and plans for achieving them, and perceived facilitators and barriers to health behavior changes [15]. Development and regulation of health behaviors depend on the reciprocal determinism of personal, environmental, and behavioral factors [15]. SCT recognizes goals, both long-term and short-term, as self-incentives for behavior change [15]. In terms of health behavior, long-term goals establish direction for a healthy lifestyle, while short-term goals guide more immediate plans for health behavior change [15].

SCT and goal setting have been used in adolescent nutrition education interventions to successfully promote health behavior change [5]. Bagherniya et al. performed a SCT-based study for obesity prevention among female Iranian adolescents, in seventh and eighth grades (mean age of 13 years), with overweight and obesity [73]. The design aligned with SCT constructs: personal (i.e., increasing knowledge via nutrition education), environmental (parental involvement), and behavioral (i.e., food preparation and goal setting) [73]. Goal setting activities included adolescents (opportunities to set goals in private nutrition counseling and encouraging text messages) and their parents (involvement in nutrition counseling and reminders to support the adolescents' goals) [73]. The study's outcome measures included 24-hour dietary recalls and a self-report Likert-scale SCT questionnaire [73]. The questionnaire assessed knowledge, self-efficacy,

intention, situation, social support, and outcome expectations and expectancies [73]. Specifically, intention aligns with goals and goal plans according to the SCT, and it was measured by five questions in the SCT questionnaire [73].

The study duration was seven months with outcome measures at baseline, middle point (3 months), and endpoint [73]. Diet recalls revealed significant improvements in consumption of fruits and vegetables, low fat dairy, fats and oils, and junk foods ($P < 0.001$) overtime in the intervention group. There were also significant improvements for dietary intention (proximal goals) and other SCT-related measures in the intervention group versus control ($P < 0.001$) [73]. Findings from the Bagherniya et al. study support the use of SCT-based nutrition-focused interventions with the inclusion of goal setting for encouraging dietary behavior change among adolescents.

Self-Determination Theory

SDT [74] is widely accepted in a range of health contexts, including health behavior-focused adult interventions [71], and also appears in adolescent nutrition interventions. SDT principles emphasizes motivation as a driver of behavior change [16]. Motivation is described as partially autonomous (originated from the self) and partially controlled (influenced by external forces) energy directed towards achieving a particular goal [16]. Autonomy, perceived competence, and social relatedness and support all play important roles in achieving optimal motivation for behavior change [16]. SDT states that extrinsic and intrinsic motivation shape an individuals' goal pursuits or aspirations [16]. Research on motivation from an SDT health behavior perspective has revealed that when individuals prioritize extrinsic aspirations, like wealth and image, they experience lower levels of autonomy, poorer physical and mental health, and more health risk behaviors compared to individuals who prioritize intrinsic aspirations [16]. Prioritizing intrinsic

aspirations, such as personal health, is associated with positive health outcomes [16]. In SDT, autonomous self-regulation is thought to promote behaviors that are consistent with one's goals and values [16]. Focus on intrinsic motivation, self-regulation, and goal setting has been employed in SDT-based health behavior change interventions [71].

Recent literature reveals the success of behavior-focused, theory-based adolescent nutrition interventions using SDT combined with SCT to promote behavior change [75]. An example of this multi-theory framework is the *In Defense of Food* intervention [75]. This pilot study aimed to evaluate the effectiveness of the *In Defense of Food* curriculum in decreasing highly processed foods (HPF) and increase whole/minimally processed foods (W/MPF) in the diets of participating middle schoolers (mean age of 12 years)[75]. In doing so, authors wanted to understand how SCT (outcome expectations, intention, self-efficacy) and SDT (autonomous motivation and self-regulation) may mediate behavior change among participants [75]. Goal setting and self-regulation skills were taught and practiced by having adolescents write action plans related to HPF and W/MPF intake during sessions [75]. The intervention duration was 10 weeks with dietary and mediator measures assessed via pretest-posttest surveys. Semi-structured interviews were also used to collect qualitative data.

*In Defense of Food* elicited significant increases W/MPF consumption overtime ($P < 0.01$). Survey data only revealed SCT-related constructs as significant mediators of participant behavior change [75]. However, during the interviews participants reported using self-regulation skills to work towards behavioral goals [75]. The findings suggest that both SDT and SCT constructs help promote dietary behavior change in a goal setting nutrition curriculum for middle school-aged adolescents.

SCT and SDT support the role of goals in behavior change and previous studies demonstrate the theories' efficacy and effectiveness in middle school adolescent nutrition interventions [73, 75]. Goal setting activities added to the UGA EFNEP *Teen Cuisine* adapted curriculum uses SMART goal setting criteria with the intention to encourage health behavior change among high school-aged adolescents. Next, this review will summarize adolescent nutrition interventions using goal setting to further appraise the addition of SMART goal setting activities to *Teen Cuisine*.

**Goal Setting Adolescent Nutrition and Health Interventions**

Behavior theories used for designing health behavior-focused interventions, including SCT and SDT, highlight the importance of goals in achieving behavior change [5, 15, 16, 71]. Goal setting is considered a tool for dietary behavior change [14]; particularly its use in adolescent nutrition education interventions are of relevance to this project. Goal setting in adolescent nutrition and health interventions with similar characteristics to the current research project are discussed next.

Despite increasing evidence of goal setting having positive impacts in health-related interventions, there is limited research on SMART goal setting used with (1) high school-aged adolescents (2) from low-income communities (3) in group nutrition education (4) targeting behavior change. One study that comes close to meeting these criteria used a curriculum called *Choice, Control, and Change* [43].

The *Choice, Control, and Change* project used a science and nutrition curriculum to target behavior and psychosocial mediators for obesity [43]. The middle school-aged participants had a sample mean age of 12 years and were recruited from low-income neighborhoods [43]. The theory-based intervention addressed personal agency and autonomous motivation from SCT and

SDT, respectively [43]. Personal agency is defined as an assembly of outcome expectation, intentionality, self-efficacy, and self-regulation that impacts behavior [43]. Autonomous motivation is defined as the ability to act and reflect with a complete sense of choice [76]. Addressing personal agency and autonomous motivation in the curriculum was intended to help youth from underserved populations navigate highly obesogenic environments and sustain healthful behaviors despite barriers [43].

The *Choice, Control and Change* curriculum spanned eight to 10 weeks, with 24 45-minutes lessons taught during school hours [43]. Guided goal setting allowed participants to select appropriate target behaviors from a list [43]. Pretests and posttests were used to measure the behavioral outcomes and theory-based psychosocial mediators [43]. Adolescents from the intervention group reported significantly less frequent undesirable health behaviors (consumption of sugar-sweetened beverages [$P < 0.001$] and processed packaged snacks [$P = 0.005$]) compared to those from the control group [43]. The intervention group also had significantly smaller fast food meal portions ($P = 0.002$), greater exercise frequency ($P = 0.044$), and less screen time frequency ($P < 0.001$) compared to control [43]. For nutrition and health SCT and SDT mediators, there were higher scores from the intervention compared to control in all outcome expectations, intention to change (or goal intention), perceived barriers, self-efficacy, and personal agency/autonomous motivation measures, apart from eating fruits and vegetables self-efficacy and perceived barriers to eating healthfully [43]. More specifically, a cumulative goal intention to change score was greater in the intervention group compared to control ($P < 0.001$) [43]. The significant results highlighted personal agency, autonomous motivation, and intention for goal achievement as mediators for adolescent behavior change [43]. This study provides an

example of an effective nutrition education intervention employing goal setting with adolescents from low-income communities to achieve behavior change.

Guided goal setting was used in the *Choice, Control, and Change* study with a middle school-aged participants, 11-13 years old [43]. This technique of goal setting been described as an evidence-based approach suitable for adolescent populations and tested mainly in middle school populations [43, 77-79]. Guided goal setting was developed on the preface that self-written goal setting requires abstract reasoning, an ability that may not be fully developed in some adolescents [80]. The process of guided goal setting allows adolescents to choose from pre-determined appropriate goals that meet criteria for optimal goal achievement: specific, proximal, difficult, and attainable [77]. These criteria are like those outlined in SMART goal setting (Specific, Measurable, Achievable, Realistic, and Timely). However, guided goal setting is more controlled compared to the self-written SMART goals used in the current project with *Teen Cuisine*. It is worth noting that autonomy, self-efficacy, and abstract thinking progress through the stages of adolescence, [24, 80]. Older high school-aged adolescents, like those in UGA EFNEP youth programming, may be better suited for writing SMART goals compared to middle school-aged adolescents.

The impact of SMART goal setting behavior-focused adolescent interventions is less visible in the literature, but one article supports of the efficacy using a SMART goal approach with high school-aged adolescents for behavior change [81]. The study took place in a high school classroom with adolescents participating in the *Healthy Me* curriculum, part of Health Corps programming [81]. Health Corps is a nonprofit that provides nutrition and health programming in high schools with a focus on students from low-income households.

The *Healthy Me* curriculum consists of four 45-minute modules teaching the Dietary Guidelines for Americans (DGA) and lasts approximately 12 weeks. Participants completed a health behavior questionnaire in the second module and wrote SMART goals in the third module [81]. Researchers measured associations between the behavior questionnaire and the topics of participants' SMART goals [81]. Results showed that adolescents were more likely to write SMART goals related to DGA nutrition and health recommendations they were not achieving or only partially achieving at the second module ($P < 0.0001$) [81]. The most frequently written goals were related to breakfast, PA, and sugary beverage DGA recommendations [81]. Overall, the results demonstrated that high school-aged adolescents can set relevant SMART goals for target nutrition and health behaviors. This study supports the feasibility of using SMART goals with a similar population to EFNEP youth programming.

SMART goal setting may be a helpful tool for high school-aged adolescent nutrition and health behavior improvements, but more research is needed to assess the effectiveness of this strategy. Guided goal setting has been shown to produce desirable outcomes among middle school-aged adolescents [43, 78], and SMART goals are considered feasible with high school-aged adolescents [81]. The next section defines Stages of Change from the Transtheoretical Model and assesses its usefulness in evaluating the effectiveness of adolescent nutrition interventions.

**The Transtheoretical Model**

The effectiveness of adolescent nutrition interventions, including those that involve goal setting, is often measured by behavior change outcomes or clinical measures. Measuring BMI or behavior change alone can limit a study by overlooking psychological changes that may occur before behavior change is achieved [17].

The Transtheoretical Model (TTM) conceptualizes behavior change as a sequential experience [17]. The Stage of Change construct of TTM represents the timely dimensions of behavior change, emphasizing that behavior change is not a single event but instead consists of chronological stages leading toward a specified change [17]. The five Stages of Change are as follows: **Precontemplation,** in which individuals have no intention of changing behavior; **Contemplation,** in which individuals intend to change their behavior; **Preparation,** in which individuals have plans to take action towards change; **Action,** in which individuals have overtly modified their behavior; **Maintenance,** in which individuals are increasingly more confident in maintaining their new behavior; and Relapse, in which individuals return to earlier stages before action, often back to contemplation or preparation for another attempt at the behavior change [17]. The model was originally used in a study by DiClemente and Prochaska to identify why "self-changers" were more likely to quit smoking among a sample of smokers [82]. Since then, TTM has been used to a range of health behaviors, including health and nutrition education interventions for adolescents [83].

Supporting evidence suggests increases in Stages of Change are associated with positive dietary behavior changes [84]. Studies may use the Stages of Change to evaluate intervention effectiveness. Lee et al. used Stages of Change to assess the Nutrition Care Process with children and adolescents with obesity [18]. Goal setting was used alongside other techniques to achieve BMI, diet, self-efficacy, Stages of Change improvements [18]. The researchers designed a 24-week individualized intervention using the Nutrition Care Process for children and adolescents (ages 6-17 years) with obesity [18]. Expected outcomes were improvements in diet quality, BMI z-scores, and motivation, as evidenced by pre/post anthropometrics, 3-day food log, and assessments of self-efficacy and stages of change [18]. Self-efficacy was measured to reflect motivation for

behavior change, while stages of change was measured to identify at what point the behavior change occurred [18]. Tailored goal setting specific to participants' nutrition diagnoses, along with goal monitoring and evaluation, were incorporated into six monthly individualized nutrition counseling visits [18]. A control group received nutrition education without the nutrition counseling and goal setting [18].

Results of this study showed improvements over time in the intervention group for dietary intake (energy, carbohydrates, fat, protein, sodium all with $P < 0.001$), BMI ($P < 0.01$), and self-efficacy ($P < 0.01$) [18]. BMI was negatively associated with self-efficacy ($P = 0.016$) [18]. Results showed greater, but not significant, Stages of Change improvements over time in the intervention group, from contemplation and preparation to action and maintenance, compared to control [18]. Several limitations in this study may have contributed to the lack of statistically significant intergroup results. However, participants did demonstrate progression along the Stages of Change [18]. This study demonstrates how Stages of Change outcomes can provide insight into participants' psychological changes and progression towards behavior change [18].

Readiness for change is a concept based on TTM used in health behavior modification to identify an individual's progress towards behavior change [17]. Once an individual is associated with a stage of change, different counseling tools, interventions, and theories can be employed to encourage or maintain behavior change [85]. A tool that is often used to measure readiness for change is the Readiness Ruler (Appendix 4), a validated analogical scale self-reported readiness [86]. Readiness for change has a practical application in one-on-one counseling for health behavior change, but it is less common in health behavior-focused interventions studies.

An example where TTM and a Readiness Ruler were used in evaluating the impact of an intervention is a study by Boff et al. [19]. In this study, the intervention group's Stages of Change

were used to determine how various areas of health promotion (nutrition, psychology, and physical education) impacted health outcomes for adolescents (ages 15-18 years) with obesity [19]. The protocol consisted of 12 sessions to encourage motivation for dietary changes, physical activity engagement, and improved self-efficacy [19]. Anthropometrics (BMI, waist circumference, and hip circumference), blood pressure and other metabolic variables, motivational variables, and psychological measures (binge eating and body image satisfaction) were measured at baseline and a three-month follow-up [19]. Specifically, measured motivation variables are of interest. These included readiness to change diet and readiness to start exercise assessed by a Readiness Ruler, importance of decision-making in losing weight, and diet and exercise self-efficacy [19].

Results showed improved readiness scores for diet and exercise overtime ($P < 0.001$) [19]. No significant intergroup differences in readiness were found, suggesting that the control group benefited from modified thoughts and feelings towards achieving target behavior changes [19]. The study provides support for evaluating effectiveness of adolescent nutrition intervention through readiness for change measured by a Readiness Ruler.

**Rationale**

Adolescence, youth ages 10-19 years [24], is defined as a stage of growth involving autonomy, self-efficacy, and the development of habits that continue into adulthood [2]. During this time, nutrition and health education is critical to reduce risk of chronic disease later in life [2]. Many adolescents do not meet recommendations for a healthy diet pattern and physical activity which is related to the high prevalence of childhood obesity [3, 9, 21]. Adolescents from low-income families often face greater barriers to healthy lifestyles, including good nutrition [10, 11]. Behavior-focused nutrition and health education interventions can be used to target adolescent diet quality

and physical activity [4, 5]. Researchers continue to study how behavior change can be best achieved nutrition education[4, 5, 10]. For example, goal setting is factor in behavior change according to the Social Cognitive Theory and Self-Determination Theory and has been used to target adolescent nutrition behavior and diet quality [14-16]. However, few studies have assessed the feasibility of high school-aged adolescents setting SMART goals related to nutrition and health [81]. The Transtheoretical Model is also used in adolescent nutrition interventions to promote behavior change [19, 83]. The model states that behavior change occurs sequentially [17]. Assessing adolescent readiness to change before and after nutrition education interventions can provide insight into their progression towards achieving target behaviors [18, 19]. One method used to capture participant readiness to change is the Readiness Ruler, a 10-point scale aligning with Stages of Change outlined in the Transtheoretical Model [87].

The Expanded Food and Nutrition Education Program (EFNEP) provides nutrition education and addresses nutrition insecurity among families and youth in low-income communities at greater risk of development of obesity [6]. EFNEP is federally funded through the National Institute of Food and Agriculture to deliver programming through the Land-grant Universities (LGU)/Cooperative Extension system [6]. EFNEP reaches approximately 450,000 limited resource youth nationwide through series-based, interactive nutrition education curricula [7]. In youth programming, EFNEP focuses on the following core behavior areas: diet quality and physical activity, food safety, and food resource management [6].

EFNEP at the University of Georgia (UGA EFNEP) provides youth programming for adolescents in 9$^{th}$-12$^{th}$ grades via two nutrition education curricula: *Food Talk Teen* and *Teen Cuisine*. *Food Talk Teen* was adapted from an adult curriculum designed by UGA EFNEP, *Food Talk.* The curriculum provides nutrition education and resources through eight interactive lessons

and cooking demonstrations. It is informed by the Dietary Guidelines for Americas and DASH diet principles for hypertension prevention. The effectiveness of Food Talk at improving UGA EFNEP adolescent participants' nutrition and health behaviors was previously assessed [62]. Significant behavior improvements were shown in three out of the 14 target behaviors [62]. The *Food Talk* curriculum's content coverage of targeted youth EFNEP behaviors was also measured in the same study [62]. The curriculum covered 10 out of the 14 target behaviors and content coverage was not significantly associated with behavior improvements [62]. In a qualitative measure, adolescents reported the curriculum was acceptable, but they wanted more engagement, hands-on activities, educational extenders, and recipes accommodating teenage food preferences [62]. The Unwin et al. findings were helpful in identifying areas of the adult curriculum that needed adaptations for a youth audience. UGA EFNEP has plans to further adapt the *Food Talk Teen* curriculum to best promote behavior change for participating adolescents.

While Food Talk Teen continues to be adapted for adolescents, *Teen Cuisine* was adapted and launched by UGA EFNEP for youth programming in Georgia. *Teen Cuisine* is a hands-on six session adolescent nutrition education curriculum developed by Registered Dietitians and nutrition educators at Virginia Tech part of Virginia Cooperative Extension [8]. The curriculum aims to support health and nutrition behavior change, self-efficacy, and sustainable positive habits among adolescent participants in grades 6-12 [8]. *Teen Cuisine* was adapted by UGA EFNEP before its launch in Georgia with modifications made to its physical appearance, recipes, nutrition information, nutrition facts labels, and virtual learning tools. SMART goal setting activities were also added in each session by UGA EFNEP. This project is the first time the adapted *Teen Cuisine* has been studied with UGA EFNEP youth programming.

Currently, both *Food Talk Teen* and *Teen Cuisine* are used for UGA EFNEP youth programming. The goals of this project are to determine if UGA EFNEP youth programming improves EFNEP measured nutrition and health behaviors via two nutrition education curricula, *Teen Cuisine* and *Food Talk Teen*. The feasibility of SMART goal setting activities in the UGA EFNEP adapted *Teen Cuisine* curriculum is also assessed. Finally, Readiness Rulers are used to measure youth participants' readiness to change before and after participation in *Teen Cuisine*.

**Specific Aims and Hypotheses**

The specific aims and hypotheses of this study are:

1) To examine health behavior changes related to diet quality, physical activity, food safety, and food security in 9th – 12th grade adolescents participating in UGA EFNEP youth programming via *Teen Cuisine* or *Food Talk Teen.* The hypothesis is UGA EFNEP youth participating in *Teen Cuisine* will demonstrate comparable improvements in measured health behaviors to those participating in *Food Talk Teen* as evidenced by a validated, federally mandated pre/post EFNEP Youth $9^{th}$-$12^{th}$ Nutrition Education Survey.

2) To assess the feasibility of implementing goal setting in the adapted *Teen Cuisine* curriculum with UGA EFNEP youth participants. The hypothesis is at least 50% of participants will report setting nutrition and/or health goals during *Teen Cuisine* as evidenced by a post-intervention survey question.

3) To measure changes in readiness for goal setting, diet quality, physical activity, and food safety behaviors among UGA EFNEP youth participating in the adapted *Teen Cuisine*. The hypothesis is participants will identify with greater readiness for health and nutrition behavior change as evidenced by pre/post Readiness Rulers.

# CHAPTER 3

# METHODOLOGY

## Research Design

This study was a secondary analysis of UGA EFNEP youth programming WebNEERs data and a quantitative analysis of survey data collection before and after UGA EFNEP youth programming with an adapted *Teen Cuisine* curriculum. There are three aims: (1) Examine the health behavior changes of UGA EFNEP youth participating in *Teen Cuisine* compared to *Food Talk Teen*, measured by the pre/post EFNEP Youth 9th-12th Nutrition Education Survey. (2) Assess the feasibility of implementing goal setting in the adapted *Teen Cuisine* curriculum with UGA EFNEP youth, measured by a post-intervention survey question. (3) Measure changes in readiness for nutrition and health behaviors among UGA EFNEP youth participating in an adapted *Teen Cuisine* curriculum, measured by pre/post Readiness Rulers.

## Curricula Descriptions

The UGA EFNEP adapted *Teen Cuisine* curriculum consists of six 45- or 90-minute sessions including nutrition education, food preparation, food safety, and physical activity topics (Appendix 1). The series is offered with either 45-minute lessons or 90-minute lessons, depending on the needs of the high school class. The six sessions are: “Eat Smart”, “You Are What You Eat”, “Power Up with Breakfast”, “Find the Fat”, “Watch Out for Added Sugars”, and “Snack Attack”. The *Teen Cuisine* teaching curriculum aims to limit lecture time and strengthen adolescent self-efficacy through various activities and group discussions [8]. This objective aligns with the learner-centered approach and Experiential Learning Model used in developing the

curriculum [8]. Depending on the structure of the Georgia high school class used for UGA EFNEP youth programming, *Teen Cuisine* sessions are offered either once a week for six weeks or twice a week for 3 weeks with at least one day between sessions. It can take 3-6 weeks to complete the curriculum. The EFNEP Youth 9th-12th Nutrition Education Survey is used to collect nutrition and health behavior data from youth participants before and after programming [59].

UGA EFNEP adapted the original *Teen Cuisine* curriculum and added a goal setting activity in each session. For these activities, participants receive goal setting handouts that outline SMART goals criteria (Appendix 2). The handouts include a probe ("Something new I learned today in this session is…") and space for writing SMART goals relating to content from the *Teen Cuisine* session. The UGA EFNEP Program Assistants (PAs) are provided with SMART goal information in the Leader's Guide to facilitate the goal setting activities with the students.

*Food Talk Teen* curriculum is modified from the adult curriculum, *Food Talk,* that consists of eight sessions [62]. The eight sessions are: "Your Food, Your Choice", "Keep Your Pressure in Check", "Save with Smart Shopping", "Color Me Healthy", "Eat Well on the Go", "Become a Nutrition Detective", "Keep Yourself Well!" and "Keep Your Health Out of Jeopardy". The curriculum is informed by the Dietary Guidelines for Americans and DASH diet principles for hypertension [3, 57]. Each session involves recipe demonstrations and educational extenders as learning aids [62]. The curriculum is scripted, interactive, and based on the Health Belief model, like the adult curriculum [62]. As with *Teen Cuisine* and all EFNEP youth programming, the enrollment and exit Youth 9th-12th Nutrition Education Survey is used to evaluate behavior change among participants [59].

**Study design**

Nutrition and Health Behavior Change

For aim 1, a secondary analysis of deidentified data from WebNEERs was performed. WebNEERs software is a national database that is used to store and evaluate all EFNEP data. The UGA EFNEP WebNEERs data from fiscal year 2022 (FY22) was used for this study. Data collection from participating Georgia high schools ended September 30th, 2022. Data entry and WebNEERs analysis was completed October-December 2022. Secondary data analysis and comparisons between *Teen Cuisine* and *Food Talk Teen* groups were done Spring 2023.

UGA EFNEP youth participants completed either Food Talk Teen or Teen Cuisine depending on which curriculum was being taught in their county. All EFNEP youth completed the EFNEP Youth 9th-12th Nutrition Education Survey (Appendix 3) before and after youth programming. The surveys include 14 behavior questions related to core EFNEP behavior areas: dietary quality (questions 1-6) and physical activity (question 7-9), food safety (questions 10-13), and food security (question 14). Food resource management is a core EFNEP behavior area for adult programming and is not a target for EFNEP youth; therefore, it is not measured in the EFNEP Youth 9th-12th Nutrition Education Survey.

UGA EFNEP participants are 9th-12th grade students. Programming typically takes place in public high schools across the state. EFNEP also partners with other community agencies such as Boys and Girls clubs, public libraries, and other youth education sites. Students successfully graduate from UGA EFNEP youth programming if they complete six of the eight sessions offered with *Food Talk Teen*, or if they complete all six sessions offered with *Teen Cuisine*. They also must answer at least one question from the EFNEP Youth 9th-12th Nutrition Education Surveys before and after curriculum completion. In FY21, 1125 youth graduated from UGA

EFNEP youth programming. The graduation total for FY22 was expected to be approximately 1500 youth.

Goal Setting Participation and Readiness for Nutrition Behavior Change

For aims 2 and 3, survey data was collected from UGA EFNEP youth grades 9th-12th participating in *Teen Cuisine.* Youth were sampled from a high school part of regular UGA EFNEP programming in Georgia Houston County. Programming with *Teen Cuisine* lasted three weeks with two 45-minute sessions delivered per week by the same PA. Self-report survey questions were added to the EFNEP Youth 9th-12th Nutrition Education Survey to measure goal setting and readiness for change. These included a post-intervention goal setting question and four pre-/post-intervention Readiness Rulers described in the next section.

Researchers had access to 45 – 60 *Teen Cuisine* students from Houston County with an expected n-size of 15 – 20 participants. Data collection for aims 2 and 3 ended February 2023. Data analysis for these aims was completed February-March 2023.

**Measurable Outcomes**

In aim 1, nutrition and health behavior change were examined using the EFNEP Youth 9th-12th Nutrition Education Survey before and after youth programming via either the *Teen Cuisine* or *Food Talk Teen* curriculum. The survey uses Likert scale self-reported behavior questions related to EFNEP core behavior areas: dietary quality (questions 1-6, ex. “Yesterday, how many times did you eat vegetables, not counting French Fries?”); physical activity (questions 7-9, ex. “During the past 7 days, how many days were you physically active for at least 1 hour?”); food safety (questions 10-13, ex. “How often do you wash your hands before eating?”); food security (question 14, ex. “In the last month, if your family did not have enough

food, how often did you help by going to a food pantry or finding other free or low cost food resources?" [59].

In aim 2, the feasibility of additional goal setting activities was assessed by a yes/no self-report survey question (Appendix 5) regarding participation in the activities. The question asked adolescents to recall if they set goals during *Teen Cuisine*, "Did you set nutrition and/or health goals during *Teen Cuisine*?".

In aim 3, readiness for behavior change was measured by self-reported scores on Readiness Rulers (Appendix 4-5). The Readiness Ruler is an 11-point stages of change scale that can be analyzed similarly to Likert Scale style questions. As the ruler scores progress from zero to 10, participants move from the precontemplation stage up to the maintenance stage. Participants were asked to identify their level of readiness before and after *Teen Cuisine* via four Readiness Rulers: "On each of the rulers below, please circle the number that best described how you feel right now… (1) [setting] nutrition and/or health goals… (2) [eating] more vegetables each day… (3) [being] active for an hour each day… (4) [washing] your hands before each meal". Apart from readiness to set nutrition and/or health goals, these Readiness Rulers align with behavior questions from the EFNEP Youth 9$^{th}$-12$^{th}$ Nutrition Education Survey: the second ruler matches behavior question one (vegetable consumption), the third ruler matches behavior question seven (daily physical activity), and the fourth ruler matches behavior question 10 (handwashing) (Appendix 3-5). Researchers did not designate a Readiness Ruler for the food security question 14, because this behavior may not be applicable to all EFNEP youth. A composite Readiness Ruler score was assessed by combining average scores for all four Readiness Rulers. The purpose of this composite score was to identify overall improvements in readiness to change.

The Readiness Ruler is a simplified measure of readiness to change, compared to Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) (developed in 1987 by William R. Miller) and Readiness to Change Questionnaire (RCQ) [88]. In a study done by Maisto et al., Readiness Rulers were used with a clinical sample of adolescents for marijuana use behavior. Participants, ages 14-18, and were from not-for-profit rehabilitation centers. A majority were male (65.5%), identified as white (86.2%), and were of lower middle to middle socioeconomic status. Most participants said marijuana was their most frequently used drug and reported abstinences from marijuana about 57% of days in the past month. This 10-point Readiness Ruler was originally developed by Miller et al. [87, 89]. It prompted participants to identify how ready they were to change their marijuana use. A score of 1 was "not ready to change", 4 with "unsure", 6-7 with "ready to change", and 10 as "trying hard to change". The rulers used evidenced predictive validity and greatest clinical utility (relating to ease of administration) compared to SOCRATES and a staging algorithm [90].

The Readiness Ruler has also been used in adolescent nutrition behavior interventions. In a Transtheoretical Model-based adolescent obesity intervention by Boff et al., readiness for change was measured at baseline and follow-up [19]. The rulers used in this study were similar to a ruler originally developed by Velasquez et al [86]. It is unclear whether this Readiness Ruler is related to the one developed by Miller [87, 89]. But, both Boff et al. and Maisto et al. describe the rulers as analogical stages of change measures that were used to study drug use. The Boff et al. data show significant intragroup improvements over time in readiness for diet and exercise behavior change [19]. It is worth noting that the Readiness Rulers in this study were not previously validated with adolescents for readiness to change nutrition-related behaviors [19].

In the current project, UGA EFNEP youth nutrition and health behavior and readiness to change will be measured before and after participation in *Teen Cuisine*. To fit the topics covered in this project, the Readiness Ruler prompts and options differed from the ruler with predictive validity described in Maisto et al. [90]. The researchers aimed to use analogous language for readiness to change but related to nutrition and health instead of marijuana use behaviors. Using a measure of readiness alongside behavior change outcomes provides the opportunity to identify psychological improvements that may occur before behavior change is achieved, according to the Transtheoretical Model [87].

**Statistical Analysis**

FY22 UGA EFNEP Youth Behavior Change Data

The secondary data set included demographics of FY22 UGA EFENP youth participants reported during collection in FY22. Youth behavior changes before and after participation in either *Teen Cuisine* or *Food Talk Teen* were recorded during FY22 using the EFNEP Youth 9$^{th}$-12$^{th}$ Nutrition Education Survey. This data collection was part of regular UGA EFNEP youth programming and was stored in WebNEERs. After data collection ended in September 2022, the following data analyses were performed using Statistical Package for the Social Sciences (SPSS). For composite behavior area scores—diet quality, physical activity, and food safety—pre/post scores of related behavior questions (questions 1-6 cover diet quality, questions 7-9 cover physical activity, and questions 10-13 cover food safety) were averaged. Food security is only measured by one question, question 14, so a composite score was not computed. Averages were used to conduct paired t-tests to assess *Teen Cuisine* and *Food Talk Teen* participant composite behavior area improvements. A nonparametric analysis, using Wilcoxon signed-rank tests, was used to assess behavior score changes for individual behavior questions in each

curriculum. Independent t-tests were used to measure differences in behavior question mean score changes between curricula.

Goal Setting Participation

For aim 2, the feasibility of adding SMART goals to the adapted Teen Cuisine curriculum was measured using percentage of participants who reported setting nutrition and health goals during the intervention. This reported participation was collected using one post-intervention survey question.

Readiness for Nutrition and Health Behavior Change

The Readiness Ruler is a 10-point Likert-type scale used in aim 3. Wilcoxon signed-rank tests in SPSS were used to measure changes over time alongside descriptive statistics. A paired t-test was used to assess improvements in this composite Readiness Ruler score.

# CHAPTER 4

# RESULTS

## UGA EFNEP Youth Programming Behavior Change

A total of 2,580 Georgia high school students were enrolled in UGA EFNEP Youth Programming in Fiscal Year 2022 (FY22) and participated in either *Teen Cuisine (TC)* or *Food Talk Teen (FTT)*. Of participating youth, 50% and 70% were considered EFNEP *TC* and *FTT* graduates, respectively. Overall, UGA EFNEP youth from FY22 most identified as Black or African American (52%), were in 9th grade (36%), and from urban/metro communities (47%) or rural and smaller town communities (identified by EFNEP as rural when the population size is <10,000 and smaller town when the population size ranges from 10,000-50,000, 51%). Demographic statistics are provided in Table 1.

**Table 1.** *UGA EFNEP Participant Demographic Statistics of FY22*

| Characteristics | Total | *Food Talk Teen* | *Teen Cuisine* |
|---|---|---|---|
| **Number of participants** | 2,580 | 1,433 | 1,147 |
| **Percent graduated (%)** | 61 | 70 | 50 |
| **Identified Sex (%)** | | | |
| Female | 60 | 58 | 62 |
| Male | 39 | 41 | 37 |
| **Ethnicity (%)** | | | |
| Not Hispanic | 85 | 81 | 89 |
| Hispanic | 10 | 11 | 10 |
| Not provided | 5 | 8 | 1 |

| | | | |
|---|---|---|---|
| **Race (%)** | | | |
| Black or African American | 52 | 54 | 48 |
| White | 32 | 26 | 38 |
| American Indian or Alaska Native | 2 | 1 | 2 |
| Asian | 1 | 1 | 1 |
| Multiple Races | 7 | 8 | 7 |
| Not provided | 7 | 10 | 4 |
| **Grade (%)** | | | |
| 9th | 36 | 44 | 25 |
| 10th | 27 | 27 | 27 |
| 11th | 17 | 15 | 18 |
| 12th | 20 | 14 | 28 |
| **Place of residence** | | | |
| Town, population <10,000 | 28 | 18 | 41 |
| Town, population 10,000 - 50,000 | 23 | 22 | 23 |
| Suburb, population >50,000 | 2 | 4 | 0 |
| City, population >50,000 | 47 | 55 | 36 |

Behavior changes in *Food Talk Teen* and *Teen Cuisine*

Nutrition and health behavior data from UGA EFNEP youth was collected via the EFNEP Youth 9th-12th Nutrition Education Survey pre/post participation in *TC* or *FTT*. Of the FY22 graduates, 531 (37%) youth participating in *TC* and 890 (63%) in *FTT* fully completed the pre/post surveys. Surveys with incomplete data were not included in the analyses. Composite scores were computed for each behavior area: diet quality (Q1-Q6), physical activity (Q7-Q9), and food safety (Q10-Q13). Paired t-tests were then used to assess changes in composite

behavior area scores of participants in *TC* and *FTT*. The results for the three behavior areas per curriculum are provided in Table 2.

**Table 2.** *Behavior Area Scores per Curriculum*

| | ***Teen Cuisine*** **(n = 531)** | | | ***Food Talk Teen*** **(n = 890)** | | |
|---|---|---|---|---|---|---|
| **Behavior area** | **Entry score Mean (SD)** | **Exit score Mean (SD)** | **P-value [ab]** | **Entry score Mean (SD)** | **Exit score Mean (SD)** | **P-value [ab]** |
| Diet quality | 1.64 (0.55) | 1.89 (0.63) | <.001 | 1.63 (0.59) | 1.83 (0.64) | <.001 |
| Physical activity | 3.16 (1.24) | 3.32 (1.23) | <.001 | 3.00 (1.25) | 3.23 (1.21) | <.001 |
| Food safety | 4.20 (0.62) | 4.33 (0.63) | <.001 | 4.10 (0.72) | 4.23 (0.67) | <.001 |

[a] Paired t-tests used to determine statistical significance between entry and exit scores.

[b] Statistical significance for $P \leq .05$

Researchers used Wilcoxon signed-rank tests to analyze pre to post score changes for the 14 behavior questions (Q1-Q14) from the EFNEP Youth 9th-12th Nutrition Education Survey. *TC* elicited statistically significant improvement in most behavior question scores except for Q8 (participation in moderate-vigorous activity), Q13 (frequency of checking expiration dates), and Q14 (help by finding free or low-cost resources). For *FTT* there were statistically significant improvements in all behavior question scores except Q5 (choosing whole grain products) and Q14. Mean score changes for the 14 behavior questions per curriculum are provided in Table 3 and Table 4.

**Table 3.** *Pre/Post Behavior Question Scores in* Teen Cuisine

| Behavior Question [a] | Entry score Mean (SD) | Exit score Mean (SD) | P-value [bc] |
|---|---|---|---|
| Q1 | 1.16 (1.03) | 1.53 (1.12) | <.001 |
| Q2 | 1.33 (1.17) | 1.73 (1.23) | <.001 |
| Q3 | 0.67 (0.91) | 0.85 (1.02) | <.001 |
| Q4 | 1.50 (1.03) | 1.76 (0.97) | <.001 |
| Q5 | 2.72 (1.09) | 2.86 (1.07) | .004 |
| Q6 | 2.44 (0.97) | 2.64 (1.01) | <.001 |
| Q7 | 3.69 (2.24) | 3.97 (2.14) | .003 |
| Q8 | 3.26 (1.34) | 3.29 (1.31) | .681 |
| Q9 | 2.52 (1.41) | 2.71 (1.40) | .003 |
| Q10 | 4.11 (0.97) | 4.33 (0.90) | <.001 |
| Q11 | 4.25 (1.14) | 4.35 (1.04) | .029 |
| Q12 | 4.19 (1.22) | 4.35 (1.09) | .008 |
| Q13 | 4.26 (1.06) | 4.30 (1.08) | .276 |
| Q14 | 1.76 (1.18) | 1.78 (1.19) | .772 |

[a] Behavior questions from EFNEP Youth Survey 9th – 12th grades, see Appendix 3

[b] Wilcoxon signed-rank tests used to determine statistical significance between entry and exit scores

[c] Statistical significance for $P \leq .05$

**Table 4.** *Pre/Post Behavior Question Scores in* Food Talk Teen

| Behavior Question [a] | Entry score Mean (SD) | Exit score Mean (SD) | P-value [bc] |
|---|---|---|---|
| Q1 | 1.09 (1.11) | 1.46 (1.20) | <.001 |
| Q2 | 1.44 (1.29) | 1.75 (1.31) | <.001 |
| Q3 | 0.76 (1.07) | 0.94 (1.15) | <.001 |
| Q4 | 1.36 (1.04) | 1.54 (1.02) | <.001 |
| Q5 | 2.69 (1.07) | 2.68 (1.08) | .729 |
| Q6 | 2.41 (1.04) | 2.58 (1.07) | <.001 |
| Q7 | 3.53 (2.32) | 3.73 (2.26) | .004 |
| Q8 | 3.06 (1.38) | 3.35 (1.31) | <.001 |
| Q9 | 2.43 (1.41) | 2.62 (1.43) | <.001 |
| Q10 | 4.20 (0.96) | 4.34 (0.90) | <.001 |
| Q11 | 4.13 (1.20) | 4.26 (1.16) | <.001 |
| Q12 | 3.88 (1.34) | 4.07 (1.23) | <.001 |
| Q13 | 4.20 (1.13) | 4.28 (1.08) | .036 |
| Q14 | 2.03 (1.29) | 2.06 (1.27) | .508 |

[a] Behavior questions from EFNEP Youth Survey 9th – 12th grades, see Appendix 3

[b] Wilcoxon signed-rank tests used to determine statistical significance between entry and exit scores

[c] Statistical significance for $P \leq .05$

Comparison of behavior changes between *Teen Cuisine* and *Food Talk Teen*

For the comparison between *TC* and *FTT,* researchers first averaged changes in EFNEP Youth 9th-12th Nutrition Education Survey individual behavior question scores (Q1-Q14) and behavior area composite scores (diet quality, physical activity, and food safety) for each curriculum. Food security was measured by one question, Q14, so a composite score was not included. Independent t-tests were then used to determine if significant differences existed between *TC* and *FTT*. No significant differences were found between curricula for the behavior area composite scores. For individual behavior question scores, *TC* participant mean score for Q5 (choosing whole grain products) significantly improved more (mean 0.15, SD 1.12) compared to *FTT*, in which the mean score lowered (mean -0.01, SD 1.18), $P$=0.013. Whereas for Q8 (participation in moderate-vigorous activity), *FTT* mean score improvements (mean 0.297, SD 1.370) were significantly greater than TC (mean 0.024, SD 1.342), $P$<0.001. All data from the comparison of curricula mean change scores is provided in Table 5.

**Table 5.** *Comparison of Behavior Changes Between Curricula*

| **Behavior Area and Questions** [a] | ***Teen Cuisine* Mean Score Change (SD)** | ***Food Talk Teen* Mean Score Change (SD)** | **P-value** [bc] |
|---|---|---|---|
| Composite diet quality | 0.26 (0.55) | 0.20 (0.61) | .071 |
| Q1 | 0.37 (1.21) | 0.37 (1.33) | .977 |
| Q2 | 0.40 (1.36) | 0.31 (1.43) | .228 |
| Q3 | 0.18 (1.05) | 0.18 (1.24) | .975 |
| Q4 | 0.25 (1.07) | 0.18 (1.09) | .211 |
| Q5 | 0.15 (1.12) | -0.01 (1.18) | .013 |
| Q6 | 0.20 (1.01) | 0.17 (1.16) | .625 |
| Composite physical activity | 0.16 (1.07) | 0.23 (1.09) | .266 |
| Q7 | 0.27 (1.91) | 0.20 (2.08) | .516 |
| Q8 | 0.02 (1.34) | 0.30 (1.40) | <.001 |
| Q9 | 0.19 (1.48) | 0.18 (1.51) | .979 |
| Composite food safety | 0.13 (0.63) | 0.13 (0.70) | .923 |
| Q10 | 0.21 (0.89) | 0.14 (0.98) | .173 |
| Q11 | 0.10 (1.04) | 0.12 (1.16) | .662 |
| Q12 | 0.16 (1.30) | 0.18 (1.52) | .752 |
| Q13 | 0.04 (1.10) | 0.08 (1.19) | .602 |

| | | | |
|---|---|---|---|
| Food security Q14 | - 0.02 (1.20) | - 0.03 (1.48) | - .824 |

[a] Behavior questions from EFNEP Youth 9th-12th Nutrition Education Survey, see Appendix 3. Composite scores for behavior area: diet quality (Q1-Q6), physical activity (Q7-Q9), and food safety (Q10-Q13)

[b] Independent T-tests used to determine statistical significance between curricula mean scores

[c] Statistical significance for $P \leq .05$

**Goal Setting and Readiness Rulers**

Goal setting and Readiness Ruler data were collected in Spring 2023 in a high school classroom in Houston County, Georgia, using the UGA EFNEP adapted *Teen Cuisine* for UGA EFNEP youth programming. Of the 18 students who enrolled in the study, 15 fully completed the enrollment and exit surveys and were considered EFNEP graduates. Surveys with incomplete data were not included in the analyses. Overall, the enrolled youth most identified as White (61%) and were in 10$^{th}$ and 11$^{th}$ grades (88%). All participants were from Houston, a smaller Georgia town community (population <10,000). Demographic data of this UGA EFNEP youth programming sample is provided in Table 6.

**Table 6.** *UGA EFNEP Participant Demographic Statistics of High School in Houston County*

| Characteristics | Sample |
|---|---|
| **Number of participants** | 18 |
| **Percent graduated (%)** | 83 |
| **Identified Sex (%)** | |
| Female | 83 |
| Male | 17 |
| **Ethnicity (%)** | |

| | |
|---|---|
| Not Hispanic | 16 |
| Hispanic | 2 |
| **Race (%)** | |
| Black or African American | 22 |
| White | 61 |
| American Indian or Alaska Native | 0 |
| Asian | 6 |
| Multiple Races | 11 |
| **Grade (%)** | |
| 9th | 11 |
| 10th | 44 |
| 11th | 44 |
| 12th | 0 |
| **Place of residence (%)** | |
| Town, population <10,000 | 100 |

All 15 graduates reported "Yes" to setting health and/or nutrition goals during *TC*. The four Readiness Rulers captured participant readiness to change behavior related to: (1) setting nutrition and/or health goals, (2) eating more vegetables each day, (3) being active for an hour each day, (4) handwashing before each meal. Researchers used Wilcoxon signed-rank tests to assess pre/post change scores in the four Readiness Rulers. Participation in *TC* elicited statistically significant score increases in Readiness Rulers for daily activity (3) and food safety (4). Readiness for goals setting (1) and vegetable intake (2) improved as well but not significantly. A composite Readiness Ruler score was computed and analyzed via a paired t-test to assess overall change in readiness. Readiness Ruler data is provided in Table 7.

**Table 7.** *Readiness to Change and Composite Readiness Ruler*

| Readiness Ruler | Entry score Mean (SD) | Exit score Mean (SD) | P-value [b] |
|---|---|---|---|
| (1) Goal setting | 5.20 (2.40) | 6.20 (2.08) | .068 [c] |
| (2) Vegetable intake | 5.93 (2.74) | 6.67 (1.95) | .075 [c] |
| (3) Daily activity | 6.33 (2.26) | 7.20 (2.54) | .041 [c] |
| (4) Handwashing | 7.07 (2.49) | 8.40 (1.64) | .040 [c] |
| Composite Readiness | 6.13 (1.86) | 7.12 (1.66) | .005 [d] |

[a] For full Readiness Rulers, see Appendix 4-5.

[b] Statistical significance for $P \leq .05$

[c] Wilcoxon signed-rank tests used to determine statistical significance between entry and exit scores

[d] Paired t-test used to determine statistical significance between entry and exit scores

The study sample were also participants in regular EFNEP youth programming. This includes the completion of EFNEP Youth 9th-12th Nutrition Education Surveys. Readiness Rulers 2, 3, and 4 align with behavior questions 1, 7, and 10 from the EFNEP Youth 9th-12th Nutrition Education Survey, respectively (Appendix 3-5). Participants reported improvement in behavior question scores for Q1 (frequency of vegetable intake) and Q7 (participation in physical activity for at least 1 hour), but not statistically significant. Behavior question scores for Q10 (frequency of handwashing) did not change from before to after *TC.* Data for relevant behavior questions is provided in Table 8.

**Table 8.** *Behavior Question Scores Related to Readiness Rulers*

| Behavior Question [a] | Entry score Mean (SD) | Exit score Mean (SD) | P-value [bc] |
|---|---|---|---|
| Q1 | 2.13 (0.99) | 2.27 (0.96) | .557 |
| Q7 | 4.40 (1.88) | 4.53 (2.32) | .751 |
| Q10 | 4.07 (0.70) | 4.07 (1.10) | 1.00 |

[a] Behavior questions from EFNEP Youth Survey 9th – 12th grades, see Appendix 3

[b] Wilcoxon signed-rank tests used to determine statistical significance between entry and exit scores

[c] Statistical significance for $P \leq .05$

# CHAPTER 5

# DISCUSSION

The purpose of this study was twofold. (1) To examine nutrition and health behavior changes of high school-aged youth participating in UGA EFNEP youth programming while also comparing two adapted nutrition curricula (adapted *Teen Cuisine* and *Food Talk Teen*), and (2) to assess and measure goal setting feasibility and readiness to change among UGA EFNEP youth participating in the adapted *Teen Cuisine* program.

For most individual behavior questions and behavior area composite scores from the EFNEP Youth 9$^{th}$-12$^{th}$ Nutrition Education Survey, the results support the hypothesis that *Teen Cuisine* behavior improvements would be equal to those in *Food Talk Teen*. Youth scores for participation in moderate-vigorous physical activity did not increase as much in *Teen Cuisine* as they did in *Food Talk Teen*, but both curricula elicited positive physical activity behavior change. The results provide evidence that both curricula promote improvement in most EFNEP youth target behaviors among participants in UGA EFNEP Youth Programming

In the second portion of the study, all 15 participants reported setting health and/or nutrition goals during *Teen Cuisine*. This supports the hypothesis that goal setting would be feasible with UGA EFNEP high school-aged youth. And finally, data from the composite readiness ruler score and individual readiness rulers supports the hypothesis that UGA EFNEP youth participants would identify with greater readiness for health and nutrition behavior change from before to after the *Teen Cuisine* nutrition education curriculum.

**UGA EFNEP Youth Programming Behavior Change**

Both UGA ENFEP youth nutrition education curricula, *Teen Cuisine* and *Food Talk Teen*, were used during this time. Researchers examined change scores for nutrition and health behaviors related to diet quality, physical activity, food safety, and food security across curricula.

The data suggest that *Teen Cuisine* and *Food Talk Teen* achieve similar health behavior improvements measured by the EFNEP Youth 9th-12th Nutrition Education Survey. Composite scores for diet quality (survey questions 1-6), physical activity (survey questions 7-9), and food safety (survey questions 10-13) improved significantly among participants in each curriculum and there were no significant differences in composite change scores between *Teen Cuisine* and *Food Talk Teen*. Individual behavior question scores also improved significantly in each curriculum. Participation in moderate-vigorous intensity physical activity and frequency of checking expiration dates did not change among *Teen Cuisine* participants. Frequency of choosing whole grains did not change among *Food Talk Teen* participants. Participant report of helping his/her family by finding free or low-cost food resources did not change in either curricula. *Teen Cuisine* differed significantly from *Food Talk Teen* in two individual behaviors, whole grains consumption and participation in moderate-vigorous intensity physical activity. Potential reasons for this significant differences are covered in the following sections.

Diet quality

Diet quality behaviors measured by the EFNEP Youth 9th-12th Nutrition Education Survey are related to US government recommendations provided in the Dietary Guidelines for Americans [3]. FY22 UGA EFNEP youth programming curricula, *Teen Cuisine* and *Food Talk Teen*, both resulted in score improvements for composite diet quality and most individual diet-related behaviors.

Mean score for one behavior question did not improve from before to after *Food Talk Teen*: question five, "When you eat grain products, how often do you eat whole grain (i.e., whole grain bread instead of white bread)?". Comparatively, *Teen Cuisine* elicited significantly greater score improvements compared to *Food Talk Teen* for this question. A likely reason for this difference is that *Food Talk Teen* discussed whole grains less than *Teen Cuisine*. The *Teen Cuisine* curriculum mentions whole grains in five out of the six sessions. Whole grains are a focus of session three "Power Up with Breakfast", during which teens learn about the satiating and immediate health benefits of whole grains and practice identifying various sources of whole grains. *Teen Cuisine* also references the DGA recommendation "make half your grains whole grains" throughout the curriculum and relates whole grains back to other session topics (ex. Session six "Snack Attack" discusses whole grain snack options).

The *Food Talk Teen* curriculum mentions whole grains in two of the eight sessions, primarily session six "Become a Nutrition Detective". In this session, participants learn to identify whole grains and the importance of fiber for disease prevention. Multiple "Meals in Minutes" recipes part of *Food Talk Teen* used whole grains. *Food Talk Teen* uses tenants of the Health Belief model to address fiber and whole grains with a disease prevention lens [58, 62]. Research shows that adolescents may not prioritize long-term benefits of nutrition, such as its role in disease prevention [40]. In *Teen Cuisine*, more discussion about whole grains, practical application following the Experiential Learning Model [66], and emphasis on whole grains' immediate health benefits may resonate with adolescents and better promote behavior change [40]. It is worth noting that previous interventions have addressed adolescent nutrition behavior through a disease prevention lens. For example, Bay et al. demonstrated adolescents' capacity for statistically significant diet quality behavior improvements before and after an intervention about

nutrition and noncommunicable disease risk reduction [5]. More research could assess whether the disease prevention approach used by *Food Talk Teen* is appropriate for high school-aged adolescents.

Physical activity

Physical activity behaviors measured in the EFNEP Youth 9th-12th Nutrition Education Survey align with Physical Activity Guidelines for Americans [22]. During FY22, *Teen Cuisine* and *Food Talk Teen* both elicited significant score improvements for composite physical activity and most individual physical activity-related behaviors, except for moderate to vigorous intensity physical activity in *Teen Cuisine*.

Among *Teen Cuisine* participants, scores for moderate-vigorous intensity physical activity, measured by question eight, increased but not significantly. Question eight from the EFNEP Youth 9th-12th Nutrition Education Survey read, "During the past 7 days, how often were you so active that your heartbeat fast and you breathed hard most of the time?". *Teen Cuisine* participants' scores had a mean of about "2 times last week" from before and after with no statistically significant change. In *Food Talk Teen*, participating UGA EFNEP youth reported significantly higher scores for question eight post-intervention compared to pre-intervention. Furthermore, question eight scores improved significantly more in *Food Talk Teen* versus *Teen Cuisine*.

The *Teen Cuisine* curriculum discussed this behavior with similar language to the EFNEP youth survey. *Teen Cuisine* session two "You Are What You Eat" covered the definition, importance, and examples of moderate-vigorous intensity physical activity. Posters explained how low to vigorous intensity activities cause increasingly heavy breathing and quicker heart

rate. The *Food Talk Teen* curriculum addresses physical activity but does emphasize moderate-vigorous intensity physical activity as seen in *Teen Cuisine*.

*Teen Cuisine* session two emphasized moderate-vigorous intensity physical activity, and PAs ideally taught this session on week two of programming. Participants completed the post EFNEP Youth 9th-12th Nutrition Education Survey on the last week of programming. Perhaps this delay in outcome measures failed to capture more immediate behavior change elicited by session two of *Teen Cuisine*. The *Food Talk Teen* curriculum addresses physical activity much later in the curriculum, during session seven (week seven). It is possible participants overestimated their participation in physical activity. This may be one reason *Food Talk Teen* participants had significantly greater question eight score improvements than *Teen Cuisine* participants, despite there being less discussion of physical activity intensity in the *Food Talk Teen* curriculum.

Additionally, if *Food Talk Teen* participants are unfamiliar with physical activity behaviors that cause heavy breathing and high heart rate, they may overestimate their participation in these behaviors. This could result in self-report bias and participants misclassifying their physical activity behaviors [91, 92]. Further research can minimize potential for self-report bias with additional behavior outcome measures to reinforce reported behavior change.

Food safety

Baseline food safety-related question scores were the highest in both curricula out of the three behavior areas. Even with high baseline scores, *Teen Cuisine* and *Food Talk Teen* elicited statistically significant score improvements in composite food safety and most individual food safety questions.

One exception was question 13, “How often do you check the expiration date before eating or drinking foods?”. Among *Teen Cuisine* participants, scores for question 13 increased but not significantly. A closer look at the *Teen Cuisine* curriculum reveals that the phrases “sell by”, “best if used by”, and “use by” are used in place of “expiration date”. Furthermore, the Leader’s Guide included education on checking dates on food packages for PAs, but this topic is not in the teaching outline. Therefore, PAs might not disseminate this topic to the students. The curriculum includes other food safety topics in more detail. For example, most of the sessions discuss handwashing, washing produce, and refrigeration; all behaviors assessed on the EFNEP Youth 9$^{th}$-12$^{th}$ Nutrition Education Survey. Further research could assess how PAs disseminate information from the Leader’s Guide to UGA EFNEP youth participants.

Food security

Neither *Teen Cuisine* nor *Food Talk Teen* resulted in significant changes in the reported food security behavior. Food security was measured by one question, question 14 “In the last month, if your family did not have enough food, how often did you help by going to a food pantry or finding other free or low-cost food resources?”. Food security is not addressed in either curriculum. The goal of the adult Food Talk curriculum is to improve food resource management behaviors. Food resource management is a core EFNEP behavior area measured in adult programming but not youth. Discussion of food resource management in this curriculum includes comparing prices before buying food and decreasing likelihood of running out of food, which may relate to helping the family with free/low-cost resources. However, this education did not translate to increased food security behavior scores from before to after *Food Talk Teen*.

*Teen Cuisine* also discusses how to compare the cost of food items in a session four activity. This activity is also only part of the 90-minute format of *Teen Cuisine*. EFNEP youth

participating in the 45-minute *Teen Cuisine* do not have any exposure to food cost. Improving food security and food resource management behaviors are not objectives of this curriculum which explains the lack of improvement in question 14.

**Goal Setting and Readiness Rulers**

Researchers measured the feasibility of goal setting activities and readiness to change health and nutrition behaviors in a separate sample of UGA EFNEP high school-aged youth from Spring 2023. To assess the feasibility of goal setting in the adapted *Teen Cuisine* curriculum, participants answered a post-intervention question added to the EFNEP Youth 9$^{th}$-12$^{th}$ Nutrition Education Survey. Researchers added four pre/post readiness rulers to the survey to measure participant readiness to change before and after participation in *Teen Cuisine*.

SMART goal setting

All 15 participants reported setting goals during *Teen Cuisine*, supporting the feasibility hypothesis that at least 50% of participants will practice goal setting. The original *Teen Cuisine* curriculum was adapted by UGA EFNEP with the addition of SMART goal setting activities to each session. Youth practicing goal setting during nutrition and health interventions has positive implication for behavior change: Goal setting is a factor in behavior change according to the Social Cognitive Theory and Self-Determination Theory [15, 16]; additionally, previous studies suggest goal setting can help promote health and nutrition change in adolescents [43, 45].

Most research on goal setting used in adolescent nutrition education interventions have been based on guided goal setting [43, 77-79]. Martin et al. demonstrated that high school-aged youth set relevant nutrition and health SMART goals [81]. Findings from the current study also support the feasibility of SMART goal setting activities with this age group. More research is needed to

assess if written goals follow SMART goal criteria (Specific, Measurable, Achievable, Realistic, and Timely) [68] and impact adolescent behavior change.

Readiness for health and nutrition behavior change

Researchers assessed participant readiness to change using four Readiness Rulers related to goal setting and nutrition and health behaviors from the EFNEP Youth 9th-12th Nutrition Education Survey. The composite Readiness Ruler score increased with statistical significance from before to after *Teen Cuisine*. The individual Readiness Ruler scores all increased with the physical activity and food safety readiness scores improving significantly.

Readiness Rulers can be used to capture an individual's progression along the stages of change that may occur before behavior change is achieved and maintained, according to the Transtheoretical Model [17]. Progression along the stages of change and improvements in readiness to change, measured by using Readiness Rulers, have been used to evaluate adolescent nutrition education interventions [18, 19]. In the study at hand, each of the four Readiness Rulers is a 10-point stages of change scale analyzed similarly to Likert scale style questions. Readiness Ruler scores quantified improvements in *Teen Cuisine* participants' readiness to change.

In the goal setting Readiness Ruler, youth identified with greater readiness to change goal setting behavior after participating in *Teen Cuisine*. Increases in the goal setting Readiness Ruler may reflect greater willingness among participants to continue setting health and nutrition goals after practicing this behavior in the session, considering they all reported setting goals during *Teen Cuisine*.

The diet quality Readiness Ruler was related to the first behavior question from the EFNEP Youth 9th-12th Nutrition Education Survey. Question one reads, "Yesterday, how many times did you eat vegetables, not counting French Fries?" Mean scores for this Readiness Ruler

and behavior question one both increased but not significantly. Consumption of vegetables is a heavily discussed topic in *Teen Cuisine*. Less than significant improvements in this Readiness Ruler may reflect participants' unwillingness to eat more vegetables than the two vegetables they reported eating in a day. Pre to post intervention scores still suggest small improvements in participant readiness to change and daily vegetable intake.

The physical activity Readiness Ruler aligned with behavior question seven from the survey which reads, "During the past 7 days, how many days were you physically active for at least 1 hour?". The physical activity Readiness Ruler scores increased with statistical significance while scores for behavior question seven increased less than significantly. Each session of *Teen Cuisine* discussed physical activity; the repetition could have promoted a significant increase in readiness to change. Participants still reported improved participation in weekly physical activity alongside readiness to change.

The food safety Readiness Ruler was related to behavior question 10, "How often do you wash your hands before eating? (Think about eating at school or home)." The mean answer for this behavior question "most of the time" remained unchanged from before to after *Teen Cuisine*. However, this Readiness Ruler mean score increased significantly. Participants had improved readiness to change handwashing behavior after participating in *Teen Cuisine* even though frequency of handwashing was not notably increased. As mentioned earlier, the curriculum discusses handwashing in multiple sessions. PAs may also demonstrate washing their hands before recipe demonstrations in front of the class. Repeated exposure to handwashing during the curriculum may have prompted improvements in readiness to change among participants. A longer study duration may allow participants to demonstrate consequential behavior change.

Previous research suggests that increases in stages of change are associated with positive dietary behavior changes [84]. Future research could assess how improvements in readiness ruler scores for UGA EFNEP youth impact behavior change.

**Strategies for Adolescent Nutrition and Health Behavior Change**

A large body of literature focuses on adolescent nutrition education and behavior interventions. Systematic reviews have attempted to sort through studies to identify what intervention strategies, or tactics and characteristics, best promote nutrition and health behavior change in this age group [4, 5, 50]. Like previous studies, the current project delivers nutrition education in combination with physical activity education directly to youth participants. Educating adolescents directly supports autonomy, decision-making, and motivation essential to food choice during this age [1, 4]. In both *Teen Cuisine* and *Food Talk Teen*, PAs facilitate nutrition education via "hands-on" learning, group activities and food preparation; all of which have been identified as components of successful adolescent nutrition interventions [5, 51].

Researchers did not measure the direct impact of these *Teen Cuisine* and *Food Talk Teen* strategies on adolescent behavior change in this study. However, the results support previous research by demonstrating that intervention employing these strategies achieve behavior improvements. It is worth noting that UGA EFNEP youth programming spans from three to eight weeks depending on curriculum and delivery frequency. This timeline is substantially shorter than adequate program durations for behavior change identified by Murimi et al. [51]. Furthermore, it is more challenging to improve nutrition behaviors of youth from disadvantaged backgrounds compared to their peers [5]. EFNEP targets youth from low-income households [6]. Despite these barriers, UGA EFNEP youth programming was successful in achieving significant behavior change among youth participants.

**Strengths and Limitations**

This study had several strengths. This project observes UGA EFNEP youth programming in a community setting. The findings are translatable across Georgia youth participating in UGA EFNEP and reflective of this specific demographic. To the authors' knowledge, this is the first study to measure the effectiveness of *Teen Cuisine* curriculum specifically with EFNEP youth and evaluation. Furthermore, this study supports the effectiveness of UGA EFNEP youth programming curricula in achieving positive adolescent nutrition and health behavior changes via the adapted *Teen Cuisine* and *Food Talk Teen*.

The study also adds to a limited body of research on the feasibility of SMART goal setting with high school aged adolescents. Goal setting activities were completed by 100% of UGA EFNEP youth study participants during the adapted *Teen Cuisine* curriculum. Finally, use of Readiness Rulers allowed researchers to identify significant readiness to change improvements not reflected in behavior change scores.

This study had limitations. As with all EFNEP programming, enrollment and exit surveys are provided to collect data for EFNEP evaluation, but participants are not required to complete them to stay in the program. This contributed to the difference between the total UGA EFNEP youth enrolled and number of graduates for both samples of the study.

Another limitation of this study is that there are many program assistants (PAs) delivering both *Teen Cuisine* and *Food Talk Teen* across the state of Georgia. Differences in teaching styles, content coverage, and other factors may confound measured outcomes. For the study sample that contributed to goal setting and readiness to change outcomes, there was only one PA delivering *Teen Cuisine.* Thus, there was more consistency in teaching methods and less

potential for confounders on outcomes. However, the small sample size may have reduced the statistical power of the data in this portion of the study.

The high school class used from the second part of the study (aims 2 and 3) was a convenience sample of 18 youth. Participants from this small-town sample mainly identified as White and were mostly 10th and 11th graders. Comparatively, UGA EFNEP youth from FY22 mainly identified as Black or African American and were mostly 9th graders from urban communities. Research shows that adolescents, ages 12-19, were less likely to consume fruit compared to their urban counterparts [93]. Non-Hispanic Black adolescents were also found to partake in greater sedentary time and drink more sugar-sweetened beverages than Non-Hispanic while adolescents [94]. Researchers also suggest that adolescent development influences food choice; different aged adolescents (for example, 11th graders vs. 9th graders) may experience varying personal and environmental factors that determine their food choice and nutrition behaviors [1, 24]. Therefore, data collected from the smaller sample in the second part of this study may not be representative of all UGA EFNEP high school-aged youth.

Data for both parts of the study was self-report survey data using the NIFA mandated EFNEP Youth 9th-12th Nutrition Education Survey. An older version of this youth survey and a similar adult behavior survey has been validated, but research on the updated youth survey is not available [60, 61]. Therefore, a limitation of this study is that the EFNEP Youth 9th-12th Nutrition Education Survey needs to be further tested for validity and reliability. Survey data collection is also a limitation due to the risk of answer bias. And, to avoid answer fatigue among participants, researchers limited the number of questions added to the 14-question EFNEP Youth 9th-12th Nutrition Education Survey. Ideally, Readiness Rulers for each of the EFNEP behavior questions capture improvements in participant readiness to change for all target behaviors. Future research

should explore the relationship between readiness to change and health and nutrition behaviors measured for EFNEP youth programming.

Finally, systematic reviews have identified strategies employed in effective adolescent nutrition interventions, such as family involvement [50] and adequate program duration (considered 6 months by Murimi et al [51]). A holistic approach of combining behavior-based programs with community-based prevention has been deemed crucial for counteracting disease risk behaviors developed during adolescence in the presence of an obesogenic and westernized environment [4, 5, 10]. UGA EFNEP is just one tool for adolescent nutrition education. It may be that when used in combination with other successful strategies and community-based prevention programs, UGA EFNEP youth programming can best promote behavior change among youth across the state of Georgia. In terms of promoting healthy life trajectories, previous interventions often lack long-term improvements on adolescent behaviors [4, 10]. EFNEP youth programming evaluation only includes self-report behavior change questions and does not assess follow-up behavior change. Future research with follow-up measures for adolescent nutrition and health behaviors of UGA EFNEP youth graduates may be beneficial in assessing the sustainability of changed behaviors.

**Future Directions**

As stated previously, *Food Talk,* the UGA EFNEP adult nutrition education curriculum, utilizes the Health Belief Model to emphasize the importance of nutrition for disease prevention for adult participants. Future research could assess if this disease prevention lens resonates with an EFNEP youth audience in *Food Talk Teen* to best promote behavior change. Future research with UGA EFNEP programming may employ additional measures that minimize the potential for answer bias, assess how PAs disseminate information from the curriculum teaching guides to

the students, and measure compliance to SMART goal criteria. Future research direction may also explore the effect of setting goals and readiness to change on adolescent behavior change.

# CHAPTER 6

# CONCLUSION

Development and practice of positive nutrition and health behaviors during adolescence is a critical in healthy life trajectory [1, 2]. A large body of literature continues to address how to best promote positive food choice and nutrition behavior change in this age group [4, 5, 50].

This study establishes the effectiveness of both UGA EFNEP youth programming curricula, an adapted *Teen Cuisine* and *Food Talk Teen*, in promoting health and nutrition behavior change among UGA EFNEP high school-aged youth. The authors suggest that any differences between behavior outcomes may be related to Program Assistants' (PAs) teaching styles, the Health Behavior Model informing *Food Talk Teen*, and varying degrees of content discussion and repetition. More research could assess whether the disease prevention approach used by *Food Talk Teen* is appropriate for high school-aged adolescents. Additionally, future UGA EFNEP evaluation could assess how PAs deliver youth nutrition education curricula to identify differences in teaching styles that might influence participant behavior change. Finally, *Food Talk Teen* continues to be adapted by UGA EFNEP to best promote EFNEP targeted behavior change among high school-aged adolescents.

Multiple behavior theories emphasize the importance of goal setting in health behavior change [15, 16]. Previous studies suggest goal setting can help promote health and nutrition change in adolescents [43, 45]. Most studies on goal setting used in adolescent nutrition education interventions have looked at guided goal setting in middle school-aged adolescents [77-79]. This study helps fill a gap in the literature by supporting the feasibility of SMART goal setting

activities in the adapted *Teen Cuisine* curriculum with high school-aged adolescents. Of the study participants who completed the goal setting question, all reported setting health and nutrition goals during *Teen Cuisine*. More research is needed to assess if written goals follow SMART goal criteria (Specific, Measurable, Achievable, Realistic, and Timely) [68] and impact adolescent behavior change.

Readiness Ruler scores quantified improvements in participants' readiness to change from before to after *Teen Cuisine.* Youth participants reported significant improvements on Readiness Rulers related to physical activity and food safety behaviors from the EFNEP Youth 9th-12th Nutrition Education Survey ($P<.05$). Future research directions may identify how improvements in readiness to change impact UGA EFNEP youth behavior change.

In both *Teen Cuisine* and *Food Talk Teen*, PAs facilitate nutrition education via "hands-on" learning, group activities and food preparation; all of which have been identified as components of successful adolescent nutrition interventions [5, 51]. It is worth noting that UGA EFNEP youth programming timeline spans from three to eight weeks, which is substantially shorter than adequate program durations for behavior change [51]. Furthermore, EFNEP targets behavior change in youth from low-income households; these households often face greater barriers to improving health behavior [5, 6]. Despite these barriers, UGA EFNEP youth programming was successful in achieving significant behavior change among youth participants.

This study demonstrates the effectiveness of both UGA EFNEP youth programming curricula, the feasibility of additional goal setting activities to *Teen Cuisine,* and improvements in readiness to change among youth participants. On a grander scale, this research helps progress EFNEP youth programming for adolescent behavior change, specifically UGA EFNEP youth programming with Georgia high school-aged adolescents.

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**APPENDIX 1: *Teen Cuisine* 45-minute vs. 90-minute Session 1 Overviews**

## *SESSION OVERVIEW*

### *45 MINUTES*

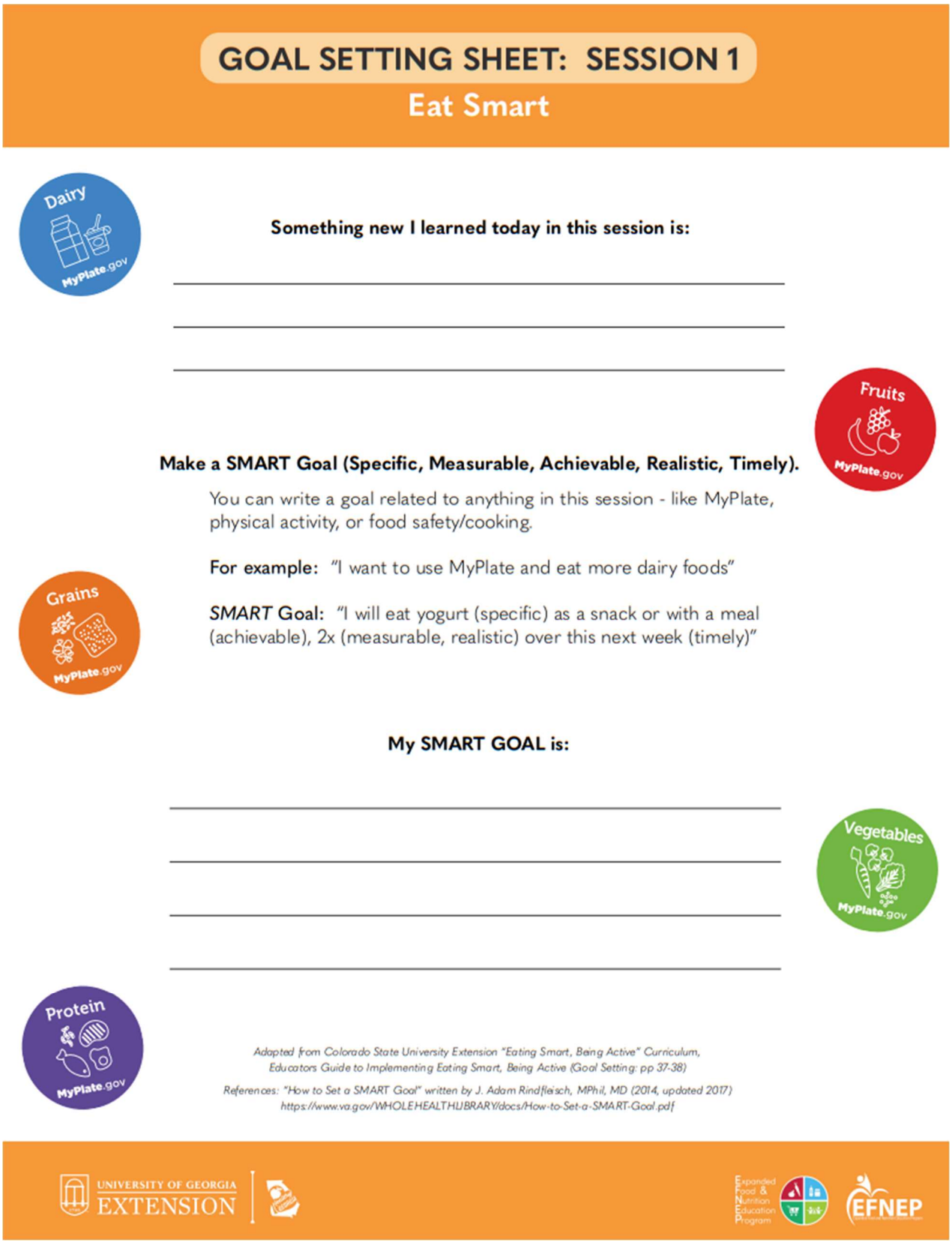
| | | |
|---|---|---|
| **Introduction** | Welcome to Teen Cuisine | 5 minutes |
| **Enrollment Questionnaire** | 14 Question Youth Enrollment form | 10 minutes |
| **Nutrition** | Introducing MyPlate<br>Understanding MyPlate | 10 minutes |
| **Food Prep**<br>**Food Safety** | Cooking Experience: Fruit with Yogurt Orange Dip<br>Handwashing: The Best Germ Blocker | 10 minutes |
| **Physical activity** | Get Moving | 5 minutes |
| **Close** | Set a MyPlate Goal | 5 minutes |

## *SESSION OVERVIEW*

### *90 MINUTES*

| | | |
|---|---|---|
| **Introduction** | Welcome to Teen Cuisine | 5 minutes |
| **Enrollment Questionnaire** | 14 Question Youth Enrollment form | 10 minutes |
| **Nutrition** | Introducing MyPlate<br>Understanding MyPlate | 15 minutes |
| **Food Safety** | Handwashing: The Best Germ Blocker | 15 minutes |
| **Food Prep** | Cook Like an Expert<br>Measuring activity, Recipe reading<br>Cooking Experience:<br>Fruit with Yogurt Orange Dip | 30 minutes |
| **Physical activity** | Get Moving | 10 minutes |
| **Close** | Set a MyPlate Goal | 5 minutes |

**APPENDIX 2: *Teen Cuisine* Goal Setting Activity (Session 1 Example)**



GOAL SETTING SHEET: SESSION 1

Eat Smart

**Something new I learned today in this session is:**

_____

_____

_____

**Make a SMART Goal (Specific, Measurable, Achievable, Realistic, Timely).**

You can write a goal related to anything in this session - like MyPlate, physical activity, or food safety/cooking.

**For example:** "I want to use MyPlate and eat more dairy foods"

*SMART* Goal: "I will eat yogurt (specific) as a snack or with a meal (achievable), 2x (measurable, realistic) over this next week (timely)"

**My SMART GOAL is:**

_____

_____

_____

_____

*Adapted from Colorado State University Extension "Eating Smart, Being Active" Curriculum, Educators Guide to Implementing Eating Smart, Being Active (Goal Setting: pp 37-38)*

*References: "How to Set a SMART Goal" written by J. Adam Rindfleisch, MPhil, MD (2014, updated 2017) https://www.va.gov/WHOLEHEALTHLIBRARY/docs/How-to-Set-a-SMART-Goal.pdf*

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**APPENDIX 3: EFNEP Youth 9th-12th Nutrition Education Survey**

## QUESTIONNAIRE

As you read each question, think about how you usually do things. This is not a test! There are no wrong answers.

1. Yesterday, how many times did you eat **vegetables**, not counting French fries?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

2. Yesterday, how many times did you eat **fruit**, not counting juice?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

3. Yesterday, how many times did you have **skim milk, 1% milk or yogurt**?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

4. Yesterday, how many times did you drink **sweetened drinks** like soda, fruit-flavored/sports/energy drinks, or vitamin water?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3

5. When you eat grain products, how often do you eat whole grains (i.e. whole grain bread instead of white bread?

- ◯ Never
- ◯ Once in a while
- ◯ Sometimes
- ◯ Most of the Time
- ◯ Always

6. When you eat out at restaurants or fast food places, how often do you make healthy choices when deciding what to eat?

- ◯ Never
- ◯ Once in a while
- ◯ Sometimes
- ◯ Most of the Time
- ◯ Always

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**7** During the past 7 days, how many days were you physically active for at least 1 hour?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7

**8** During the past 7 days, how often were you so active that your heart beat fast and you breathed hard most of the time?

- ◯ Never
- ◯ 1 time last week
- ◯ 2 times last week
- ◯ 3 times last week
- ◯ 4 or more times last week

**9** How many hours a day do you spend watching TV/movies, playing video games, or using a computer for something other than school work?

- ◯ 1 hour or less
- ◯ 2 hours
- ◯ 3 hours
- ◯ 4 hours
- ◯ 5 or more hours

**10** How often do you wash your hands before eating? (Think about eating at school or home.)

- ◯ Never
- ◯ Once in a while
- ◯ Sometimes
- ◯ Most of the time
- ◯ Always

**11** How often do you wash your fruits and vegetables before eating them?

- ◯ Never
- ◯ Once in a while
- ◯ Sometimes
- ◯ Often
- ◯ Almost always

**12** When you take food out of the refrigerator, how often do you put them back within 2 hours?

- ◯ Never
- ◯ Once in a while
- ◯ Sometimes
- ◯ Often
- ◯ Almost always

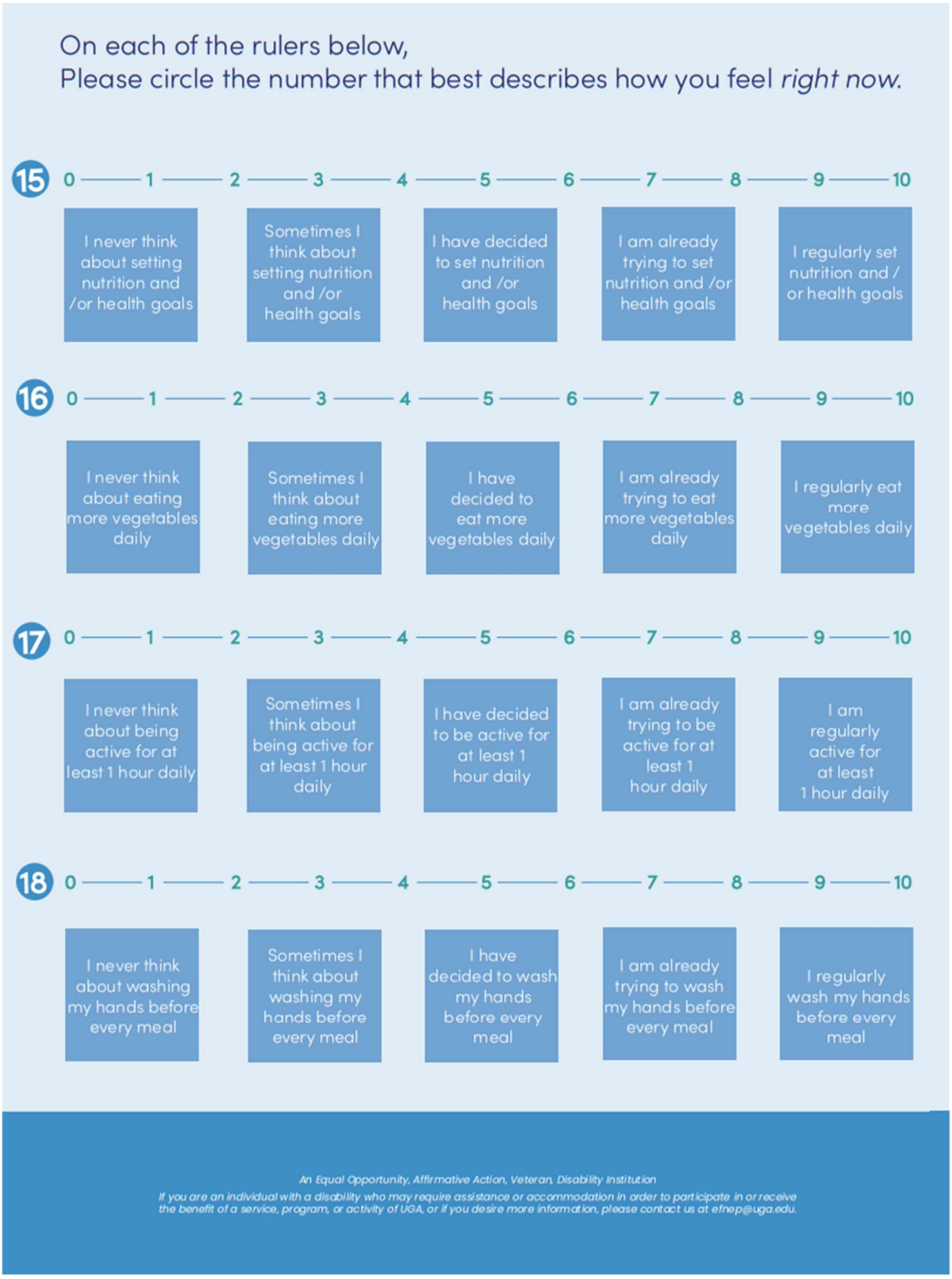
**13** How often do you check the expiration date before eating or drinking foods?


- ◯ Never
- ◯ Once in a while
- ◯ Sometimes
- ◯ Often
- ◯ Almost always

**14** In the last month, if your family did not have enough food, how often did you help by going to a food pantry or finding other free or low cost food resources?

- ◯ Never
- ◯ Once on a while
- ◯ Sometimes
- ◯ Often
- ◯ Almost Always

**APPENDIX 4: Additional Pre-Intervention Survey Page**



**APPENDIX 5: Additional Post-Intervention Survey Page**