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The Effects of 'The College Cooking Connection' on Cooking Abilities, Nutrition Literacy, and Fruit and Vegetable Intake in College Students

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THE EFFECTS OF 'THE COLLEGE COOKING CONNECTION' ON COOKING ABILITIES, NUTRITION LITERACY, AND FRUIT AND VEGETABLE INTAKE IN COLLEGE STUDENTS

By

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An Abstract of the Thesis Presented
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Objective: The objective of this study was to examine if an evidence-based cooking intervention would improve the cooking skills (CS), cooking self-efficacy (CSE), interactive nutrition literacy (INL), and fruit and vegetable intake (FVI) of participating college students.

Methods: A pre-post quasi-experimental study measured the effects of a cooking and nutrition education intervention on health behaviors of college students. An electronic survey was sent out to all undergraduate students at the University of Maine and University of Kentucky assessing sociodemographic factors, FVI, CS, CSE, and INL. Following the survey, respondents could enroll in a cooking intervention: the College Cooking Connection (CCC). A paired-samples t-test was used to assess changes in FVI, CS, CSE, and INL pre to post intervention. A repeated measures ANOVA analyzed changes in variables between those who attended all four classes

and those who attended less than four. Descriptive frequencies described students' perceptions of skill improvement.

Results: Participants were an average of 19.4 (±3.1) years old, primarily white (79.7%), female (70.3%), and evenly distributed across grade levels. There was a significant difference in college students' CS ($t(62)= -3.4$, $p<.001$), CSE ($t(63)= -5.4$, $p<.001$), INL ($t(63)= -8.2$, $p<.001$), vegetable intake (VI) ($t(54)= 15.8$, $p<.001$) and whole fruit intake (WFI) ($t(57)= 2.0$, $p=.027$. More than half of the students stated they felt their skills improved "somewhat" or "a lot" for knife knowledge and skills (68.3%), mental health (86.2%), budgeting (80.7%) and meal preparation (77.2%). Participants who attended all four classes significantly improved their WFI compared to students who attended less than four ($p=.046$), no other differences were found.

Conclusion: Findings justify the utilization of a cooking intervention, such as CCC to increase healthy behaviors in college students. In doing such, college students may acquire the skills necessary to partake in a healthy lifestyle, ultimately resulting in positive behavior change and sustainable healthy habits.

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LIST OF ABBREVIATIONS

ANOVA: Analysis of Variance

BMI: Body-Mass Index

CBC: Culinary Bootcamp

CCC: College Cooking Connection

CBPR: Community-Based Participatory Research

CS: Cooking Skills

CSE: Cooking Self-Efficacy

DGA: Dietary Guidelines for Americans

DQ: Diet Quality

DSQ: Dietary Screener Questionnaire

FVI: Fruit and Vegetable Intake

INL: Interactive Nutrition Literacy

NHANES: National Health and Nutrition Examination Survey

NL: Nutrition Literacy

SCT: Social-Cognitive Theory

SES: Socioeconomic Status

SHEI: Short Healthy Eating Index

USDA: United States Department of Agriculture

VI: Vegetable Intake

WFI: Whole Fruit Intake

YA-NLT: Young Adult Nutrition Literacy Tool

LIST OF DEFINITIONS

Community-Based Participatory Research: Joining with the community as full and equal partners in all phases of the research process.

Cooking Skills: The ability to perform tasks associated with food preparation.

Cooking Self-Efficacy: Confidence in one's ability to perform cooking tasks.

Diet Quality: The overall healthfulness of the diet measured by examining nutritional adequacy based on the Dietary Guidelines for Americans, 2020-2025.

Interactive Nutrition Literacy: The ability to apply nutrition information to make decisions to improve one's health.

Nutrition Literacy: The degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed in order to make appropriate nutrition decisions.

Social Cognitive Theory: A theory describing behavior as the result of dynamic interactions between personal, behavioral, and environmental factors.

Vegetable Intake: Servings of vegetables consumed daily not including French fries. For example: 1 cup raw vegetables, 1/2 cup cooked vegetables, or 1/2 cup 100% vegetable juice.

Whole Fruit Intake: Servings of fruit consumed daily not including juice. For example: 1/2 cup cut-up fruit, 1/2 a banana, or one small piece of whole fruit (apple, orange, pear, etc.).

Young Adult: A unique developmental period that occurs between the ages of 18 and 25 years.

CHAPTER ONE

INTRODUCTION

1.1 Problem:

College is a key transitional period where many young adults are practicing independence and self-management for the first time.[1–4] For many students, this is the first time they are independently making eating decisions, cooking and preparing meals, and navigating a grocery store.[5] Managing this new freedom puts the young adult age group at greater risk for unhealthy behaviors and habits that are sustained for life, ultimately leading to weight gain and greater risk for developing chronic disease.[2,4,5]

The healthfulness of the diet is influenced by fruit and vegetable intake (FVI) where college student consumption is notoriously low.[3,5] Having adequate cooking skills (CS) and cooking self-efficacy (CSE) are associated with preparing fruits and vegetables for a healthful meal,[6] however these knowledge and skills can be hindered by a lack of nutrition literacy (NL).[7] One domain of NL, interactive nutrition literacy (INL) is the perceived self-efficacy for healthy eating. INL plays an important role in the dietary choices of a young adult, specifically in their ability to navigate the college eating environment to make healthful decisions.[8]

It is possible that basic nutrition and cooking education can greatly increase the FVI, CS, CSE, and INL of young adults and thus lead to healthier behaviors.[5,9] Within the current literature, there are limited studies that address the effect of a cooking intervention on INL in conjunction with FVI and cooking abilities in college students. Additionally, many interventions in the college student population do not utilize community-based participatory research (CBPR) techniques which involve joining with the community throughout the entirety of the research process to better tailor interventions to the target population. Finally, current studies neglect to

inquire about student perceptions of the targeted skills being developed during the intervention. A combination of these three concepts is a novel approach to college health programming.

1.2 Hypothesis and Objectives:

The objective of this study was to examine if a cooking intervention, called *The College Cooking Connection* (CCC), developed using CBPR and the social cognitive theory (SCT), would improve the CS, CSE, INL, and FVI of participating college students. The following hypotheses were formulated:

- **(1)** Students who participate in the cooking intervention will significantly increase their CS, CSE and INL from pre to post intervention.
- **(2)** Students who participate in the cooking intervention will significantly increase their FVI.
- **(3)** Students who participate in all four CCC classes will significantly increase their FVI, CS and CSE, and INL from pre to post intervention compared to those who attended less than four.

Additionally, student perceptions of skill improvement after intervention (i.e., knife knowledge and skills, budgeting, mental health, and meal prepping) were evaluated.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

Young adulthood is a critical period of time for establishing healthy behaviors that last throughout adulthood.[1,10] However, poor dietary habits are common among the young adult age group resulting in an increased risk of weight gain and chronic disease later in life.[1,11] Young adults note various factors that hinder maintaining a healthy weight including lack of discipline, social influence, limited time due to the demanding college schedule, and limited access to healthy food.[1,10] In the young adult age group, age 18-25, diets are often lacking in fruits and vegetables and high in saturated fat, sodium, and added sugars.[1,12] Adequate FVI is important in a healthy diet, however, the 2020-2025 Dietary Guidelines for Americans (DGA) found that young adults were not meeting FVI requirements.[12] Americans aged 19-30 were consuming an average of 1.5 cup/equivalents of vegetables per day compared to the recommended 3.0 cups and 1.0 cup/equivalent of fruits per day compared to the recommended 2.0 cups.[12] Poor FVI is a result of poor NL and CS.[9,13] Despite the fact that 38% of adults aged 18-24 attended a two or four year University in 2021,[14] universities offer limited interventions targeted at increasing the health behaviors of young adults, which is necessary to increase self-efficacy and improve overall diet quality.[15]

2.2 Diet Quality

Diet quality (DQ) looks at the overall healthfulness of the diet and is measured by examining nutritional adequacy based on the 2020-2025 DGAs.[16] A healthy diet focuses on nutritionally dense foods including fruits, vegetables, whole grains, lean proteins, and healthy

fats.[9,12] Foods and beverages high in added sugar, sodium, saturated fat, and alcohol should be limited.[12] Poor DQ results in higher cases of all-cause mortality and chronic disease, for example type II diabetes, cardiovascular disease, and neurodegenerative disease.[1,17] Poor dietary habits carry into adulthood and contribute to the development of chronic disease.[18]

Despite the evidence supporting the relationship of better DQ and decreased chronic disease,[1,18] many young adults do not meet the requirements stated by the DGA.[12] The 2020-2025 DGA found that in young adults aged 18-30: 62% of males and 66% of females exceeded the limits for added sugar, 76% of males and 71% of females exceeded the limit for saturated fat, and 97% of males and 84% of females exceeded the limit for sodium.[12] Perceived factors contributing to poor DQ in young adults includes access to a variety of food, self-efficacy in making healthy choices, perception of free time, food security, and employment status.[2,11] When considering health programming in this population, understanding what factors influence dietary choices in emerging adults is crucial to tailoring interventions to improve habits for better DQ.

2.2.1 Factors Affecting Healthy Eating in College Students

Eating habits of young adults are influenced by various factors. Sorgari and colleagues conducted a focus group with students aged 18-25 from Cornell University (n=26) to assess the barriers and enablers of healthy eating in this population.[3] The 90-minute discussion was directed by a semi-structured question guide focused on questions related to eating habits, physical activity, and weight change.[3] Focus groups were recorded and transcribed, then analyzed by the principal investigator who was trained in qualitative analysis.[3] Results were represented using the Ecological model, which considers behavior in terms of a person's interactions with their environment.[3] Factors contributing to healthy eating in college students included (1) adequate

food preparation knowledge and nutrition knowledge, (2) meal planning, and (3) being physically active.[3] Barriers to healthy eating included (1) time constraints, (2) consumption of unhealthy snacks and high-calorie convenience foods, (3) stress, (4) perceived expensiveness of healthy food, and (5) greater access to unhealthy food.[3] At the social level, parental eating habits and peer influence were both enablers and barriers to healthy eating.[3] It's crucial to identify and consider other factors that impact DQ in college students, such as socioeconomic status (SES).

Socioeconomic status is an established influence of dietary behavior in college students.[19] Zein and colleagues conducted a cross sectional study across eight universities assessing the prevalence of food insecurity and its correlation with sociodemographics and health.[19] Food insecurity was measured using the United States Department of Agriculture's (USDA) Adult Food Security Survey Module.[19] A majority of the 855 participating students were female (68.8%), non-Hispanic white (62.4%), and 19 years old (65.4%).[19] Results showed that 12% of students had low food security and 7% had very low food security with 25.3% being at risk of food insecurity.[19] Those who were a racial minority, lived off campus, received a Pell-grant, recognized a parent's education as high school or less, or did not have a meal plan were the most probable of being food insecure.[19] These findings are significant as students who are food insecure are at an increased risk of practicing poor dietary habits, specifically inadequate FVI.[19] It's crucial to identify risk factors for food insecurity in this population as health interventions could be tailored to ensure identified students are included.

The multitude of expenses a college student faces puts them at great risk for food insecurity and the accompanying nutrition-related consequences. Castellanos and Holcomb conducted a cross-sectional study to assess food insecurity and its relationship with food priority in college students.[20] A logistic regression was used to estimate the association of food insecurity

with various financial-related factors.[20] Of the participating students (n=560), a majority were non-Hispanic White (78%), with a yearly tuition cost of $41,750 and median household income of $149,000.[20] Over a quarter (25.4%) were classified as having low food security and 11.3 % as having very low food security.[20] The students were asked to rank nine categories in order of prioritization for finances.[20] Of the rankings, 87.5% put food in their top three.[20] However, students who prioritized spending money on tuition or alcohol were more likely to be food insecure.[20] The college environment along with pressure from peers promotes drinking, going out to eat, and spending money in general. Although students state that food is a priority in the budget, other factors can reduce the amount of money left over to shop healthfully resulting in the purchase of undesirable convenience food. Findings illuminate consideration of college student expenses in addition to food security status as a potential risk factor for partaking in undesirable dietary behaviors. Interventions should consider economic limitations of the student in the development of programming.

Much like SES, aspects of the built college environment can be barriers to healthy eating. Skelton and Evans examined student health perceptions of the campus environment via a sequence of focus groups.[10] Students (n=33) were asked a series of open-ended questions related to nutrition and healthy eating environments, availability and barriers to accessing healthy foods, campus experiences, nutrition information provided on campus, and suggested areas for improvement.[10] The majority of participants were majority sophomores (42%), African-American (42.4%), and lived off campus (60.1%) with an average BMI of 27 kg/m^2 (overweight) .[10] In addition, the majority of participants rated their diets as “unhealthy” and reported consumption of 2.0 servings of fruits and vegetables per day.[10] Five major themes emerged from the focus groups. The first theme revealed students felt accessibility of healthy

food was a barrier to healthy eating. They stated that lack and/or poor locations of grocery stores impacted access to healthy foods as did time restraints. In addition, construction impeded their ability to get to grocery stores. Finally, a surplus of unhealthy vending machines made choosing healthy foods a challenge.[10] Theme two discussed money being a barrier with lack of healthy options available for purchase via dining dollars and healthy food being too expensive.[10] The third theme was food options noting lack of advertising for healthy options, undesirable taste of healthy foods, and "all you can eat " unhealthy buffets offered.[10] Theme four was lack of student involvement, more specifically student's feeling like their opinions didn't matter.[10] The final theme was education, with participants noting that more nutrition resources should be available on campus with additional nutrition classes being offered to educate students on healthy eating.[10] Including student perceptions of the collegiate health environment aligns with the CBPR ideology of including the community throughout the research process to better tailor interventions to the specific needs of the population.[21] Conducting focus groups proves to be an effective way of gaining student perceptions of barriers to healthy behaviors. All barriers mentioned make it difficult for students to consume adequate servings of fruits and vegetables,[10] which constitutes a healthy diet.[12] Optimal DQ for ideal health outcomes begins with sufficient FVI.[22]

2.3 Fruit and Vegetable Intake

Fruits and vegetables are imperative to a healthy diet as they provide high amounts of dietary fiber, vitamins, minerals, phytochemicals, and antioxidants.[22] Sufficient FVI is associated with healthy body weight management and reduced risk of chronic disease including cardiovascular disease, hypertension, hypercholesterolemia, osteoporosis, and many cancers.[22]

Despite the known health benefits of FVI, most young adults do not meet the daily intake requirements.[12] As previously stated, the DGAs of 2020-2025 found that Americans aged 19-30 were consuming an average of 1.5 cup/equivalents of vegetables per day compared to the recommended 3.0 cups and 1.0 cup/equivalent of fruits per day compared to the recommended 2.0 cups.[12] Additionally, in 2018, The American College Health Association found that 95.8% of college students surveyed did not meet the recommendations of 5 servings/day of fruits and vegetables.[5] This highlights the need to investigate the FVI in young adults to determine why it is important in this population and explore how health interventions can improve intakes.

2.3.1 Fruit and Vegetable Intake in College Students

Moyer and colleagues conducted a secondary analysis by examining data from the 2013-2014 National Health and Nutrition Examination Survey (NHANES) to explore the relationship between FVI and biological, sociocultural, and psychological personal factors.[23] NHANES data is released to the public every two years and provides a snapshot of the nutritional health of US citizens.[24] Moyer and colleagues used survey data from 20-32 year old individuals (n=1137) who participated in both a home interview and physical examination.[23] FVI was measured by the NHANES 24-hour recall surveys and compared to the DGA recommendation of 2.0 cup/equivalents per day of fruit and 2.5 cup/equivalents per day of vegetables.[12,23] Those who met or exceeded those intakes were classified as meeting the guidelines for FVI.[23] Two separate logistic regression models analyzed the predictability of people meeting the DGA recommendations for fruits and vegetables using the following variables: age, gender, BMI, smoking status, race/ethnicity, education, employment status, income, marital status, parental status, and perceived health status.[23] Respondents were primarily

female (50.2%), Non-Hispanic white (40.7%), in college or a college graduate (60.5%), with a normal BMI (38.5%). However 30.5% were classified as obese (BMI > 30kg/m^2).[23] Only 13.2% of participants met fruit intake guidelines and only 17.1% met vegetable intake guidelines.[23] The logistic regression model for vegetable intake was statistically significant (X^2 = 33.882; df = 14, p = .002) for only one dependant factor, having a college education. Having a college education significantly impacted vegetable intake, while none of the studied factors significantly impacted fruit intake.[23] These findings support the conclusion that FVI in the young adult population is unsatisfactory, however the rationale for inadequate intakes is complex. Further exploration of personal factors affecting FVI in the college student population is warranted, and FVI should be considered when developing the curriculum for an intervention.

The literature illuminates low FVI in young adults, therefore further exploration of the factors contributing to low intakes should be explored. Larson and colleagues conducted a 10-year longitudinal study to examine predictors of FVI during adolescence into young adulthood.[18] This analysis used data from the Project Eating and Activity in Teens and Young Adults (EAT) study design. EAT-1 was conducted at adolescence (mean age =15.8 years), EAT-2 followed through to emerging adulthood (mean age=20.4 years), and finally EAT-3 was given at young adulthood (mean age=26.2 years).[18] Separate linear regression models were used to find EAT-2 factors that predicted EAT-3 factors.[18] Factors in emerging adulthood that predicted higher FVI in young adulthood included (1) greater concern about health, (2) lower perceived time barriers to eating healthy, (3) taste likeability, and (4) less frequent fast food consumption (when adjusted for energy intake and sociodemographics).[18] Socio-environmental factors that predicted higher FVI included (1) significant other's healthy eating attitudes, (2) fruit and vegetable availability at home, and (3) less home availability of unhealthy foods.[18] By young-adulthood, the average daily

intake of fruit was 0.9 servings (IQR 0.4-1.6) and the intake of vegetables was 1.8 servings (IQR 1.1-3.0).[18] These findings reveal the need to address the barriers to adequate FVI as early as possible in order to promote healthy eating behaviors later in life.[18] Young adulthood is an ideal place to begin FVI education as this is a defining age of self-exploration and habit formation.[25] Surveying the target population on motivators and barriers to adequate FVI utilizes a CBPR approach, therefore resulting in a more individualized intervention to better reach the population.

Robson and colleagues evaluated the effect of a CBPR developed intervention on health behaviors in adults aged 18 and older.[26] Using CBPR, Cooperative Extension researchers conducted stakeholder interviews, focus groups, and community advisory boards to obtain information from the community.[26] This data was used to form a 3-month intervention in which participants "competed" in teams to accumulate points based on engagement in healthy behaviors.[26] All participants received incentives, however, the team with the highest amount of points at the end of the intervention period received a prize.[26] Points were earned for taking more steps per day, parking the car farther away from building entrances, preparing new recipes, getting health screening, and participating in Extension programs.[26] Participants (N=76) were an average of 51.3±17.4 years old and the majority were female (77.0%), Non-Hispanic, Black, or African American (59.2%) with an annual household income of <20,000 United States dollars (45.4%).[26] Participant FVI significantly increased after the 3 month intervention (+0.44 servings/day, $p = 0.018$).[26] In addition to FVI, participant weight and BMI significantly decreased post intervention.[26] While this study did not specifically occur in the college student population, results support the effectiveness of CBPR-based interventions in increasing health behaviors of target populations.[26] More research is needed in the young adult population, particularly addressing health disparities faced by college students. One health behavior that

could be addressed is mental health, as research has shown that adequate FVI can be associated with greater mental health benefits.[27]

Emerging adulthood is a time of great psychological stress which can be both a barrier and result of poor FVI. Conner and colleagues examined the effects of a two week FVI intervention on the psychological well-being in low FVI individuals ages 18-25 years who were pre-registered in the Australian New Zealand Clinical Trials.[27] Participants (n=171) were divided into three groups: (1) control group who consumed their typical diet, (2) ecological momentary intervention (EMI) group in which participants received two daily text reminders to consume more fruits and vegetables along with a payment voucher and (3) the FVI intervention group where participants were physically given 2 additional servings of fruits and vegetables daily.[27] Participants of all groups completed a baseline survey to obtain demographics and depression/anxiety measures. They were also given a daily survey to explore mood, feelings, vitality and thriving levels.[27] The sample of participants was primarily female (67.3%) and European (63.7%) with an average age of 19.43 years old and a normal BMI of 24.13kg/m^2.[27] Participants in the FVI group reported the greatest improvement in vitality and thriving.[27] The EMI and control group did not report any improvements.[27] No changes were found in depressive symptoms, anxiety, or mood in any group.[27] Results support the assumption that increased FVI has positive effects on mental health outcomes (ie., vitality and thriving).[27] These results also suggest that interventions in which young adults are provided with fruits and vegetables have increased mental health benefits as compared to solely providing nutrition education.[27] While providing students with fruits and vegetables can increase intakes, it's crucial that students obtain the skills needed to properly prepare healthful dishes. Inadequate FVI could be a result of young

adults lacking knowledge in selecting, preparing, and cooking fruits and vegetables in order to consume a healthful diet, thus, CSE should be explored in conjunction with FVI.

2.4 Cooking Skills and Cooking Self-Efficacy

For many students, college is a time of major lifestyle changes.[5] Some students have never cooked on their own or learned how to properly prepare fruits and vegetables to make a healthy meal, resulting in low cooking self-efficacy. Cooking self-efficacy CSE is the confidence one has in their ability to perform cooking tasks.[28] Students experience barriers to cooking healthfully that can affect their cooking self-efficacy.[9] Velez-Toral and colleagues conducted a focus group with college students (n=26) to assess three main objectives: (1) perception of the definition of healthy cooking, (2) cooking skills, and (3) barriers to healthy eating.[9] Data was collected via a semi-structured discussion guide of 14 open ended questions and analyzed by the moderator using the content analysis method.[9] A majority of students recognized the importance of consuming a healthy diet regardless of whether or not they followed one.[9] Participants defined healthy cooking as a complicated process using healthy ingredients and techniques.[9] Economic barriers to healthy eating were noted including the financial situation of the student, the cost of healthy food, and lack of proper cooking equipment.[9] Other barriers mentioned included time restraints, lack of willingness or desire to cook, geographic accessibility, culinary knowledge and skills, anxiety and/or depression and social factors/peer influence.[9] Examining the perceived student barriers to cooking healthful meals is imperative in designing a cooking intervention that meets the needs of the students. It is crucial for students to achieve adequate CS and CSE as these behaviors have been linked to better health outcomes.[5]

Hanson and colleagues explored cooking skills in relation to FVI and BMI in first-year college students.[5] Data from a cross-sectional study (GetFRUVED research project) were used (n=1108).[5] FVI was measured via the National Cancer Institute's Fruit and Vegetable Screener.[5] Cooking frequency, type, and self-efficacy were measured using a short survey asking students how often they participated in various cooking behaviors.[5] Statistical analysis consisted of a Shapiro-Wilk W test for normality of FVI and BMI (which was rejected at $p<0.001$) and multiple linear regressions to determine associations among variables.[5] The survey population was an average of 18.5±0.6 years old, white (53.9%), female (66.4%), and lived on campus (86.9%) with an average BMI of 24.4±4.9kg/m^2 (classified as normal weight).[5] The mean FVI intake was 2.4±2.3 cups/day with the majority of students stating they cooked 0 times weekly (73.2%).[5] Cooking more often (4–7 times/week) was associated with higher FVI ($\beta = 0.26$, $p = 0.004$).[5] Greater cooking skills, cooking more frequently and participating in meal planning was associated with greater FVI and lower BMI in this population.[5] This study exemplifies the role adequate CS and CSE play in healthy eating behaviors, thus health programming to strengthen cooking abilities is warranted. While evidence supports the role that FVI, CS and CSE play in the overall DQ of young adults, unhealthy behaviors can be exacerbated by poor nutrition literacy. Research supports the relationship between higher NL and better health behaviors.

2.5 Nutrition Literacy

Nutrition literacy (NL) is defined as “the degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed in order to make appropriate nutrition decisions”.[13] Adequate NL includes being knowledgeable in reading and interpreting food labels, understanding food safety concepts, demonstrating portion size control,

and practicing healthy weight management.[29] Better NL has been found to predict adherence to a healthy dietary pattern in adults.[13] However, limited research has been done on the relationship between NL and positive health behaviors, specifically in young adults. The minimal existing research supports the hypothesis that better NL leads to more healthful eating behaviors in young adults.

2.5.1 Nutrition Literacy in College Students

NL is defined by three domains: (1) functional, defined as the knowledge of factual nutrition information, (2) interactive, defined as the perceived self-efficacy for eating healthy, and (3) critical, defined as the ability to critically appraise nutrition information and advocate for healthful environments.[8] College students typically have poor NL, creating an additional barrier to achieving a healthful diet.[7,30] Qi and colleagues explored the relationship between NL and a healthful diet in terms of fast-food consumption using a cross-sectional design of college students in Bengbu, China.[30] Fast food is known for being energy-dense and high in sodium, saturated fat, and added sugars thus contributing to the poor diet of college students.[27] Participants (n=2,130) completed a questionnaire containing (1) demographic questions, (2) take-out food consumption, assessed via two questions regarding type of fast food visited and frequency, and (3) NL, assessed with a 43-item validated NL questionnaire.[30] NL scores were categorized into four quartiles based on the scores from the NL questionnaire (Q1 being the lowest NL and Q4 being the highest).[30] Participants were an average of 20.9±1.6 years, primarily female (65.4%), with 37% expressing they ate take-out food 1-3 times/wk and 24.5% getting take-out more than 4 times a week.[30] Those with NL in the lowest quartile (Q1) consumed take-out the most frequently compared to NL in Q2-Q4.[30] Chi-square results showed NL was

significantly associated with getting take-out food more than 4 times weekly (OR = 0.995, 95% CI = 0.990-1.000).[30] Students with higher NL also consumed more vegetable and fruit salad.[30] These findings illustrate the high frequency of unhealthy take-out food in a college student's diet.[30] However, better NL can be a mediating factor in decreasing the frequency of consumption, thus highlighting the importance of increasing NL in this population.[4]

In addition to frequent consumption of take out, there are many other environmental factors on college campuses that foster poor dietary behavior. Lai and colleagues hypothesized that better NL mediated the effect of factors that influence unhealthy eating choices among six Taiwanese universities.[4] Students (n=412) completed a questionnaire divided into four parts: demographics, healthy eating behavior scale,[4] factors influencing healthy behavior scale,[4] and a NL scale (measured via an 8-item scale).[4] The NL scale asked questions regarding how difficult or easy students found aspects of NL (ie. obtaining, understanding, analyzing nutrition information).[4] Answers were structured in terms of a Likert scale (from 1=very difficult to 6=very easy); upon completion, scores were summed for the final NL score.[4] Healthy eating behavior was also measured using a Likert scale (1-never to 5=always); questions asked participants how often they engaged in various healthy behaviors.[4] The survey population was an average of 20.1 (±1.8) years with the majority living on campus (66.3%).[4] The average NL score was 4.3 (±0.78) out of a maximum score of 6.0 and the average healthy eating behavior score was 3.1 (±0.57) out of a maximum score of 5.0.[4] NL predicted healthy eating behavior when all influencing behaviors were controlled for.[4] A mediation analysis determined that NL mediated for the following barriers with the proportions of the total effects listed: preference for healthy food (27.3%), healthy eating attitudes (41.4%), healthy eating self-efficacy (25.9%), peer support (31%), family social support (48.3%), and availability of healthy foods (43.1%).[4] These results

support the hypothesis that having stronger NL can improve the healthfulness of a college student's diet by mediating some of the barriers in the collegiate environment.[4] It is crucial to identify student perceptions of NL in order to better understand how it can be improved in this population via health programming for better health behaviors.

2.5.2 Interactive Nutrition Literacy

Interactive nutrition literacy is "the ability to apply nutrition information to make decisions to improve one's health" and can be measured in college students using the validated Young Adult Nutrition Literacy Tool (YA-NLT).[8] In the context of a college student, INL encompasses how well a student feels that they are able to navigate campus and its surroundings to partake in healthy behaviors.[8] Many students feel that eating healthy on a college campus is more difficult than it would be off campus.[7] There are numerous barriers built into the college environment that students feel make it difficult to engage in healthy behaviors, thus affecting their INL.[1,7,11] These barriers include accessibility to healthy food, money, lack of healthy food options, and lack of nutrition education and resources on campus.[10]

McNamara and colleagues conducted a qualitative study of undergraduate college students (n=24) to identify how the different nutrition literacy domains influenced eating decisions in college students.[7] Participants were recruited into one of four semi-structured focus groups to engage conversationally on the topic under the direction of a trained moderator.[7] Demographic data was analyzed using descriptive statistics and focus groups themes were determined by thematic analysis.[7] Subjects were an average of 20.1±1.5 years and primarily female (70%), white (77%), and natural science majors (57%).[7] A majority of participants reported consuming less than 2 servings of vegetables a day (76%) and eating only one fruit a

day (57%).[7] Two INL themes emerged, (1) "navigating the college environment" and (2) "awareness of food marketing on dietary behavior".[7] Students expressed that they made poorer dietary choices in the college environment than they did outside of the college campus.[7] Additionally, barriers in the college environment that made a healthy lifestyle difficult included (1) gatherings centered around alcohol and unhealthy food, (2) busy or inconsistent schedules leading to consumption of energy-dense convenience foods, (3) lack of cooking equipment to prepare healthy meals, and (4) limited resources and access to healthy food.[7] Students described awareness of diet food advertisements being a potential marketing technique with social media being the main platform for obtaining that information.[7] Responses indicated that students were able to identify areas of their environment that could be improved upon, but might be lacking knowledge and access to nutrition information.[7] Furthermore, students may not have understood the necessity of having greater INL in order to increase healthy behaviors and encourage a more healthful environment.

Young adults are aware of the college environmental barriers on health and could potentially benefit from education to improve FVI and INL. Clark and colleagues examined the effect of an educational intervention on increasing FVI in young adults at risk for metabolic syndrome.[31] Participants (n=17) were recruited to participate in a 9-week trial in which they consumed a diet of 50% fruits and vegetables (within energy recommendations) and met with a nutrition researcher once weekly for an hour.[31] Participants showed their weekly food logs to the counselor and set nutrition related goals during their session.[31] Sessions included education and personalized intervention to increase FVI.[31] Study subjects were on average 22.2 (±3.4) years old, primarily white (76.5%) and female (64.7%).[31] There was a significant increase in FVI in participants pre intervention and post intervention: 1.6 (±1.4) cups vs. 3.4 (±2.7) cups, $p<.001$.

Results exemplify the usefulness of dietary intervention and education on young adults FVI.[31] Providing young adults with basic health education can improve INL and therefore increase FVI and overall DQ. Interventions that educate young adults on healthful eating behaviors, specifically on the preparation of healthy foods and overcoming boundaries to cooking, can increase FVI and INL in this population.[15,32]

2.6 College Health Programming to Improve Cooking Skills in Young Adults for Better Health Behaviors

Research has shown that implementing classes on basic nutrition education and cooking has resulted in an increase in healthy dietary habits in college students.[15,32] McMullen and colleagues used a quasi-experimental study to assess the effects of a college culinary intervention on student's self-efficacy in utilizing fruits and vegetables to create healthy meals.[32] This intervention was driven by the SCT focusing on goal setting, reinforcements, improving behavioral capability through skill building, and self-efficacy.[32] Students enrolled in the intervention (n=15) met for 2 hours once a week, four times.[32] Classes began with a nutrition education and cooking skills review session followed by a hands-on cooking activity where participants prepared two to three recipes.[32] All participants were White, with the intervention group consisting of all eighteen-year-old freshman that were 73% female.[32] The control group was primarily male (71%) and freshman (82%) with an average age of 18.3±0.59.[32] A paired t-test analysis revealed college students who participated in the intervention experienced a significant increase in FVI pre (9.24±3.85) to post intervention (9.18±3.13), p=.04 and a significant increase in CSE scores pre (31.27±6.0) to post intervention (37.2±5.94), p=.006.[32] The control group (n=17) had no significant changes in FVI (p=.17) or CSE (p=.90).[32] Un-paired

t-tests revealed there was no significant difference in FVI mean changes between the intervention and control group (p=.11).[32] These findings reveal that a cooking education class can be successful in improving FVI and CSE in participating college students.[32] Further exploration of changes in NL could provide a better understanding of the effectiveness of the educational component of the intervention. In addition, utilizing CBPR techniques could increase participation into the intervention and potentially strengthen desired health outcomes.

Additional exploration of a cooking intervention on nutrition behaviors and DQ in college students was conducted by Szczepanski and colleagues.[15] The intervention was named "Culinary Boot Camp" (CBC). CBC was developed at a land-grant university using the SCT and an extensive literature review on health behaviors in the collegiate population.[15] The CBC consisted of four classes (once per week) with the final class taking place at a local grocery store.[15] The first three included a 30 minute lesson, 15 minute cooking demonstration, 55 minute cooking experience, and 20 minutes for eating.[15] There were 86 participants in CBC; 71 completed a pre-survey, 46 a post-survey and 20 a follow-up survey.[15] Variables measured included eating competence, cooking skills, cooking attitudes, grocery shopping self-efficacy, healthy eating self-efficacy, FVI, and convenience food frequency.[15] Study findings included significant differences between post- and follow-up scores for key nutrients including vitamin C, magnesium, potassium, and dietary fiber intakes, indicating an increase in FVI for participants in CBC[15] Additionally, cooking skills, cooking attitudes, and grocery shopping self-efficacy all improved significantly over time.[15] This CBC study strengthens the evidence that cooking interventions can have a positive effect on FVI and nutrition knowledge,[15] however, looking at INL specifically could help to address perceived barriers of the built college environment that students feel make it difficult to partake in healthy behavior.

2.7 Gap in the Literature

While there is evidence supporting the role cooking interventions play in improving health outcomes in college students, there is limited research in this population that explores the effect of an intervention specifically on INL. Examining INL in conjunction with FVI and cooking abilities is crucial in determining if the variable plays a significant role in improving health behaviors. Additionally, many of these studies in the college student population do not utilize CBPR techniques to tailor their interventions specifically to the needs of their environment, thus the interventions used could be missing the target population. Finally, inquisition of targeted skills being developed during the intervention could further improve the quality of the health program and explore areas for future improvements to the lessons. A combination of these three concepts is a novel approach to college health programming.

2.8 Summary of the Problem

College is a time when many young adults are adjusting to their newfound independence and potentially living on their own for the first time.[1,2] Emerging adults face additional barriers to achieving a healthy lifestyle including poor eating habits, lack of nutrition knowledge and education, peer influence, the unhealthy built college environment and occasionally low SES status.[3,10,19] This makes college an ideal time for instilling healthy behaviors in young adults that will last a lifetime. Evidence suggests basic cooking and nutrition evidence can improve health behaviors in college students, however, there is limited evidence on cooking interventions in the young adult population: (1) in relation to INL combined with FVI and CSE (2) utilizing CBPR techniques, and (3) inquiring about specific skills taught during the intervention.

CHAPTER THREE

METHODOLOGY

3.1 Study Design:

This pre-post quasi-experimental study aimed to understand how a pilot cooking intervention developed via CBPR techniques[21] impacted college students' FVI, INL, CS, and CSE over the course of a semester.

3.2 Setting, Recruitment, and Participants:

Recruitment and assessment occurred via an electronic survey that was sent out to all full-time undergraduate students at the University of Maine, Orono and University of Kentucky. The protocol received Institutional Review Board approval in December 2022 at both institutions. Students had to be 18 years or older to participate.

The survey addressed sociodemographic factors, NL, CS and CSE, and FVI. Students were incentivized to participate in the survey with a chance to earn a $25 gift card. Upon completion of the survey, students had the option to enroll in the *College Cooking Connection* (CCC); an in-person cooking intervention. Students were incentivized to join CCC by having the opportunity to earn a series of Amazon gift cards. Participants were awarded $5 for the first class attended, $10 for the second class, $15 for the third class, and $25 for the fourth.

3.3 Intervention - College Cooking Connection:

The health intervention was developed using a CBPR approach and driven by the SCT focusing on improving behavioral capability through skill building, increasing self-efficacy and offering reinforcements. In the Fall of 2021, University of Maine and Kentucky undergraduates

enrolled in a CBPR course at their respective university evaluated their campus via a series of interviews with stakeholders, environmental audits and student surveys. In January of 2022, students from both universities came together to tailor an intervention to the needs of their campuses at an in person 3-day workshop. The result of that workshop was CCC.

The *College Cooking Connection* was a series of four classes spread out over the course of the Spring 2023 semester. The workshop took place simultaneously at the University of Maine and the University of Kentucky. The classes were taught by graduate students, assisted by undergraduates, and overseen by two Registered Dietitians. Each class lasted approximately 90 minutes, beginning with a short lesson followed by a cooking activity in the commercial kitchen where students were able to practice their skills by making a recipe coinciding with the lesson. See Table 1.1 for an overview of the CCC curriculum.

Table 1.1: *College Cooking Connection Class Content*

Class Date (2023)	**Lesson**
Lesson 1: February 13&14	MyPlate, knife knowledge and skills
Lesson 2: March 6&7	Nutrients for mental health, gut-brain connection
Lesson 3: March 20&21	Saving money at the grocery store, budgeting
Lesson 4: April 10&11	Meal planning

3.4 Survey Instruments:

The effectiveness of the program was assessed using a pre-post data analysis approach. The survey was distributed via Qualtrics to students during the second week of the Spring 2023 semester and then again at the end of the semester. Survey data was analyzed using SPSS

software version 28.0. The survey recorded demographics of participants including age, gender, and ethnicity.

Diet quality was measured using the Short Healthy Eating Index (sHEI), which assessed adherence to the DGA, 2015-2020.[33] Scores ranged from 0-100, with higher scores indicating healthier DQ.[33] Questions aimed to get a snapshot of the healthfulness of the respondents diet.[33] Whole fruit and vegetable intake was measured using the Dietary Screener Questionnaire (DSQ).[33] Respondents indicated how many daily servings of (1) whole fruits not including fruit juice and (2) vegetables not including French fries were consumed.[33] Participants could indicate consumption of "less than 1, 1-5 individually, or 6 or more" servings. The sHEI has been validated in the college student population.[33]

Interactive nutrition literacy was measured using the Young Adult-Nutrition Literacy Tool (YA-NLT).[8] The YA-NLT measures the three aspects of NL: functional, critical, and interactive. A one-factor 10-item INL instrument assessed college students' perceived ability to make healthful eating decisions in various scenarios, for example: "I can select foods for a low-sugar eating pan".[8] Scores were interpreted on a scale of 1-5 (1= strongly disagree, 5= strongly agree), with higher scores indicating better INL.[8] The YA-NLT has been validated in the college student population.[8]

Cooking skills and cooking self-efficacy were measured using the Food Preparation Knowledge and Confidence survey.[34] Questions measured students' perceptions of cooking skills and self-efficacy, for example: "I can cook a nutritious meal."[34] Scores ranged from 1-5 (1= not confident at all, 5= extremely confident), with higher scores indicating better knowledge and self-efficacy. This survey has been validated in the college student population.[34]

3.5 Statistical Analysis:

Statistical analyses were conducted using the Statistical Package for Social Sciences (Version 28.0, International Business Machines Corporation, Armonk, NY). Means and standard deviations were calculated for continuous variables, and frequencies were calculated for categorical variables. Descriptive frequencies described students' perceptions of skill improvement. A paired-samples t-test determined significant differences between CS, CSE, INL, and FVI pre and post intervention. A repeated measures Analysis of Variance (ANOVA) was used to determine any significant changes in variables between those who attended all four classes and those who attended less than four. Significance levels were set to $p<0.05$.

CHAPTER FOUR

RESULTS

4.1 Descriptive Analysis of College Cooking Connection Participants

Descriptive analysis determined demographic characteristics of the study population (Table 2.1). Participants were an average of 19.4 (±3.1), primarily white (79.7%), female (70.3%), and evenly distributed across grade levels. Most students perceived their health as good (28%) or very good (21%). There were no significant differences attributed to school attended (UMaine vs. KYU).

Table 2.1: ***Participants (N=64) Demographic Information***

Variables	Mean (±SD) or % (n)
Age, year	*19.4 (±3.1)*
Gender	
Male	*23.4 (15)*
Female	*70.3 (45)*
Gender non-conforming	*6.3 (4)*
Ethnicity	
White	*79.7 (51)*
Hispanic	*3.1 (2)*
Black	*1.6 (1)*
Native American	*12.5 (8)*
Other	*1.6 (1)*
Sexual Identity	
Heterosexual	*59.4 (38)*
Homosexual	*7.8 (5)*
Bisexual	*20.3 (13)*
Queer	*7.8 (5)*
Questioning	*4.7 (3)*
Year in College	
Freshman	*28.1 (18)*
Sophomore	*23.4 (15)*
Junior	*25.0 (16)*
Senior	*23.4 (15)*

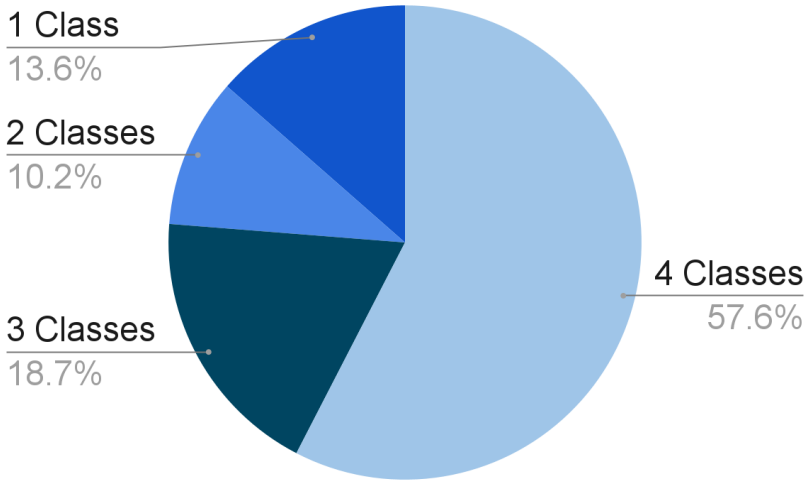
Table 2.1: ***Participants (N=64) Demographic Information*** **(cont)**

Variables	Mean (±SD) or % (n)
State	
UMaine	*43.8 (28)*
KYU	*56.3 (36)*
Meal Plan	
Yes	*57.8 (37)*
No	*42.2 (27)*
On/Off Campus	
On Campus	*59.4 (38)*
Off Campus	*40.6 (26)*
Perceived General Health	
Excellent	*6.3 (4)*
Very Good	*32.8 (21)*
Good	*43.8 (28)*
Fair	*14.1 (9)*
Poor	*3.1 (2)*

Sample size for variables:: Age, Gender, Sexual Identity, Year in College, Meal Plan, On/Off Campus, General Health: n= 64, Ethnicity: n= 63

More than half of the students attended all four classes (57.6%). See Figure 1.1 for further breakdown of classes attended by CCC participants.

Figure 1.1: Number of Classes Attended by CCC Participants (N=64)



4.2 Behavioral Outcomes of College Cooking Connection

A paired-samples t-test and evaluation of means was conducted to compare variables in students before and after intervention. There was a significant difference in college students' CS, CSE, INL, VI, and WFI before and after participation. See Table 2.2 for values.

Table 2.2: ***Paired T-test and Means Results (N=64)***

	Baseline mean (SD)	**Post mean (SD)**	**t**	**df**	**One sided p-value**
Cooking Skills (CS)[a]	*3.5 (±0.6)*	*3.7 (±0.6)*	*-3.4*	*62*	*<.001*
Cooking Self-efficacy (CSE)[a]	*3.2 (±1.0)*	*4.0 (±0.7)*	*-5.4*	*63*	*<.001*
Interactive Nutrition Literacy (INL)[b]	*3.2 (±0.7)*	*3.9(±0.5)*	*-8.2*	*63*	*<.001*
Vegetable Intake (VI)[c]	*1.4(±0.2)*	*2.5(±0.5)*	*15.8*	*54*	*<.001*
Whole Fruit Intake (WFI)[c]	*.92 (±0.4)*	*1.1 (±0.3)*	*2.0*	*57*	*.027*

Sample size for variables: Cooking Skills: n = 63, Cooking Self-Efficacy, Interactive Nutrition Literacy: n= 64, Vegetable Intake, Fruit Intake: n= 58.
[a]Measured using the Food Preparation and Confidence Survey
[b]Measured using the Young Adult Nutrition Literacy Tool
[c]Measured using the component scores of the Short Healthy Eating Index- Dietary Screener Questionnaire

4.3 Student Perceptions of Skill Improvement Post-Intervention

After participating in the classes, participants were asked how well they felt they improved (not at all, very little, somewhat, a lot) in each of the skills focused on during the CCC workshop. More than half of the students stated they felt their skills improved "somewhat" or "a

lot" for knife knowledge and skills (68.3%), mental health (86.2%), budgeting (80.7%) and meal preparation (77.2%). Responses are displayed in Table 2.3.

Table 2.3: ***Student Perceptions of Skill Improvement Post-Intervention***

	n	Not at all % (n)	Very little % (n)	Somewhat % (n)	A lot % (n)
Lesson 1 Skill: Knife knowledge and skills	60	*6.6 (4)*	*25.0 (15)*	*50.0 (30)*	*18.3 (11)*
Lesson 2 Skill: Mental Health	58	*1.7 (1)*	*12.1 (7)*	*48.3 (28)*	*37.9 (22)*
Lesson 3 Skill: Budgeting	57	*3.5 (2)*	*15.8 (9)*	*57.9 (33)*	*22.8 (13)*
Lesson 4 Skill: Meal Preparation	57	*5.2 (3)*	*17.5 (10)*	*54.4 (31)*	*22.8 (13)*

4.4 Repeated Measures ANOVA

Over half (57.6%) of the CCC participants attended all four classes. A repeated measures ANOVA revealed students who attended all 4 classes (n=36) significantly improved their WFI compared to students who attended less than 4 (n=21), no other differences were found. See Table 2.4 for means measured using the Dietary Screener Questionnaire.

Table 2.4: ***Whole Fruit Intake* Differences Between Students Participating in All 4 Classes and Less Than 4 Classes***

Variable	Baseline	Post	p-value
Whole fruit intake			
4 classes	*3.1 (±1.8)*	*4.2 (±1.5)*	**.046**
<4 classes	*3.6 (±1.7)*	*3.3 (±2.0)*	

**Wilks Lambda value= .924, F=4.201, df=1, p=.046*
** 4 classes: N = 32, <4 classes: N=21*

CHAPTER FIVE

DISCUSSION

5.1 Discussion:

A pre-post quasi-experimental study was conducted, which explored how a pilot cooking intervention (CCC), developed utilizing CBPR and SCT techniques, impacted college students' CS, CSE, INL, and FVI over the course of a semester. Results were consistent with the hypotheses that students who participated in the CCC workshop would have improvements in FVI, CS and CSE, and INL from pre to post intervention. Given the known barriers that young adults must overcome to engage in healthy behaviors, these results are promising, as they illuminated the positive influence of a cooking intervention, such as CCC, on the CS, CSE, INL, and FVI of college students. Behaviors and skills that influence a healthy lifestyle should be strengthened in this population to promote positive behavior change and sustainable healthy habits.

5.2 Fruit and Vegetable Intake

Prior to CCC, participants reported inadequate WFI and VI. These findings are consistent with current research demonstrating that college students consume inadequate FVI.[5,18,23] Larson and colleagues found the average daily FVI in young adults was less than one serving of fruit, and less than two servings of vegetables.[18] These findings coincide with a study by Hanson and colleagues, which indicated 95.8% of surveyed college students were not meeting the recommendations of 5 servings/day of fruits and vegetables.[5] Additionally, Moyer and colleagues found that only 13.2% of participants were meeting fruit intake guidelines and 17.1% were meeting vegetable intake guidelines.[23] It is possible that students find adequate WFI intake more

attainable than VI as fruits are more readily available in the built college environment compared to vegetables. Fruits are a ready to made food (ie. a whole apple or orange) compared to vegetables that are typically more extensive to prepare (ie. chopping, boiling, sauteing), therefore, college students may find it easier to simply grab a fruit when on the go compared to taking the time to prepare a meal with vegetables.

Although CCC participants were not meeting FVI recommendations at post intervention, participants experienced a significant increase in both WFI and VI from pre to post participation. The increase in WFI is especially encouraging considering the CCC intervention primarily focused on strengthening participants' cooking skills versus specific dietary components such as WFI, with most of the recipes focused on vegetables. These findings on FVI are encouraging, as they suggest a cooking intervention, such as CCC, could improve consumptions in college students regardless of their intake at baseline. Cooking interventions, similar to CCC, have found comparable results. McMullen and colleagues[32] demonstrated that college students who participated in a cooking intervention experienced a significant increase in FVI pre to post intervention. Participants may have increased their self-efficacy in consuming an overall more healthful diet and learned more skills on vegetable preparation. Participants may have also gained knowledge on the importance of selecting more fruits. Other variables still need to be considered, such as CSE.

5.3 Cooking Skills and Cooking Self-Efficacy

Improving college students' CSE is essential to promoting healthy eating behaviors by providing students the confidence needed to prepare healthy dishes. The CCC participants experienced a significant increase in both their CS and CSE from pre to post intervention. These

results are consistent with previous studies that support the role of cooking interventions in improving CS and CSE. Szczepanski and colleagues found that cooking skills and cooking attitudes improved significantly after students participated in the Culinary Boot Camp.[15] Additionally, McMullen and colleagues found a significant increase in CSE scores pre to post intervention in a college student population that participated in the four class intervention,[32] thus supporting findings that cooking interventions are successful in strengthening CS and CSE in college students.

As peer influence plays a role in the health decisions of college students, cooking interventions in which peers work together to strengthen CS and CSE are particularly beneficial.[7] Furthermore, working with others to strengthen skills targets both the environmental and social constructs of the SCT to promote behavior change.[35] The literature reveals college students are incredibly influenced by their peers and additionally suffer from poor NL.[7,36] Therefore, it is important to consider how utilization of SCT constructs, in addition to NL, could benefit college students in a cooking intervention.[7,35]

5.4 Interactive Nutrition Literacy

The CCC participants experienced a significant increase in their INL from pre to post intervention. Currently, there is limited research on the impacts cooking interventions play on the INL of college students. However, a study by Lai and colleagues found in general, NL as a whole (i.e., functional, interactive, and critical NL) predicted college student's healthy eating behaviors, even when controlling for several other factors.[4]

Findings from this study, in addition to the limited literature, serve as a starting point in demonstrating that cooking interventions, such as CCC, could be successful in improving college

students INL. Improving INL in young adults is imperative, as the literature emphasizes that many students feel eating healthy on a college campus is more difficult than it would be off campus. Strengthening INL in young adults via a basic nutrition education and cooking intervention results in improved application of nutrition information to make health decisions, specifically, the ability to navigate campus and its surroundings to partake in healthy behaviors.[8] Providing students with tangible strategies to navigate their environment in a healthy way can result in an increase in the overall healthfulness of a college campus.

5.5 Considerations for Future Programming

There were no significant differences in CS, CSE, INL, or VI pre-post intervention between students who attended less than four and all four classes, however, people who attended all classes significantly improved their WFI compared to students who did not attend all. It is also important to note that students who attended less than 4 classes decreased their fruit intake from post-intervention to pre-intervention. This could reveal that attending minimal classes is not enough exposure to actually promote behavior change. Repeated exposure to health programming is important for students to practice their skills in order to strengthen their expertise and increase self-efficacy, thus leading to sustained healthy behaviors and positive habits that last a lifetime.

When asked about specific skill sets after participating in CCC, more than half of the students stated they felt their skills improved “somewhat” or “a lot” for all skills. Using the goal setting component of the SCT could increase the number of students who felt their skills improved “a lot”. Providing the space for students to clearly state what skills they wish to improve could increase their awareness and concentration of these skills during lessons and

workshops, resulting in higher self-efficacy. Given that self-efficacy is a key component of behavior change,[35] it is imperative that interventions focus on developing student's desired skills.

Focusing on the SCT when developing a collegiate health program also means addressing the environmental factors that young adults state are a barrier to a healthy lifestyle.[35] College students have reported limited accessibility to healthy food,[3,10] surplus of unhealthy options,[10] and lack of value to their personal opinions[10] as being common environmental barriers to living a healthy lifestyle. Utilizing CBPR to work with the built environment and tailoring programs to meet the needs of college-aged young adults could be effective in the future development of college health programming.

5.6 Limitations

There was a notable lack of diversity in this study's population, with participants being primarily White (79.7%) and female (70.3%). Additionally, this study took place at a rural university where findings can be significantly different than those of an urban university. Implementing CCC at an urban university, as well as one with greater diversity, could test whether this intervention can be successful, regardless of demographic limitations. Another consideration is socioeconomic status, as differences in SES can contribute to variation in FVI and nutrition knowledge.[19] Socioeconomic status was not controlled for in this study, however, future studies should consider SES in development.

As FVI, INL, CS and CSE were all self-reported, it is possible participants over reported intakes or viewed their INL and CS as stronger than they were. Additionally, this study had no control group, therefore causation of the intervention on positive behavior change cannot be guaranteed as students may have changed organically throughout the semester without

participating in the classes. Finally, while participation in all four cooking classes was encouraged, not all participants (42.5%) were able to attend all classes. However, attendance may not greatly affect findings, as results showed there was not a significant difference between VI, CS and CSE, or INL in students who participated in all four classes versus less than four.

5.7 Conclusion

Findings from this pre-post quasi-experimental study justify the utilization of a cooking intervention, such as CCC, to improve the FVI, CS and CSE, and INL of college students in the United States. This population reported inadequate FVI prior to participation, however, post intervention FVI scores significantly improved. Additionally, INL, CS and CSE scores significantly improved thus validating the usage of a cooking intervention that is developed using CBPR and the SCT. As college students face several known barriers impacting their ability to engage in healthy behaviors, it is critical to introduce cooking interventions, such as CCC, within the college population. In doing such, college-aged young adults can acquire the skills necessary to partake in a healthy lifestyle, ultimately resulting in positive behavior change and sustainable healthy habits.

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APPENDICES

APPENDIX A: SURVEY QUESTIONS

Start of Block: Generate ID Code

Q2 Please enter your unique ID.

o First letter of your last name (EXAMPLE: Mary White = W): (4)
_____

o Day of birth (EXAMPLE: May 05 = 05) (5)
_____

o First letter of first name (EXAMPLE: Mary White= M): (6)
_____

o Last four digits of cell phone number (EXAMPLE: 123-456-7890 = 7890): (7)
_____

End of Block: Generate ID Code

Start of Block: Demographics

Q176 Are you 18 years old or older?

o Yes, I am 18 years old or older. (1)

o No, I am younger than 18 years old. (2)

Skip To: End of Survey If Are you 18 years old or older? = No, I am younger than 18 years old.

Q177 How old are you?

▼ 18 (1) ... Older than 30 (8)

Q178 What is your gender identity?

o Male (1)

o Female (2)

o Trans-male/Trans-man (3)

o Trans-female/Trans-woman (4)

o Gender non-conforming (5)

o Different identity - please state: (6)
_____

Q179 What is your ethnicity?

o White (1)

o Hispanic or Latino (2)

o Black or African American (3)

o Native American or American Indian or Asian/Pacific Islander (4)

o Other (5) _____

o Choose not to answer (6)

Q180 What year in college are you?

o Freshman (1)

o Sophomore (2)

o Junior (3)

o Senior (4)

o Graduate student (5)

Q181 Do you have a dining meal plan?

o Yes (1)

o No (2)

o Choose not to answer (3)

Q182 Do you live:

o On campus (1)

o Off campus (2)

o Choose not to answer (3)

Q183 Do you think of yourself as..

o Heterosexual, or straight (1)

o Homosexual, or gay or lesbian (2)

o Bisexual (3)
o Queer (4)
o Questioning/Unsure (5)
o Something else - Specify: (6)
_____

Q184 What is your height in inches?

▼ 56 (56) ... 79 (79)

Q185 What is your weight (in pounds)?

_____

Q186 What is your GPA?

_____

End of Block: Demographics

Start of Block: CDC Healthy Days Module

Q90 Would you say that in general your health is:
o Excellent (1)
o Very Good (2)
o Good (3)
o Fair (4)
o Poor (5)

Q94 Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?

▼ 0 (0) ... Don't Know (9999)

Q96 During the past 30 days, for about how many days did poor physical health, including any injury or illness, keep you from doing your usual activities, such as self-care, work, or recreation?

▼ 0 (0) ... Don't Know (9999)

Q97 Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?

▼ 0 (0) ... Don't Know (9999)

Q98 During the past 30 days, for about how many days did poor physical and mental health keep you from doing your usual activities, such as self-care, work, or recreation?

▼ 0 (0) ... Don't Know (9999)

Q99 During the past 30 days, how many days have you felt SAD, BLUE, or DEPRESSED?

▼ 0 (0) ... Don't Know (9999)

Q100 During the past 30 days, for about how many days have you felt WORRIED, TENSE, or ANXIOUS?

▼ 0 (0) ... Don't Know (9999)

Q101 During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP?

▼ 0 (0) ... Don't Know (9999)

Q102 How many days did poor mental health keep you from doing your usual activities, such as self-care, work, or recreation?

▼ 0 (0) ... Don't Know (9999)

Q103 During the past 30 days, for about how many days have you felt VERY HEALTHY AND FULL OF ENERGY?

▼ 0 (0) ... Don't Know (999)

End of Block: CDC Healthy Days Module

Start of Block: Cooking Skills/Self-Efficacy

Q104 Check the box that describes your agreement or disagreement to each statement.

	Strongly Agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly Disagree (5)
Cooking takes too much time. (1)	o	o	o	o	o
I enjoy cooking. (2)	o	o	o	o	o
Cooking meals is expensive. (3)	o	o	o	o	o
If you know how to cook, it is easier to eat more fruits and vegetables. (4)	o	o	o	o	o
Cooking is hard. (5)	o	o	o	o	o
I feel comfortable in the kitchen. (6)	o	o	o	o	o

Q105 Check the box that best describes your CONFIDENCE to each statement.

	Extremely confident (1)	Very confident (2)	Moderately confident (3)	Not very confident (4)	Not at all confident (5)
I can cook a nutritious meal. (1)	o	o	o	o	o

I can cook a meal in a short amount of time. (2)	o	o	o	o	o
I can cook a nutritious meal without spending a lot of money. (3)	o	o	o	o	o
I can follow a recipe. (4)	o	o	o	o	o

End of Block: Cooking Skills/Self-Efficacy

Start of Block: Interactive Nutrition Literacy

Q27
I can select foods for a low-sodium eating plan.

- o Strongly disagree (1)
- o Disagree (2)
- o Neither agree nor disagree (3)
- o Agree (4)
- o Strongly agree (5)

Q28
I can create new recipes that will benefit my health.

- o Strongly disagree (1)
- o Disagree (2)
- o Neither agree nor disagree (3)
- o Agree (4)
- o Strongly agree (7)

Q29
I can eat healthy on a budget.

- o Strongly disagree (1)

o Disagree (2)

o Neither agree nor disagree (3)

o Agree (4)

o Strongly agree (5)

Q30
I can estimate the amount of calories in a food based on the amounts of fat, protein, and carbohydrates it has.

o Strongly disagree (1)

o Disagree (2)

o Neither agree nor disagree (3)

o Agree (4)

o Strongly agree (5)

Q31 I can give someone healthy eating advice.

o Strongly disagree (1)

o Disagree (2)

o Neither agree nor disagree (3)

o Agree (4)

o Strongly agree (5)

Q32 I can plan healthy meals for a week.

o Strongly disagree (1)

o Disagree (2)

o Neither agree nor disagree (3)

o Agree (4)

o Strongly agree (5)

Q33 I can prepare an acceptable meal for someone with a food allergy.

o Strongly disagree (1)

o Disagree (4)

o Neither agree nor disagree (5)

o Agree (6)

o Strongly agree (7)

Q34 I can select a healthy meal when eating out.

o Strongly disagree (1)

o Disagree (4)

o Neither agree nor disagree (5)

o Agree (6)

o Strongly agree (7)

Q35 I can select foods for a low-carbohydrate eating plan.

o Strongly disagree (1)

o Disagree (4)

o Neither agree nor disagree (5)

o Agree (6)

o Strongly agree (7)

Q36 I can select foods for a low-sugar eating plan.

o Strongly disagree (1)

o Disagree (4)

o Neither agree nor disagree (5)

o Agree (6)

o Strongly agree (7)

End of Block: Interactive Nutrition Literacy

Start of Block: SHEI

Q117 On average, how many servings of fruit (not including juice) do you eat per day? *Example: 1 serving fruit = 1/2 cup cut-up fruit, 1/2 a banana, or one small piece of whole fruit (apple, orange, pear, etc.) One small piece of whole fruit is the size of a baseball. 1/2 cup cut-up fruit is the size of a computer mouse.*

o Less than 1 (1)

o 1 (2)

o 2 (3)

o 3 (4)

o 4 (5)

o 5 (6)

o 6 or more (7)

o Choose not to answer (8)

Q118 On average, how many servings of 100% fruit juice do you drink per day? Note: Do not include fruit flavored drinks such as Hi-C, Tang, Sunny-D, etc. *Example: 1 serving juice = 1/2 cup 100% fruit juice (apple, grape, orange, etc.), 1 cup of juice = juice box.*

o Less than 1 (1)

o 1 (2)

o 2 (3)

o 3 (4)

o 4 (5)

o 5 (6)

o 6 or more (7)

o Choose not to answer (8)

Q119 Now, think about all the vegetables you eat in a day. On average, how many servings of vegetables do you eat per day? Note: Any vegetable or 100% vegetable juice counts as a member of the vegetable group. *Example: 1 serving = 1 cup of raw vegetables, 1 cup of salad, 1/2 cup cooked vegetables, or 1/2 cup 100% vegetable juice. One cup of raw vegetables is the size of a baseball. 1/2 cup cooked vegetables is the size of a computer mouse.*

o Less than 1 (1)

o 1 (2)

o 2 (3)

o 3 (5)

o 4 (6)

o 5 (7)

o 6 or more (8)

o Choose not to answer (9)

Q120 Now, think about just the green vegetables you eat in a day like spinach, green beans, kale, broccoli, zucchini, or other mostly green vegetables. On average, how many servings of green

vegetables do you eat per day? NOTE: Do not include starchy vegetables like green peas. *Example: 1 serving = 1 cup raw vegetables or ½ cup cooked vegetables. 1 cup raw vegetables is the size of a baseball. ½ cup cooked vegetables is the size of a computer mouse.*

o Less than 1 (1)

o 1 (2)

o 2 (3)

o 3 (4)

o 4 (5)

o 5 (6)

o 6 or more (7)

o Choose not to answer (8)

Q121 Now, think about just the starchy vegetables you eat in a day like corn, green peas, or potatoes. On average, how many servings of starchy vegetables do you eat per day? *Examples: 1 serving = 1 cup raw vegetable or ½ cup cook vegetables. 1 cup raw vegetables is the size of a computer mouse.*

o Less than 1 (1)

o 1 (2)

o 2 (3)

o 3 (4)

o 4 (5)

o 5 (6)

o 6 or more (7)

o Choose not to answer (8)

Q122 On average, how many servings of grains do you eat per day? *Examples: 1 serving = 1 slice of bread; ½ cup grits, 1 cup of ready-to-eat cereal, ½ cup oatmeal, 1 small tortilla, ½ cup cooked rice, or ½ cup pasta. 1 cup ready-to-eat cereal is the size of a baseball.*

o Less than 1 (1)

o 1 (2)

o 2 (3)

o 3 (4)

o 4 (5)

o 5 (6)

o 6 or more (7)

o Choose not to answer (8)

Q123 On average, how often do you eat grains?
Examples: 1 serving = 1 slice of bread; ½ cup grits, 1 cup of ready-to-eat cereal, ½ cup oatmeal, 1 small tortilla, ½ cup cooked rice, or ½ cup pasta.

o A couple times per week (1)

o A couple times per month (2)

o A couple times per year (3)

o Almost never (4)

o Never (5)

o Choose not to answer (6)

Q124
Now, just think about whole grains you eat like whole wheat bread, whole grain crackers, brown rice, or oatmeal. On average, how many servings of whole grains do you eat per day?
Examples: 1 serving = 1 slice whole wheat bread, 5-6 whole grain crackers, 3 cups popcorn, ½ cup cooked brown rice, or ½ cup oatmeal.

o Less than 1 (1)

o 1 (2)

o 2 (3)

o 3 (4)

o 4 (5)

o 5 (6)

o 6 or more (7)

o Choose not to answer (8)

Q125 On average, how often do you eat whole grains? *Examples: 1 serving = 1 slice whole wheat bread, 5-6 whole grain crackers, 3 cups popcorn, ½ cup cooked brown rice, or ½ cup oatmeal.*

o A couple times per week (1)

o A couple times per month (2)

o A couple times per year (3)

o Almost never (4)

o Never (5)

o Choose not to answer (6)

Q126 On average, how many servings of milk do you eat or drink per day? *Examples: 1 serving = 1 cup of milk, 1 cup of yogurt, 1.5 ounces of natural cheese, or 2 ounces of processed cheese. 1 cup of milk is the size of a carton of milk. 1 serving of cheese is the size of your index finger.*

- o Less than 1 (1)
- o 1 (2)
- o 2 (3)
- o 3 (4)
- o 4 (5)
- o 5 (6)
- o 6 or more (7)
- o Choose not to answer (8)

Q127 On average, how often do you drink or eat milk products?
Examples: 1 serving = 1 cup of milk, 1 cup of yogurt, 1.5 ounces of natural cheese, or 2 ounces of processed cheese.

- o A couple times per week (1)
- o A couple times per month (2)
- o A couple times per year (3)
- o Almost never (4)
- o Never (5)
- o Choose not to answer (6)

Q128 Now, just think about the milk products you eat per day. On average, how many servings of low-fat milk products do you eat per day? *Examples: 1 serving = 1 cup of skim milk, 1 cup of low-fat yogurt, or 1.5 ounces of low-fat cheese. 1 cup of milk is the size of a milk carton. 1 serving of cheese is the size of your index finger.*

- o Less than 1 (1)
- o 1 (2)
- o 2 (3)
- o 3 (4)
- o 4 (5)
- o 5 (6)
- o 6 or more (7)
- o Choose not to answer (8)

Q129 On average, how often do you drink or eat low-fat milk products?
Examples: 1 serving = 1 cup of skim milk, 1 cup of low-fat yogurt, or 1.5 ounces of low-fat cheese.

- o A couple times per week (1)
- o A couple times per month (2)
- o A couple times per year (3)
- o Almost never (4)
- o Never (5)
- o Choose not to answer (6)

Q130 On average, how many servings of beans (legumes) do you eat per day? Note: All foods made from dry beans, canned beans, peas, and lentils are considered part of this group.
Examples: 1 serving = ½ cup cooked beans. ½ cup cooked beans is the size of a computer mouse.

- o Less than 1 (1)
- o 1 (2)
- o 2 (3)
- o 3 (4)
- o 4 (5)
- o 5 (6)
- o 6 or more (7)
- o Choose not to answer (8)

Q131 On average, how many servings of nuts or seeds do you eat per day? *Examples: 1 serving = 1 tablespoon of peanut butter; ½ ounces of nuts or seeds. 1 tablespoons of peanut butter is the size of the tip of your thumb.*

- o Less than 1 (1)
- o 1 (2)
- o 2 (3)
- o 3 (4)
- o 4 (5)
- o 5 (6)
- o 6 or more (7)
- o Choose not to answer (8)

Q132 On average, how many servings of seafood do you eat per day? Note: All foods made of fish, shrimp, crab, and shellfish are considered part of this group. *Examples: 1 serving = 3 ounces of fish. 3 ounces of fish is the size of a deck of cards.*

- o Less than 1 (1)
- o 1 (2)
- o 2 (3)
- o 3 (4)
- o 4 (5)
- o 5 (6)
- o 6 or more (7)
- o Choose not to answer (8)

Q133 On average, how often do you eat seafood? Note: All foods made of fish, shrimp, crab, and shellfish are considered part of this group.
Examples: 1 serving = 3 ounces of fish.

- o A couple times per week (1)
- o A couple times per month (2)
- o A couple times per year (3)
- o Almost never (4)
- o Never (5)
- o Choose not to answer (6)

Q134 On average, how many sugar-sweetened beverages do you drink per day?
Examples: 12 ounces of soft drinks/soda, fruit flavored drinks, sweetened coffee, and sweet tea. Do not include milk or 100% fruit juice. 12 ounces of soda is the size of one can.

- o Less than 1 (1)
- o 1 (2)
- o 2 (3)
- o 3 (4)
- o 4 (5)
- o 5 (6)
- o 6 or more (7)
- o Choose not to answer (8)

Q135 On average, how often do you drink sugar-sweetened beverages?
Examples: 12 ounces of soft drinks/soda, fruit flavored drinks, sweetened coffee, and sweet tea. Do not include milk or 100% fruit juice.

- o A couple times per week (1)
- o A couple times per month (2)
- o A couple times per year (3)
- o Almost never (4)
- o Never (5)
- o Choose not to answer (6)

Q136 On average, how much added sugars do you consume per day? Note: Added sugars are often in foods such as breads, cakes, candy, sweet tea, jam, ice cream, or sugar added to food at the table. Do not include naturally occurring sugars such as lactose in milk or fructose in fruits.
Examples: white sugar, brown sugar, raw sugar, corn syrup, corn-syrup solids, high-fructose corn syrup, malt syrup, maple syrup, pancake syrup, fructose sweetener, liquid fructose, honey, molasses, and dextrose.

- o None/almost none (1)
- o Some (2)
- o A lot (3)
- o Choose not to answer (4)

Q137 How many servings of saturated fat do you consume on average per day? Note: Saturated fats for these purposes should be considered to be solid fats. Solid fats are fats that are solid at room temperature.
Examples: butter, cakes, cookies, Crisco, coconut oil, beef fat (tallow, suet), chicken fat (lard), stick margarine, and shortening.

- o None/almost none (1)
- o Some (2)
- o A lot (3)
- o Choose not to answer (4)

Q138 On average, how much water do you drink per day?

- o None/almost none (1)
- o Some (2)
- o A lot (3)
- o Choose not to answer (4)

End of Block: SHEI

Start of Block: USDA Adult Food Security Survey Module

Q65 Please answer the following questions and how they have pertained to your life in the past twelve months.

Q66 1. I worried whether my food would run out before I got money to buy more.

- o Often true (1)
- o Sometimes true (2)
- o Never true (3)
- o I don't know/prefer not to answer (4)

Q67 2. The food I bought just didn't last, and I didn't have money to get more.

- o Often true (1)
- o Sometimes true (2)
- o Never true (3)
- o I don't know/prefer not to answer (4)

Q68 3. I couldn't afford to eat balanced meals.

- o Often true (1)
- o Sometimes true (2)
- o Never true (3)
- o I don't know/prefer not to answer (4)

Q69
4. In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- o Yes (1)
- o No (2)
- o Not sure (3)

Skip To: Q71 If 4. In the last 12 months, did you ever cut the size of your meals or skip meals because there was... != Yes

Q70 5. How often did this happen- almost every month, some months but not every month, or in only 1 or 2 months?

- o Almost every month (1)
- o Some months but not every month (2)
- o Only one or two months (3)
- o Not sure (4)

Q71
6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

- o Yes (1)
- o No (2)
- o Not sure (3)

Q72
7. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?

- o Yes (1)
- o No (2)
- o Not sure (3)

Q73
8. In the last 12 months, did you lose weight because there wasn't enough money for food?

- o Yes (1)
- o No (2)
- o Not sure (3)

Q74
9. In the last 12 months, did you ever not eat for a whole day because there wasn't enough money for food?

- o Yes (1)
- o No (2)
- o Not sure (3)

Skip To: End of Block If 9. In the last 12 months, did you ever not eat for a whole day because there wasn't enough money... != Yes

Q75
10. How often were you unable not to eat for a whole day because there wasn't enough money for food – almost every month, some months but not every month, or in only 1 or 2 months?

- o Almost every month (1)
- o Some months but not all months (2)
- o Only 1 or 2 months (3)
- o Not sure (4)

End of Block: USDA Adult Food Security Survey Module

Start of Block: Behavior Environment Perception Survey

Q122 There are sports (intramural or club) available to play on campus.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q123 There are plenty of opportunities on campus to be moderately or vigorously active.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q124 I feel welcome to use the recreation center on campus.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q125 I see people being physically active on campus.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q126 It is easy to find healthy foods on campus.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q127 It is easy to find fruits and vegetables on campus.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q128 There are a variety of healthy foods available on campus.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q129 My campus makes it easy to eat healthy.

- o Strongly Agree (1)
- o Agree (2)

o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q130 It is easy to live a healthy lifestyle while living on campus.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q131 There are programs on campus that offer stress management.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q132 My campus has a system of support for emotional or psychological problems.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q133 There are resources on campus for a person who needs help managing stress.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q134 There are resources on campus for a person who is in an abusive relationship.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q135 I can get an appointment with a mental health professional.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q136 My class schedule makes it easy to eat healthy meals.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q137 It is hard to eat healthy because of all the stress at school.

- o Strongly Agree (1)
- o Agree (2)
- o Neutral (3)
- o Disagree (4)
- o Strongly Disagree (5)

Q138 I do not have enough time to pack healthy snacks for myself.

- o Strongly Agree (1)

o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q139 I cannot afford to eat healthy.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q140 The people I eat with make it easy to choose healthy foods.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q141 Friends motivate me to workout.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

Q142 Friends have a positive influence on my physical activity.
o Strongly Agree (1)
o Agree (2)
o Neutral (3)
o Disagree (4)
o Strongly Disagree (5)

End of Block: Behavior Environment Perception Survey

Start of Block: Food Resource Management

Q108 How often do you compare unit prices before you buy food?

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

Q109 How often do you plan meals ahead of time?

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

Q110 How often do you make a grocery list before you go shopping?

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

End of Block: Food Resource Management

Start of Block: Money Expenditure Survey

Q111 Since you have been in college, have you ever run out of money and were unable to buy food?

- o Yes (1)
- o No (2)
- o Choose not to answer (3)

Display This Question:

If Since you have been in college, have you ever run out of money and were unable to buy food? = Yes

Q112 When you ran out of money and were unable to buy food, how often was it because you spent it on ….

1. Social events (such as gifts for friends or significant others, hanging out)

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

Display This Question:

If Since you have been in college, have you ever run out of money and were unable to buy food? = Yes

Q113 2. Technology (such as computer, camera, phone, video games)

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

Display This Question:

If Since you have been in college, have you ever run out of money and were unable to buy food? = Yes

Q114 3. Entertainment (such as concert, travel, Greek life)

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

Display This Question:

If Since you have been in college, have you ever run out of money and were unable to buy food? = Yes

Q115 4. Alcohol, Tobacco (such as cigarettes, e-cigs, snuff) and recreational drugs

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

Display This Question:

If Since you have been in college, have you ever run out of money and were unable to buy food? = Yes

Q116 5. Coffee and Energy drinks

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

Display This Question:

If Since you have been in college, have you ever run out of money and were unable to buy food? = Yes

Q117 6. Fashion (such as clothing, handbags, shoes, tattoos)

- o Never (1)
- o Rarely (2)
- o Sometimes (3)
- o Often (4)
- o Always (5)

End of Block: Money Expenditure Survey

Start of Block: Income Questions

Q118 What is your personal income per month?

- o $0 (1)
- o $1-$249 (2)
- o $250-$499 (3)
- o $500-$749 (4)
- o $750-$999 (5)
- o $1,000-$1,999 (6)
- o $2,000-$2,999 (7)

Q119 What is your parent(s) income per year?

- o Less than $25,000 (1)
- o $25,000-$49,999 (2)
- o $50,000-$74,999 (3)
- o $75,000-$99,999 (4)
- o $75,000 or more (5)
- o Don’t know (6)

End of Block: Income Questions

Start of Block: Underlying Health Questions

Q120 Do you have any of these conditions right now?

- ▢ Type 2 Diabetes (1)
- ▢ Overweight (2)
- ▢ Obesity (3)
- ▢ Sleep Apnea (4)
- ▢ Joint pain (5)
- ▢ GERD/acid reflux (6)
- ▢ Hernia (7)
- ▢ Cancer (8)
- ▢ Depression (9)

- ▢ Anxiety (10)
- ▢ Polycystic ovary syndrome (PCOS) (11)
- ▢ High cholesterol (12)
- ▢ Cardiovascular Disease (13)
- ▢ Asthma (14)
- ▢ Autoimmune diseases like Rheumatoid Arthritis (15)
- ▢ Other (16)
- ▢ None (0)

End of Block: Underlying Health Questions

Start of Block: Resources

Q1 If you want to speak with someone please contact the Counseling Center. Here is information for the Counseling Center at the University of Maine. Hours of Operation: Monday through Friday, 8 AM – Noon and 1-4:30 PM.
Phone Number: 207-581-4975
Location: 5721 Cutler Health Center, Room 125

Student Wellness Resource Center Information
If you wish to speak with someone please contact the Student Wellness Resource Center. Here is the information for the Student Wellness Resource Center at the University of Maine.
Phone Number: 207-581-1423
Location: 149 Memorial Union, University of Maine

Black Bear Exchange
If you need access to a food pantry on campus, please consider utilizing the Black Bear Exchange. Here is the information for the Black Bear Exchange Food Pantry at the University of Maine. Hours of Operation: Wednesday 11AM–PM, Thursday 3:30PM – 5:30PM, and Saturday 9AM– Noon.
Phone Number: 207-581-4567
Location: 55 York Village, University of Maine

End of Block: Resources

APPENDIX B: CONSENT FORM

Informed Consent
You are invited to participate in a research project being conducted by Jade McNamara, a faculty member in the Department of Food Science and Human Nutrition at the University of Maine. Your email was provided by UMaine Student Records. The purpose of the research is to understand more about college students' health behaviors and current health status. You must be between the ages of 18 and 30 years old to participate.

What Will You Be Asked to Do?
If you decide to participate, you will be asked to take a 30 minute anonymous online survey assessing various aspects of your physical and mental health. You will also have the option to sign up for additional aspects of the study including a texting service and a four-part cooking and meal preparation class. You are not required to sign up for these programs. The two programs and additional survey are described below:

1. A texting program where you will receive 2 weekly texts over the course of the Spring 2023 semester about health resources occurring at your university.

2. A cooking course titled "College Cooking Connection", which is 4 cooking classes that last about 90 minutes offered on Mondays and Tuesdays during the weeks of February 6th, March 7th, March 20th, April 10th. The classes focus on meal preparation, budget grocery shopping, and healthy eating. The cooking classes are in person and are held in Hitchner Hall. You will be asked to respond to a class evaluation at the end of each class.

3. The additional survey will be emailed out at the end of the Spring 2023 semester to those who sign up and will ask about health behaviors and current health status.

Risks
Survey questions will be potentially sensitive questions. You will be asked about the following personal health behaviors: stress, fruit and vegetable intake, mental and physical health, goal setting, and drug use. Information about how to contact the Counseling Center for services is provided at the end of the survey. You may skip questions at any time.

If you enroll in the cooking class you risk physical injury. Proper attire will be required (closed-toed shoes, full length pants, and hair nets), and kitchen safety will be the first topic discussed to prevent injuries. You may stop any aspects of the survey or programs at any time.

Benefits
● While this study will have no direct benefit to you, this research may help us learn more about current health behaviors of college students at the University of Maine.
● This research may help us learn more about college students' current health status and future health programming needs.

Compensation
● By responding to this survey, you have an opportunity to enroll in a raffle by providing your email address, 5 people will win a $75 gift card.
● For those who sign up for the texting program, there will be a raffle 4 times throughout the semester for the chance to win items (t-shirt, mugs, water bottles, etc.)
● Those who attend the cooking classes will receive $5 for the first class they attend, $10 for the second, $15 for the third class, and $20 for the fourth class. With the potential to earn up to $50. You must stay for the whole class to receive the compensation for that class.
● By completing the second anonymous survey (emailed out at the end of the Spring semester) you have an opportunity to enroll in a raffle by providing your email address, 5 people will win a $75 gift card.

All gift cards will be for Amazon, and will be awarded via email. Raffle winners will be awarded their prizes within 30 days of the winner being chosen. Gift cards for participation in the cooking classes will be awarded within 7 days of the cooking class that they attend.

Confidentiality
If you choose to participate in the study, you will use a unique unidentifiable ID code, keeping all your data anonymous. The survey to enter the raffle, enroll in the two programs, and sign-up to receive the second survey will ask for identifiable information (email address and phone number) and will be stored on a password protected computer in Dr. McNamara's lab until May 2023, but that information will not be connected to your survey responses. All deidentified data will be kept on a password protected computer indefinitely.

Voluntary
Participation is voluntary. You may skip any questions and stop the survey at any time.

Contact Information
If you have any questions about this study, please contact me at 207-581-4895 or jade.mcnamara@maine.edu. If you have any questions about your rights as a research participant, please contact the Office of Research Compliance, University of Maine, 207/581-2657 (or e-mail umric@maine.edu)

BIOGRAPHY OF THE AUTHOR

Emma Elizabeth Watras was born in Ellsworth, Maine, and raised in Seal Cove, ME. She graduated from Mount Desert Island High School in 2017. She received a Bachelor of Science degree from the University of Maine in 2022 in Food Science and Human Nutrition with a concentration in Human Nutrition and Dietetics Summa Cum Laude. She is pursuing a Master of Science in Food Science and Human Nutrition. She will be completing a dietetic internship at Eastern Maine Medical Center and Bangor's Supplemental Nutrition Program for Women, Infants, and Children center in 2024. Emma's long term goal is to become a Registered Dietitian Nutritionist (RDN) and pursue a doctorate in Nutritional Sciences at the University of Maine.

Emma has been a part of Dr. McNamara's Nutrition Education and Eating Decisions lab since September 2020. She began working as a Graduate Research Assistant in 2022. She was a lead instructor of Dr. McNamara's nationally funded research project: the College Cooking Connection. Emma also worked as a Teaching Assistant and Student Grader during the 2022-2023 academic year for five undergraduate nutrition courses. She is a member of the Kappa Omicron Nu Honors society and the Maine Academy of Nutrition and Dietetics. She has presented research at two national conferences including the 2023 Food and Nutrition Conference and Expo in Denver, CO and the 2023 Healthy Campus Research Consortium in Portland, ME. She presented internationally at the 2023 International Society of Behavioral Nutrition and Physical Activity in Uppsala, Sweden. She is the first author of three abstracts and co-author of nine abstracts. Emma is a candidate for the Master of Science in Food Science and Human Nutrition from the University of Maine in May 2024.