

CULINARY SKILLS: IMMEDIATE AND INTERMEDIATE IMPACTS OF A
PEER-EDUCATION INTERVENTION FOR ADOLESCENTS

BY

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THESIS

Submitted in partial fulfillment of the requirements
for the degree of Master of Science in Food Science and Human Nutrition
with a concentration in Human Nutrition
in the Graduate College of the
University of Illinois, at Urbana-Champaign, 2016

Urbana, Illinois

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ABSTRACT

Inadequate household food preparation equipment has been identified as a barrier to home meal preparation. In a cross-sectional study of households in the United States, food secure households reported owning significantly more unique food preparation equipment items than food insecure households (mean \pm SD, 39.5 \pm 4.6 items vs. 34.1 \pm 5.2 items, $P=0.002$). Access to unique food preparation items may influence the frequency of home prepared meals and indirectly youth culinary skills education.

While youth culinary skills education has been emphasized as an important component of nutrition education, the intermediate- and long-term follow-up to support such claims is lacking. The aim of the culinary skills lessons was to determine the efficacy of peer-educators compared to adult-educators in lesson fidelity as well as participant psychosocial parameters of knowledge, attitude and self-efficacy. Two culinary skills lessons were implemented, and the immediate and intermediate effects of the intervention delivered by peer-educators or adult-educators to an adolescent population were evaluated.

Adolescents, 11-14 years of age, were recruited from the Champaign-Urbana, Illinois, area to participate in two, 2-hour culinary skills lessons. Based on availability, youths were randomized into peer-educator group (PEG) ($n=22$) or adult-educator group (AEG) ($n=20$). Participants attended the lessons that addressed the topics of knife skills, cooking methods and recipe following. Lessons included demonstrations, hands-on practice, discussions, food tastings and physical activity. Program feasibility was measured by fidelity checklists. Participants completed psychosocial questionnaires at pre-lesson, post-lesson, 3-months post-lesson and 6-months post-lesson.

All adolescents (N=42) were 12.1 ± 1.1 years of age (mean \pm SD) with 50% (n=21) female and 57% (n=24) Caucasian. At 6-months post-intervention all adolescents had increased knowledge scores compared to baseline ($P < 0.001$). Attitude, cooking self-efficacy and cooking methods self-efficacy did not significantly increase at 6-months post-lesson compared to baseline. In conclusion, peer-educators and adult-educators were equally proficient at delivering culinary skills lessons that resulted in increased participant knowledge at 6-months post-intervention. Peer-educators were able to lead culinary skills lessons with comparable fidelity as compared to adult-educators. Peer-education may be a novel approach to adolescent culinary skills education.

ACKNOWLEDGEMENTS

To those who contributed to my development during my graduate studies, thank you. Specifically, I would like to thank my thesis advisor, Dr. Sharon Nickols-Richardson for the encouragement and guidance provided over the last two and a half years. Thank you for reminding me of the big picture, particularly during my dietetic internship, when it was needed most. I greatly appreciate your mentorship and our career path discussions.

To my committee members, Dr. Pan and Dr. Y. Lee, thank you for your support of my research projects. Additionally, thank you to the Department of Food Science and Human Nutrition for the opportunity to complete my graduate studies and for the facilities to conduct the culinary skills testing. To my fellow graduate students, thank you for sharing your insight and thank you for your friendship most notably walks around campus and Bevier Café cookies.

Thank you to the members of the Nickols-Richardson Lab; Catherine Metzgar Lo, Cassandra Nikolaus, Henna Muzaffar Carli Liguori, and April Winslow, for your support and encouragement on my research projects. A special thank you to the undergraduate students that assisted with the culinary skills lessons including Kelly Chuang, Angie Hwang, Michelle Nussbaum, Lauren Schwerzler and Mia Zou.

The culinary skills research would not have been possible without the dedication of the parents of participants and involvement of the participants themselves. I greatly appreciate their dedication to attending the lessons and completing the follow-up surveys. To the culinary skills educators, both peer-educators and adult-educators, thank you for your enthusiasm in leading the culinary skills lessons. The research would not have been possible without the financial support of the United States Department of Agriculture Grant.

To my family, thank you for raising me to be an inquisitive yet appreciative person. From a young age, you taught me the importance of hard work and that even with hard work sometimes the results aren't what you would like. Thank you for always encouraging me to discover and reach my goals.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS	vii
CHAPTER 1: Introduction.....	1
CHAPTER 2: Literature Review.....	6
CHAPTER 3: Household Food Preparation Equipment Availability, Usage and Relationship with Attitudes toward Cooking in Parent-Child Dyads: A Cross-Sectional Study.....	46
CHAPTER 4: Peer-Led Culinary Skills Intervention: Impacts on Knowledge, Attitude and Self-Efficacy towards Culinary Skills in Adolescents	71
CHAPTER 5: Conclusions and Future Directions.....	101
APPENDIX A: IRB Approval Letters.....	104

LIST OF ABBREVIATIONS

AEG	Adult-Educator Group
BMI	Body Mass Index
FCS	Family and Consumer Sciences
HOME	Healthy Home Offerings via the Mealtime Environment
IRB	Institutional Review Board
PEG	Peed-Educator Group
SEM	Social Ecological Model
SCT	Social Cognitive Theory
SNAP	Supplemental Nutrition Assistance Program
TEL	Theory of Experiential Learning
WIC	Women Infants and Children

CHAPTER 1: Introduction

While attention has been drawn to the issue in recent years, children and adults often do not have adequate cooking skills for healthful eating¹⁻³. In recent decades, culinary skills have not been taught in secondary schools to the degree that they once were previously taught^{2,4}. Consumption of home-cooked meals is associated with higher-quality dietary intake and healthful weight⁵. Culinary skills interventions targeting youth have not commonly included long-term follow-up to determine if behavior and other measures can be sustained following the intervention. It is even unclear what food preparation equipment is needed for healthful meal preparation⁶⁻⁹.

Follow-up assessments after culinary skills interventions are needed to determine if behavior, attitude and knowledge changes can be sustained in a youth population. Additionally, it has been suggested, but not extensively studied, that peer-educators may serve as an efficacious option for adolescent culinary skills education¹⁰. Two previously created culinary skills lessons based on the Theory of Experiential Learning¹¹ and the Social Cognitive Theory¹² were used to test the impacts of education modality and time on participant knowledge, attitude and self-efficacy. To determine the appropriateness of the food preparation equipment selected for the culinary skills lessons, a cross-sectional survey-based study was conducted to investigate food preparation equipment available within the American household. The questionnaire also assessed parent and child attitudes toward food preparation to determine if children, aged 11-14 years had similar attitudes to their parents or guardians.

The contents of this thesis present the findings of an exploratory cross-sectional study investigating parent and child attitudes toward food preparation and food preparation equipment

availability within the home. Contents also include the results of a culinary skills intervention for early adolescent youths. There were four aims of this thesis:

1. To understand the food preparation equipment available in the homes of children, 11-14 years of age;
2. To explore the association between sociodemographic variables and attitudes toward cooking and food preparation equipment availability;
3. To test the efficacy of peer-educators as a vector for culinary skills education; and
4. To test the efficacy and feasibility of two culinary skills lessons, previously created¹³, led by peer-educators or adult-educators on the immediate and intermediate impacts (6 months) on knowledge, self-efficacy and attitudes toward cooking.

The food preparation equipment availability results informed the equipment used within a two-lesson culinary skills intervention for youth, presented by peer-educators or adult-educators. The hypothesis of the cross-sectional work was based on previous work and included that sociodemographic characteristics would impact total number of household cooking items owned^{8,9} and that parent and child attitudes would be related in at least one measure^{14,15}. The hypothesis of the culinary skills intervention was that peer-educators would be able to lead the culinary skills program comparably to the adult-educators as measured by lesson fidelity and selected participant psychosocial measures.

Chapter 2 of this thesis is a review of the literature of attitudes toward food preparation and youth culinary skills programs. Chapter 3 presents the findings from the cross-sectional work related to food preparation equipment, parent and child attitudes toward food preparation and

sociodemographic variables. The findings of Chapter 3 were used to modify the lessons described and implemented in Chapter 4. The results of the culinary skills intervention including follow-up at months 3 and 6 are found in Chapter 4. Measures from children led by either peer-educators or adult-educators are compared in this chapter. Chapter 5 contains a summary of findings and conclusions with recommendations for future work.

This research adds to the body of literature regarding food preparation equipment availability within the home. Additional understanding is gained from the exploration of the relationship of parent and child attitudes regarding culinary skills. A culinary skills intervention with outcomes measured at 6 months post-intervention contributes to the body of knowledge regarding the retention of culinary skills and attitudes in an early-adolescent population. Results from fidelity testing of a culinary skills intervention serves to enhance the understanding of the ability of peer-educators to teach a culinary skills program.

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CHAPTER 2: Literature Review

An individual's development of and relationship with meal preparation abilities are complex and evolve over one's lifetime. The Social Ecological Model (SEM) is one theory that has been used to explain the connections among various levels of influence on knowledge, attitudes, beliefs, behaviors and social norms that impact dietary intake patterns that affect health status including obesity¹. The SEM is depicted as a series of concentric circles with each representing a level of interaction that an individual has within the environment¹. At the innermost level of the SEM, is the individual (or intrapersonal) with his or her knowledge, attitudes and beliefs¹. The second circle represents the interpersonal level that includes family, friends and social networks¹. The third level includes organizations and social interactions, while the fourth circle depicts interactions between and among organizations¹. The outermost circle represents policy, from local to federal. All factors are interrelated and interact. Single and multiple levels of the SEM have been studied to better understand influences on an individual's dietary intake and attitude towards meal preparation^{1,2}.

INDIVIDUAL LEVEL

At the intrapersonal level, food preferences are both genetically determined and learned; the key is understanding how to influence learned preferences³. Individual dietary intake is influenced by exposure to various food items, as increasing exposure increases liking and acceptance of a given food⁴. The frequency and total number of instances of exposure to a given food impact an individual's preference for that food^{3,4}.

Knowledge

The influence of knowledge is multifaceted. Some individuals may simply lack the understanding that home-prepared meals tend to be more healthful than pre-packaged or restaurant-prepared meals⁵. When asked to identify barriers to home meal preparation, inadequate cooking skills were identified as a barrier⁶. Within the barrier of culinary skills knowledge are the topics of cooking method application, understanding how to substitute for equipment not owned and general menu planning⁷. A lack of knowledge regarding how to prepare healthful meals can lead to the perception that home-cooked meals are less tasty and undesirable⁸. Men, compared to women, were more likely to note that the lack of knowledge of food preparation methods was a barrier⁹. Limited knowledge of food preparation spans from ‘farm to fork,’ with a lack of understanding about the food supply from crop selection to food production and processing to sales and marketing to home preparation to consumption⁷. There are numerous aspects of cooking-related knowledge that could deter individuals from preparing meals for themselves and their families⁷. Knowledge of cooking skills includes cooking methods, ingredient substitutions, equipment substitutions and usage, food safety and knife skills⁷. Troubleshooting – or the ability to solve cooking-related problems – was also noted as an important piece of culinary skills education⁷.

Attitudes

Positive attitudes towards home meal preparation are associated with higher diet quality across all level of socioeconomic status⁹. Among the limitation of negative attitudes as a barrier to healthful home meal preparation, the dislike of clean up and the general feeling of cooking being overwhelming were commonly reported¹⁰. Additionally, the stance that home meal

preparation is more costly than convenience food preparation serves as both an individual and family barrier to home meal preparation¹¹. Frequent cooking and competency with cooking skills are positively associated with enjoyment of cooking¹². However, enjoyment of cooking is not necessarily predictive of cooking skills. Whether there is a correlational or causal relationship between cooking skills and cooking enjoyment remains unclear¹².

Beliefs

Beliefs are ideas that individuals consider as true¹³. An individual's beliefs stem from his/her experiences, cultural or religious norms¹³. Following an intervention focused on quick meal planning, adults had increased beliefs in the importance of meal planning and reading nutrition labels¹⁴.

Confidence and Self-efficacy

While confidence and self-efficacy are not interchangeable, they have commonalities¹⁵. Self-confidence is non-directional and often a more overarching term not specific to theoretical models¹⁵. Confidence in cooking ability may also impact frequency of home cooked meals¹⁶. Low confidence in cooking skills was associated with low education level, young age, and absence of children in the home¹⁶. In contrast, self-efficacy refers to one's positive belief in his/her ability to do something¹⁵.

INTERPERSONAL LEVEL

The role of family in development of attitudes and behaviors towards food cannot be overlooked. Young adults, aged 17-23 years, held food-related attitudes that were similar to their

parents', but the age at which these similarities developed was unclear¹⁷. From an early age, parents influence learned food preferences, by determining the foods that are allowed into the home¹⁸. However, the exact age at which children acquire and express parental food attitudes is unknown.

As children develop, the interpersonal and organizational levels of the SEM become the most influential, with family, social and cultural norms influencing attitudes, beliefs and behaviors underlying food intake^{2,19,20}. Barriers to home meal preparation deter individuals from cooking in their homes. Such barriers include lack of time, inadequate kitchen facilities, limited knowledge of how to cook and perception that cooking is overwhelming⁹. Dual-income households have been shown to have less frequent home food preparation¹⁷. Definitions of and tools used to measure the household food environment often ignore the fundamental concept of equipment availability^{2,21-23}.

Household Environment

Equipment

Lack of access to an adequate kitchen may be a barrier to some in their efforts to prepare healthful meals for themselves or their families^{9,10,24}. The absence of enough space for the family to eat together was shown to deter home-prepared meals⁸. Thus, with home kitchen and dining space that is poorly equipped and/or inadequate, families may choose other convenience options⁸. There is a limited body of knowledge investigating the relationship between household environment, particularly food preparation equipment availability, and home meal preparation attitudes of American households.

Appelhans et al.²⁵ found an association between environmental factors including household income, food security status and socioeconomic status with number and type of food preparation items present in the home. A low number of unique food preparation items present in the home was linked to poor dietary intake and high obesity risk in a sample of urban, Midwestern, African American adults of low socioeconomic status²⁵. The lack of adequate food preparation supplies was reported as a direct barrier to home food preparation²⁵. Households with a greater number and variety of food preparation items in the home reported more food and meal preparation, compared to households with lesser number and variety²⁵. In a study of Oklahoma *Supplemental Nutrition Assistant Program* (SNAP) participants, equipment was not reported to be a barrier to meal preparation. Yet, households commonly reported lacking food measuring tools²⁶. Interestingly, there is a lack of evidence supporting the need for extensive food preparation equipment, as substitutions may be made when a piece of equipment is not available^{7,27}. Conversely, items such as microwave, non-stick pan, slow cooker and food processor have been shown to be materially essential to home food preparation²⁸. At present, consensus on items that are necessary for home food preparation does not exist.

Family Structure and Practices

Household composition, demographics and values contribute to the overall interpersonal impacts on a person's attitudes and behaviors towards food preparation²⁹. Little is known about non-parental caregivers and impact on development of youth attitudes toward food preparation.

Greater household spending on food was linked to greater meal preparing by youths in those households³⁰. Women were shown to have higher self-perceived cooking ability than their male counterparts, though this may have been due to a social desirability bias²⁹. Dual-income

households have also shown differences in attitude of parents and their respective children³⁰.

Parental age has been associated with parental involvement in domestic activities including meal planning, food preparation and/or grocery shopping³¹. Younger males who identified as head of household were found to be more involved in domestic activities than households that had an older male as head³¹.

Kramer et al.³⁰ found that children whose parents used healthful cooking methods (baking and broiling vs. frying) were more likely to use healthful cooking methods themselves, suggesting that children may learn beneficial food preparation methods from their parents.

Parenting style has been found to impact fruit consumption, attitude, and self-efficacy in 16-17 year-olds³². Youth with parents characterized as authoritative (high demands, structure, involvement and expectations) had high scores for social support for fruit consumption^{32,33}.

Youth with positive attitude towards fruit lived in households with parents characterized as authoritative and indulgent (low demand and behavioral monitoring with high warmth)^{32,33}.

Time

Time has been reported as a factor, primarily lack of time as a barrier, to home meal preparation. The trade-off associated with spending more time on home meal preparation is realized in good dietary quality of foods in the home³⁴. Low-income women were more likely to report a busy or stressful day as a barrier to family home food preparation than men¹⁰. Lack of time as a barrier to healthful meal preparation extends to grocery shopping and menu planning²⁴. Busy schedules of various family members may deter healthful home meal preparation^{6,8}. Parental responsibility for transporting children to various activities decreases the time available for home meal preparation⁸. Some parents even desire information about cooking quick meals

over cooking healthful meals for their families³⁵. The same study also found that parents' willingness to make time to prepare meals at home was of low priority³⁵. While lack of time is often noted as a barrier to healthful eating, home meal preparation requires an average of 5.3 hours per week¹⁰. The average amount of leisure time spent in front of a television screen is nearly 20 hours per week³⁶. Home food preparation may be a matter of time allocation prioritization.

Social Environment

Influence of Peers

The typical dietary pattern of American adolescents have been recognized as a risky behavior for youths³⁷⁻³⁹. Dietary intake may be influenced by perceived consequences of consuming a given food or foods⁴. Consequences include physiological allergic reactions or psychosocial reactions of peers or family and other psychosomatic feelings associated with consumption of food⁴. Peer nutrition education has been suggested as a mechanism of decreasing health risks associated with poor food choices during adolescence³⁹. While it is understood that children learn and adopt attitudes towards food from their parents^{32,33}, it is widely recognized that peers also play a substantial role in influencing youths' attitudes towards foods^{37,38}.

SIGNIFICANCE OF CULINARY EDUCATION

There are numerous health and social benefits associated with the consumption of home-prepared healthful meals¹⁰, including decreased risk of chronic diseases such as heart disease, stroke, obesity, diabetes and some gastrointestinal cancers¹⁰. Additionally, meals prepared in the home tend to be smaller in portion size, lower in fat, lower in sugar and lesser in total

kilocalories than meals prepared outside the home⁴⁰. Healthy food consumption patterns are associated with intake of few meals from fast food restaurants and more home food preparation activities including planning, preparing and cleaning^{2,34,41,42}.

Acceptability of a given food item is higher when individuals prepared the item themselves compared to a ready-made item⁴¹. Moreover, consumption is greater and self-reported liking of the item is higher compared to a pre-prepared item⁴¹. However, adolescents select foods based on aesthetic appeal, primarily anticipated taste, over nutritional value even when nutrition knowledge is present⁴³. Self-food preparation can impact preference for the food and the amount of that food consumed. Increased intake and acceptance of self-prepared foods may be positive or negative, depending on the nutritional quality of the food that the individual chooses to prepare³⁰. There is an unclear relationship between frequency of home-prepared meals and child body mass index (BMI). For example, one study found in African American youth, high child BMI in households with a high frequency of home prepared meals³⁰. In contrast, a study of teens found that low BMI was associated with high incidence of home meal preparation⁴⁴. Chu et al.⁴⁵ reported that youth who assisted with home meal preparation had higher daily intake of fruits and vegetables as well as greater overall diet quality compared to youth who did not help to prepare home meals⁴⁵. Home food preparation also has been associated with less consumption of sugar-sweetened beverages and coffee by adolescents²⁵. Cooking methods utilized as well as foods prepared impact the overall diet quality of home prepared meals. Caregiver utilization of healthful cooking methods such as grilling, broiling, steaming and roasting was related to low risk of overweight and/or obesity in their child²⁵.

When asked to identify skills essential for healthful eating, experienced culinary skills leaders specified the ability to substitute common utensils for equipment not readily available

(e.g., using a fork rather than a whisk)⁷. Understanding the appropriate cooking method for a given dish was also identified as an essential skill to healthful food preparation⁷. Given that many parents never learned to cook themselves, the expectation that they teach their children how to prepare healthful meals is unrealistic. Time spent on home meal preparation is required for healthier eating patterns³⁴. In recent decades, the incorporation of food preparation and other family and consumer sciences (FCS) skills in schools in the United States have dramatically decreased⁴⁶. Additionally, interventions implemented during the school day face the challenges of time constraints, lack of resources and teachers being uncomfortable with leading and demonstrating cooking skills⁴⁷. With the decrease in FCS courses, youth are not learning skills that translate to science and math courses, let alone skills for healthful eating⁴⁸. For example, recipe adjustment involving fractions and following precise multi-step procedures, such as a written recipe, are core skills within the National FCS Standards and Performance Competencies⁴⁸. The utilization of fraction manipulation and following a set procedure, as in a science experiment, allows FCS to integrate classroom material into elective courses.

Additional benefits of teaching culinary skills to youths include the basic life skills of food preparation, time management and resource allocation³⁰. These skills are critical to developing healthy children and adults. Moreover, establishing healthful home food practices in youth is associated with adult in-home food preparation³⁰.

Federal recommendations suggest that culinary skills, in-part, lead to improved dietary quality and serve as one mechanism for healthy weight goals^{2,42,49}. Additionally, multiple commentaries have been published calling for the teaching of culinary skills to youth and adolescents^{46,50,51}. However, there is little evidence that directly links youth culinary skills to improved dietary intakes or even sustainable behavior changes²⁹.

SUMMARY OF CULINARY SKILLS PROGRAMS

Methods

A formal search of *Web of Science*, *Elsevier*, *Journal of Extension* and *PubMed* using the terms “cooking class”, “cooking lesson”, “cooking skills”, “cooking camp”, “culinary class”, “culinary lesson”, “culinary skills”, and “culinary camp” was conducted. Informal searches of professional conference abstracts were completed to search for any further studies on culinary skills education for children.

The search yielded 943 results. Of those, 707 were eliminated as duplicate articles or not pertaining to culinary skills education. Another 121 were eliminated for not having youth within the target audience (2-18 years of age), and 63 were eliminated for targeting special populations (e.g., homeless, cancer patients, renal patients, etc). Of the 52 articles for review, 30 were duplicated programs not previously noted from title review. Two computer-based interventions^{52,53} were reviewed and ultimately excluded on the basis that these interventions were not in-person culinary skills programs with hands-on experiential learning. The remaining 20 studies were reviewed and references checked. Two additional studies were found through reference review and were added for a total review of 22 programs^{27,54-74}.

Summary of Study Characteristics

Of the programs reviewed, audience age varied widely from kindergarten⁶⁹ to youths with adults^{60,65,69,74}. Table 1 outlines each study, participants, and culinary skills instruction dose and outcome measures. Numerous programs incorporated parental involvement, ranging from parents attending sessions with their children^{60,65,69,74} to separate classes for parent^{55,62}. The dose of culinary skills education varied widely from a single-session class⁵⁸ to multi-week summer

camps^{27,54,67,70} and after school programs^{62,68,71}. Educators for the programs most commonly included extension educators/professionals^{55,58}, college students^{27,61,62}, and chefs^{56,60,64,69,71}. The Social Cognitive Theory (SCT) was the most commonly applied theoretical framework for interventions^{27,57,60,61,65,67,69} and was occasionally combined with the Theory of Experiential Learning (TEL)^{27,54,70}. One program gave consideration to complexity of ingredients with a six ingredient limit placed on all recipes used in the program⁵⁹. Programs included those that taught culinary skills exclusively^{54,56,57,59,61,63,64,68-72,74} and those that taught culinary skills in conjunction with other skills commonly including gardening^{62,66,67}, meal planning^{60,65} and grocery shopping⁶⁰.

Application of Theoretical Models

Social Cognitive Theory

Self-efficacy and outcome expectation were the most widely applied constructs of the SCT to be measured in the reviewed programs. Self-efficacy is the individual's perceived level of control over his or her health habits^{75,76} and is linked to nutrition-related behavior change. Self-efficacy and outcome expectation have a unidirectional relationship to nutrition behavior change in children⁷⁷. Though a precursor to outcome expectation changes in youth, self-efficacy level is not predicted by outcome expectation⁷⁷. Self-efficacy is comprised of magnitude, strength and generality⁷⁶. Magnitude measures the difficulty level of a given task, while strength examines an individual's perceived ability to perform the task, and generality relates to the generalizability of the task⁷⁶. Outcome expectation is the expected benefit and cost of different habits or behaviors⁷⁵. Outcome expectation can be predicted by level of self-efficacy in nutrition interventions involving children⁷⁷.

Theory of Experiential Learning

The TEL proposes that conceptual learning is a function of the person and his or her environment⁷⁸. Constructs of the TEL include reflective observation, abstract conceptualization, active experimentation and concrete experience. Reflective observation includes seeing someone perform a certain task. Adolescent learning through observation has been linked to increasing self-efficacy, when an adult demonstrates a given task⁷⁹. Observational learning-based increases in self-efficacy have not been studied with youth leaders. Additionally, the constructs of concrete experience, active experimentation and abstract conceptualization suggest that learning comes from an environment where hands-on activities are encouraged along with cognitive review⁷⁸.

Education Modality

Of the reviewed culinary skills programs, there were a variety of leaders and types of training for these leaders. Five programs utilized a team approach^{58,60,64,66,69,71}, which varied by program. Of the team-led approaches, it was common to include chefs^{60,64,69,71}, a registered dietitian⁶⁰, or teens⁵⁸ within interventions. Programs led exclusively by adults were the most common mode of education delivery programs^{27,55,56,63,64,67,69,71-73}. Two programs described specific training provided for leaders^{55,67}. In one program, YMCA counselors attended a gardening training before leading the program⁶⁷. An Oklahoma extension intervention provided training in the form of an electronic disk with materials for lessons⁵⁵. Lesson materials included presentation, handouts, evaluations and even promotional materials for marketing the classes to youth in the community⁵⁵.

Summary of Outcomes

While the outcomes measured by each program varied, culinary skills knowledge level^{27,55,58,60,61,63-65,69,71-73} was the most common. Additional outcomes of interest included self-efficacy towards cooking^{57,67,69-71} and positive self-confidence in culinary skills^{56,63,73}, as well as improved dietary quality^{55,56,62,65,69,74}.

Knowledge

Culinary skills knowledge^{27,54,56,58,60,61,63,64,69,73} and nutrition knowledge^{27,57,58,63} were each evaluated in multiple interventions. An increase in culinary skills knowledge was reported after many of the interventions^{54,56,58,60,63,73}. Nutrition knowledge increase was reported in two interventions^{57,58}, with one intervention reporting no change in participant knowledge as a result of the intervention⁶³. Interventions of varying lengths resulted in significant increases in culinary skills knowledge. Interventions ranged from 90 minutes⁵⁸ to 32 hours⁵⁴ of culinary skills education. It is unclear whether the knowledge obtained was retained over time.

Behavior

Seven programs assessed participant behavior change; most commonly measured was dietary intake behavior^{55,56,62,65,69,74} followed by home-prepared meal frequency^{54,65,73}. Seven-day recall⁷⁴, child food screener⁶², plate waste analysis⁶⁹ and 24-hour recall⁶⁵ were methods used to assess dietary intake of participants. Four programs showed increased intakes of servings of fruits and/or vegetables following intervention^{55,56,60,71}. Significant increases in fruit and vegetable servings per day were seen in one intervention with unspecified length of culinary intervention⁵⁵. Significant increases in vegetable consumption were reported in one intervention

with unclear culinary skills dose⁵⁶. Significant increases in daily fiber intake were documented in two interventions; one involved 45-minutes of culinary skills in each of 12 lessons⁶² and another of unspecified length⁶⁵.

Frequency of home-prepared meals, food safety behaviors and grocery shopping patterns were also assessed. Frequency of home-prepared meals increased following two programs^{54,73}. Food safety behaviors including hand washing frequency, washing fruits and vegetables before preparing and using cutting boards when needed were improved following one intervention⁵⁵.

Positive Self-Confidence and Self-Efficacy

As previously mentioned, confidence and self-efficacy measures are not the same measure. They are grouped together here, as self-confidence does not fall within a particular construct of SCT. Three programs measured culinary skills-related self-efficacy, with two finding significant increases^{57,62} and one with a non-significant increase⁵⁴ following the intervention. Of the interventions that assessed self-efficacy towards cooking, the strength domain was most common. Interventions of varying lengths, from 90 minutes to 32 hours of culinary skills training, similarly led to significant increases in participant self-efficacy towards cooking^{57,70}. Two programs measured cooking confidence, and both reported increases following the program (one significant⁶³ and one unspecified⁷³).

Process Evaluation

Few interventions documented any form of process evaluation; of those that did, post-intervention surveys were most common^{65,66,69}. The *Healthy Home Offerings via the Mealtime*

Environment (HOME) intervention reported that process observation data were recorded to document feasibility of the program⁶⁵. Observations included recording of homework assignment completion, session observation and a post-intervention satisfaction survey⁶⁵. *The Delicious and Nutritious Garden* intervention included a follow-up survey with closed- and open-ended questions for participants to suggest improvements to the program⁶⁶. These process evaluations indicated that youth enjoyed the lessons but were divided over enjoyment of gardening, with some youth not enjoying weeding⁶⁶. *The Cookshop Program* gathered a variety of process measures including evaluations from participants and instructors regarding the flow of the lessons, staff observational notes, and focus group interviews with the instructors following the program⁶⁹.

FUTURE RESEARCH DIRECTIONS

Research in culinary skills training is difficult due to complexities of individuals' relationships with food. This is further compounded by the lack of a universally accepted definition of cooking²⁹. Additional research is needed to more accurately and comprehensively understand the development of attitudes, beliefs and intake patterns in children. A clearer understanding of the mediators of food-related attitudes, behaviors and social norms are needed.

Home Food Environment

Simply owning kitchen equipment does not imply that such equipment is in working condition, or even that individuals know how to use or do use that equipment²⁶. A list of types of kitchen equipment and cooking items that are necessary to the preparation of healthful meals is needed. Landers et al.²⁶ stated that respondents did not report equipment as a barrier to meal

preparation, yet indicated that few participants owned measuring tools. Larson et al.⁸⁰ found that individuals did not perceive equipment to be a barrier to cooking, but investigators did not ask individuals the specific items present for food preparation⁴⁴. Additionally, there is no evidence pointing to the food preparation items that are required for preparation of a healthful meal. It is likely that due to cultural differences, the answer to needed equipment is neither clear nor concise.

Culinary Skills Interventions

A better understanding of the link between culinary skills and dietary behaviors in middle school youth is the key to further developing effective nutrition interventions for adolescents. Soliah et al.⁴⁰ commented on the importance of the link between culinary skills and nutrition education by stating that “...possibly more time and effort needs to be spend on how to make healthful food. If more were known about the average young person’s food preparation ability then more appropriate nutrition advice could be delivered by health care professionals or health educators working with this population”⁴⁰.

It has been suggested that peer-nutrition education within an adolescent population could be one method to achieve positive psychosocial changes; however, further research is needed to understand this relationship³⁹. The extent to which the background of the culinary skills leader impacts the outcome of the intervention has not been extensively studied. Over half of participants in a survey reported that they had a desire for more information regarding various aspects of cooking²⁹. Individuals are interested in learning about cooking skills, yet the translation into behavioral change will not be clear until more is known about these relationships.

TABLE

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs

<i>Author, year, and program name</i>	<i>Primary Aim</i>	<i>Participants</i>	<i>Leaders</i>	<i>Program Topics</i>	<i>Intervention Duration (Culinary Dose)</i>	<i>Measures</i>	<i>Theory</i>	<i>Summary of Findings</i>
Beets et al., 2007 ⁵⁴ <i>Culinary Camp</i>	Development of culinary skills	N=20 adolescents boys and girls	---- ¹	Culinary skills	8 lessons, 4 hours each over 2 weeks (32 hours)	Attitude towards cooking Self-efficacy Knowledge Parent perceptions Perceived availability Frequency of home prepared meals	Theory of Experiential Learning	<u>Significant increases:</u> knowledge, perceived cooking ability <u>Non-significant increases:</u> negative opinions, self-efficacy, frequency of cooking in the last 7 days <u>No changes:</u> enjoyment (attitude, parent perceptions) <u>Decrease:</u> behavioral expectancies

¹ Indicates parameter was not reported

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Brown et al., 2005 ⁵⁵ <i>Untitled</i>	Increasing fruit and vegetable consumption	N=229 boys and girls N=373 adults, separately	Extension educators with specific training	Culinary skills Food safety practices Produce nutrition	Average of 8 classes over 2 months (----	Culinary skills knowledge Dietary intake of fruits and vegetables Fruit and vegetable exposure	----	<u>Increases</u> : intake of fruit and vegetable servings per day, both youth and adults, frequency of hand washing, using knives and cutting boards for food preparation
Caraher et al., 2013 ⁵⁶ <i>When Chef's Adopt a School</i>	Increase cooking confidence	N=169 9-11 year-old boys and girls n=86 intervention n=83 control	Chefs	Culinary skills	2 lessons of unspecified length (----	Vegetable consumption Confidence in asking for favorite fruit or vegetable Cooking confidence Culinary skills knowledge	----	<u>Significant increases</u> : cooking confidence, vegetable consumption <u>Non-significant increases</u> : cutting fruits and vegetables, measuring ingredients, following a recipe, making pasta salad

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Chessen et al., 2009 ⁵⁷ <i>Untitled</i>	Improve self-efficacy towards cooking	N=22 12-14 year-old girls (70% Hispanic)	----	Culinary skills	2 lessons per week, 2 hours each for 6 weeks (12 lessons with 90 minutes of hands-on cooking)	Nutrition knowledge Self-efficacy towards cooking Barriers to diet quality	Social Cognitive Theory	<u>Significant increase</u> : self-efficacy for cooking <u>Non-significant increase</u> : knowledge <u>Non-significant decrease</u> : barriers to healthful diet
Clark & Foote, 2004 ⁵⁸ <i>Kid's Chef School</i>	Increase knowledge for food preparation	N=unspecified 2 nd and 3 rd grade boys and girls	Extension educators and teen volunteers	Culinary skills Food safety Table setting Manners	90-120 minute lesson (90-120 minutes)	Nutrition knowledge Culinary skills knowledge	----	<u>Increases</u> : knowledge of food preparation and food safety, understanding measures, knowledge of nutrition
Concannon et al., 2011 ⁵⁹ <i>Snacks in the Stacks</i>	Increase ability to prepare healthful snacks	N=unspecified teens	----	Culinary skills	2 hour lessons, varying number (2 hour lessons)	No measures collected	----	Informal reports of preparing snacks at home

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Condrasky et al., 2007 ²⁷ <i>Cooking Camp</i>	Teach cooking methods	N=unspecified 11-14 year-old boys and girls	College students	Culinary skills	5 full-day lessons in summer camp format (Varied based on day)	Cooking methods knowledge Nutrition knowledge General health behavior change	Social Cognitive Theory Theory of Experiential Learning	Focus groups to determine effectiveness
Condrasky et al., 2008 ⁶⁰ <i>What's Cooking</i>	Increase fruit and vegetable intake	N=unspecified families	Chef, dietitian and supermarket staff	Culinary skills Menu planning Grocery shopping	7 lessons in grocery stores (---)	Frequency of meal planning Culinary skills knowledge Shopping patterns	Social Cognitive Theory Social Marketing Theory Change Theory	<u>Increases</u> : awareness, fruit and vegetable intake, knowledge

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Corr & Condrasky, 2010 ⁶¹ <i>Culinary Nutrition in Action is a SNAP</i>	Impart knowledge	N=unspecified 10-14 year-old boys and girls	----	Culinary skills	---- (----	Culinary skills knowledge Confidence Motivation	Social Cognitive Theory	----
Davis et al., 2011 ⁶² <i>LA Sprouts</i>	Improve dietary intake and lower obesity risk	N=104 9-11 year-old boys and girls (Latino; taught primarily in Spanish) n=34 intervention, n=70 control	----	Gardening Culinary skills	12 weeks with 90 minutes per lesson (45 minutes within each of the 12 lessons)	Body composition (Tanita) Dietary intake ⁸¹ Motivation towards healthy eating ⁸² Self-efficacy towards fruit and vegetable preparation	----	<u>Significant increases:</u> dietary fiber intake among all participants, preference for vegetables amongst overweight and obese participants

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Dixon et al., 2013 ⁶³ <i>Cook Like A Chef</i>	Encourage confidence in cooking techniques	N=97 10-14 year-old boys and girls	Counselors	Culinary skills	---- (----)	Confidence and motivation towards cooking Nutrition and cooking knowledge	----	<u>Significant increases:</u> cooking skills knowledge, cooking confidence <u>No changes:</u> nutrition knowledge, carrying out healthy food based actions
Dougherty & Silver, 2007 ⁶⁴ <i>Untitled</i>	Increase frequency of home prepared meals	N=36 9-12 year-old boys and girls (disadvantaged)	Chef and nutritionist	Culinary skills	5 days, 2 hours per day (Approximatel y 10 hours of intervention)	Self-reported Learning Enjoyment Knowledge of cooking skills	----	----

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

Author, year, and program name	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Fulkerson et al., 2014 ⁶⁵ <i>Healthy Home Offerings via the Mealtime Environment (HOME)</i>	Improve dietary intake and test program feasibility	N=44 parent- child dyads (8- 10 year-old boys and girls with overweight or obesity) Parent was the primary food preparer	----	Culinary skills Meal planning	3 months, 5 sessions 90 minutes each (----	Family dinner frequency Parent self- efficacy towards dietary improvement Child food preparation skills Home food availability ⁸³ Dietary intake, 24-hour recall ^{84,85}	Social Cognitive Theory	<u>Significant increases:</u> child reported cooking ability, dietary fiber intake

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Gibbs et al., 2013 ⁶⁶ <i>Stephanie Alexander Kitchen Garden</i>	Improve dietary intake	N=764 8-12 year-old boys and girls n=475 intervention n=289 control	Teachers and assistance of gardening and cooking volunteers	Gardening Culinary skills	45-60 minutes gardening each week of school year (90 minutes of culinary skills training each week of school year) Incorporated into the school day	Child well-being ⁸⁷	Adapted Social Ecological Model	<u>No change</u> : child well-being
Harmon et al., 2015 ⁷⁰ <i>Unspecified</i>	Teach culinary skills	N=65 9-12 year old boys and girls, low income	----	Culinary skills	4 sessions, once per week for 1 hour (4 hours)	Attitude towards cooking Self-efficacy	Theory of Experiential Learning	<u>Significant increases</u> : self-efficacy <u>No change</u> : attitude towards cooking

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

Author, year, and program name	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Heim et al., 2009 ⁶⁷ <i>Nutritious and Delicious Garden</i>	Determine whether exposure increased fruit and vegetable preference, asking and home availability	N=93 4 th -6 th grade boys and girls	YMCA counselors with specific training	Culinary skills Gardening	12 weeks, twice per week for 20-30 minutes (----	Fruit and vegetable Exposure Preference ⁸⁸ Self- efficacy, cooking skills ⁸⁹ Asking behavior, weekly asking of fruits and vegetables Home availability	Social Cognitive Theory	<u>Significant increases:</u> exposure to fruits and vegetables, vegetable preference, fruit and vegetable asking behavior
Hyland et al., 2006 ⁶⁸ <i>Food Club</i>	Promote dietary changes	N=98 11-13 year-old boys and girls	----	Culinary skills	Varying lengths (----	Qualitative data from focus groups	----	<u>Qualitative comments:</u> claims of diet change including fruit and healthy eating, preparing recipes after lessons

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Liquori et al., 1998 ⁶⁹ <i>Cookshop Program</i>	Increase vegetable and whole grain consumption	N=unspecified kindergarteners and their parents (multi- component program including teachers and school foodservice workers)	Chefs and teachers	Culinary skills	---- (----)	Dietary intake (plate waste assessment of whole grains and vegetable on two separate days over two weeks) Intentions to eat plant foods Attitude towards cooking and health Knowledge Cooking self- efficacy	Social Cognitive Theory	----

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Robson et al., 2016 ⁷⁴ <i>Untitled</i>	Evaluate relationship between coking intervention and home meal frequency	N=6, parent- child dyads (3- 10 year-old boys and girls)	----	Culinary skills	10 lessons, 60- 90 minutes each 6 parent only 4 parent and child (4 lessons, 60- 90 minutes attended by child with parent)	Dietary intake, 7 day dietary record which parent completed for child Caretaker attitudes and confidence ⁹⁰ Parent perceptions of portion size Home use of recipes	----	Parent effect size noted, no significance of measures
Thomas & Irwin, 2011 ⁷¹ <i>Cook it Up!</i>	Teach culinary skills	N=8 boys and girls (at-risk)	Chefs and assistance of teachers and other adult volunteers	Culinary skills	18 months (2 hours, twice per month for 18 months)	Self-efficacy towards cooking skills	----	----

Table 2.1 Reviewed Youth Culinary Skills Intervention Programs (*cont.*)

<i>Author, year, and program name</i>	Primary Aim	Participants	Leaders	Program Topics	Intervention Duration (Culinary Dose)	Measures	Theory	Summary of Findings
Thonney & Bisogni, 2006 ⁷² <i>Cooking Up Fun!</i>	Teach culinary skills for healthful eating and positive youth development	N=128 9-15 year-old boys and girls	Adult facilitators	Culinary skills	6 lessons, >90 minutes each (6 lessons, >90 minutes each)	----	----	----
Timmins & Lambden, 2004 ⁷³ <i>Get Cooking!</i>	Improve attitude towards cooking	N=unspecified 13-16 year-old boys and girls	Female leaders	Culinary skills	6 lessons over 5-6 weeks at “hard to reach” community sites to reach disadvantaged youth (----	Confidence towards cooking Frequency of cooking at home Culinary skills knowledge Attitude	----	High enjoyment of lessons and foods prepared <u>Increases</u> : cooking ability, cooking confidence, enjoyment of cooking, attitude towards cooking, frequency of home cooked meals

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CHAPTER 3: Household Food Preparation Equipment Availability, Usage and Relationship with Attitudes toward Cooking in Parent-Child Dyads: A Cross-Sectional Study¹

ABSTRACT

Lack of availability of household food preparation equipment may serve as a barrier to healthful eating. The purpose of this cross-sectional study was to explore the relationship between food preparation equipment availability and attitudes toward food preparation in parents and their 11-14 year-old children. Parent-child dyads (n=135) completed an online survey. Food preparation equipment was assessed using a 7-point frequency of use scale, after respondents indicated owning each piece of equipment, and attitudes were measured using 7-point Likert-type scales. Descriptive statistics were conducted for all variables. Attitude subcategory totals for parent and child were evaluated using Pearson's correlations, and dichotomized variables were analyzed using independent *t*-tests. Significance was set at $P<0.01$. Households reported owning 37.9 ± 8.0 (mean \pm SD) food preparation items (maximum of 46). Over 90% of households owned a refrigerator, the most frequently used household food preparation item. Food secure households owned roughly five more food preparation items compared to food insecure households ($P=0.002$). Parent and child attitude scores were significantly associated for Time Influence ($P<0.001$), Woman's Task ($P<0.001$), Value for Money ($P=0.001$), Cooking Skills ($P<0.001$), Sociability ($P<0.001$), Price ($P<0.001$), Nutrition Misperception ($P<0.001$), and Item Use Knowledge ($P<0.001$). Attitudes were not significantly associated between dyads for Cooking Involvement ($P=0.015$). At the age of 11-14 years, child attitudes were related to those of a parent regarding food preparation. Additional studies are needed to further explore and

¹ To be submitted to *Appetite*

understand the roles of household food preparation equipment availability, usage, cooking abilities and attitudes toward home food preparation on healthful food preparation among parent-child dyads.

INTRODUCTION

The way that individuals interact with food is complex, and the development of attitudes towards food is just as complicated. One theoretical framework that serves to illustrate relationships among levels of interaction is the Social Ecological Model (SEM)¹, depicting influential factors from the intrapersonal to policy level^{1,2}. Each level interacts with neighboring factors, and together, the SEM aims to explain determinants of influence on an individual for outcomes such as obesity and/or other disease risk. At the intrapersonal level of the SEM, intake is partially influenced by exposure to a given food; frequency of exposure is linked with preference for a specific food³. Children's exposure to and their attitudes toward foods are influenced by actions of parents or guardians, as adults largely control the amount and types of foods that are available in the home^{4,5}. Intrapersonal influences on attitudes, values and dietary intake are also affected by household composition and demographic variables⁶. Parental attitudes and behaviors regarding home meal preparation and trade-offs between time, convenience, value and other factors influence their children's experiences with cooking at home⁷.

Barriers to home meal preparation can deter an individual from cooking in the home. Such barriers include, but are not limited to, lack of time, inadequate facilities and equipment, limited knowledge and poor attitudes toward cooking⁸. Unavailability of food preparation equipment as well as inadequate kitchen space can be limitations to an individual's ability to prepare a healthful meal^{8,9}. Limited literature exists on the relationship between attitudes toward food preparation and household equipment availability in households with children in the United

States (U.S.). Socioeconomic characteristics have been linked to the number of food preparation items available within the home in studies of low income populations, but this has not been explored in the general population^{10,11}. Some individuals are not aware that home prepared meals are typically healthier than foods prepared outside of the home^{12,13}. Knife skills, cooking methods, food safety and substitutions of ingredients and equipment were identified as necessary culinary skills¹⁴. Parental use of cooking methods has been linked to child choice of cooking methods later in life¹⁵. It is unclear at what age children learn food preparation skills from their parents and if attitudes are also impacted at such age.

The purpose of this study was to understand what food preparation equipment was present and utilized within U.S. households and to explore the relationship between parent or guardian and their 11-14 year-old child's attitudes toward cooking. Researchers hypothesized that socioeconomic characteristics would influence the number of unique food preparation items owned, with food secure households owning more items than food insecure households. Researchers additionally hypothesized that there would be a relationship between parent and child attitudes toward cooking in at least one attitudinal categorical measure, based on previous research investigating parent-child responses^{5,16}.

MATERIAL AND METHODS

Participants

In February 2015, an online survey was administered by Qualtrics LLC Panel Services (Provo, UT, U.S.) to eligible households to approximate a representative sample of the U.S. population regarding selected socioeconomic and household characteristics. The sample consisted of 135 parent-child dyads, specifically one adult over the age of 18 years and his/her

child, aged 11-14 years per household. Participants were compensated with points that could be used to redeem gift cards; compensation value per dyad was approximately \$8. A maximum of 27 dyads per income level was set to reach a representative sample across household incomes. Parent and child participants provided informed consent and assent, respectively. The parent first completed informed consent by answering affirmatively to a consent statement presented as part of the online survey. Each parent then completed their portion of the survey. Next, the child completed informed assent by answering affirmatively to an assent statement and then proceeding to the child portion of the survey. A complete response consisted of parent's consent and response to all questions, along with child's assent and response to all questions. The study protocol was reviewed and approved by the Institutional Review Board for the Protection of Human Subjects of the University of Illinois at Urbana-Champaign (IRB #15425).

Measures

The survey instrument was developed using previously validated questionnaires of sociodemographic variables¹⁷, household food security²², household food preparation equipment¹⁰ and attitudes toward food preparation¹⁸⁻²¹. Each parent and his/her child responded to questions separately, with parents responding first followed by children second. Parents and children were instructed to answer questions separately and independently, without assistance from or influence by each other.

Sociodemographics and Anthropometrics

Sociodemographic characteristics including age, sex, highest education level completed, race, ethnicity, annual household income, assistance programs utilized, household composition

and marital status were asked of adult participants¹⁷. Self-reported height (ft, in) and weight (lbs) were used by investigators to calculate body mass index (BMI; kg/m²) for parents. Self-reported height (ft, in), weight (lbs), age (years) and sex (male=0, female=1) were used by investigators to calculate child BMI z-score (BMI-z)²¹. Five questions pertaining to parenting sense of competency was included²².

Household Food Security

The U.S. Department of Agriculture, Household Food Security Questionnaire²² for households with children under the age of 18 years was completed by parents as part of the survey. The sum of affirmative responses to 18 questions produced the household food security score, with higher scores indicative of lesser food security. Scores were categorized as high (0), marginal (1–2), low (3–7), and very low food security (8–18). Scores of high and marginal food security were classified as “food secure” while low and very-low food security were classified as “food insecure”²⁵.

Food Preparation Equipment

Adult participants marked the presence of 46 common kitchen items, and indicated the frequency of use as: 1=owned but not used within the last 6 months; 2=used less than once a month but within the last 6 months; 3=used once a month; 4=used 2-3 times per month; 5=used once per week; 6=used 2-4 times per week; or 7=used every day. Household items included the 40 pieces of equipment and utensils listed by Appelhans et al.¹⁰, as well as food thermometer, table dishes (i.e., plate and bowl), colander/strainer, liquid measuring cup, stovetop/range and oven.

Food Preparation Equipment Knowledge

Adult and child participants matched the written name of 11 pieces of household food preparation equipment to their corresponding pictures. In addition, nine multiple-choice questions assessed knowledge of the proper use of various items (e.g., Chef's knife with corresponding picture="to chop fruits and vegetables"). Multiple choice questions included the option, "I do not use this item". Correct responses to item identification and item use responses were combined (20 questions) for an overall food preparation equipment knowledge score. Each correct answer was assigned one point, for a knowledge score range of 0-20 points. Responses of "I do not use this item" were assigned 0 points.

Attitudes Toward Food Preparation

Questions pertaining to attitudes toward food preparation were asked to parents and children using a 7-point Likert-type scale with higher scores reflecting more positive attitudes¹⁸. Questions were grouped by category and provided subcategories for Time Savings (4 items), Time Pressure (5 items), Cooking Involvement (10 items), Woman's Task (3 items), Cooking Skills (5 items), Value for Money (6 items), Sociability (3 items), Price (4 items), and Knowledge (Nutrition Misperception, 9 items). Time Savings and Time Pressure were combined for a Time Influence subcategory (9 items). Knowledge was re-phrased to "Nutrition Misperception" to avoid confusion with food preparation equipment knowledge score.

Data Analyses

Descriptive statistics were used to characterize study participants and their use and knowledge of household food preparation items and attitudes toward food preparation.

Relationships between parent response and child response (dyads) for items owned and attitude measures were analyzed with Pearson correlations. Dichotomized variables (food security status, sex and food preparer status) and attitudes were analyzed using independent *t*-tests. Statistical significance was set at $P < 0.01$ for all analyses. Data were analyzed using the Statistical Package for the Social Sciences (version 22.0, 2013, IBM Corp, Armonk, NY, USA).

RESULTS

Of 173 parents who initially opened the survey, 135 dyads completed the entire questionnaire (78.0%). Table 3.1 displays sample characteristics. Parents were primarily non-Hispanic white (80.0%) with at least a bachelor's level education (47.4%). Parents' BMI was comparable to that of the U.S. population, with approximately one-third of U.S. adults identified as obese²³ and 28.9% ($n=39$) of parents in the study classified as obese. Similarly, one-third of U.S. adults are overweight²³; 28.9% ($n=39$) of parents in the study were overweight, based on self-reported heights and weights.

Nearly 70% ($n=94$) of parents reported food security, while roughly 30% ($n=41$) reported food insecurity. Incidence of household food insecurity was higher for survey respondents (30.4%) than in the U.S. population (approximately 14%)²⁵.

Food Preparation Equipment

Households reported owning an average of 37.9 ± 8.0 (mean \pm SD) items. Table 3.2 shows those household food preparation items owned and frequency of use. There was no individual item that was owned by every household. The most commonly owned items included refrigerator ($n=122$), microwave ($n=119$), kitchen plate ($n=109$), oven ($n=109$), sink/dishwasher ($n=109$),

and dishes (n=107). The least commonly owned items included hot plate (n=21), electric grill/griddle (n=43) and specialty machine (n=44). There was a significant difference ($P=0.002$) in the number of food preparation items reported as owned between food secure (39.5 ± 4.6) and food insecure (34.1 ± 5.2) households.

Figure 3.1 illustrates items reported as used by high-income (income>\$125K/year) households. Refrigerator and microwave ovens were used by high-income households on a weekly (daily or 3-4 times per week) basis for 85% and 70% of respondent households, respectively. In contrast, low-income households (income<\$25K/year) used a refrigerator at approximately 75% on a weekly basis, and nearly 90% did not own a hot plate (Figure 3.2). High-income households reported use of food thermometers with lower frequency (<10%, used in the last six months), compared to low-income households (15%, used in the last six months), although this was not statistically significant ($P=0.149$) (Figures 3.3 and 3.4). High-income households reported owning but not using a food thermometer with higher frequency, while low-income households were more likely to not own a food thermometer at all.

Food Preparation Equipment Knowledge

Both parents (10.0 ± 0.6 items) and children (10.7 ± 1.3 items) correctly identified kitchen items with high accuracy (of 11 total items). Food preparation equipment use identification scores were 4.5 ± 2.9 correct responses for children and 7.1 ± 1.7 correct responses for parents (of 9 questions). Correct identification and correct use choices for household food preparation equipment items were not significantly associated with any attitude measures for parents. Children's knowledge and number of household food preparation items owned were positively related, as were parent and child knowledge scores (Table 3.3). Parent and child food preparation

equipment knowledge scores were associated with the attitude subcategory of Sociability (Table 3.4). Item knowledge was also inversely related to Nutrition Misperception score in children.

Attitudes Toward Food Preparation

Responses for parent and child attitudes are displayed in Table 3.3. There were no significant differences between sex and attitude for children or parents, respectively. Parents who identified as the primary food preparer in the home placed value on Cooking Involvement ($P<0.001$) and Sociability ($P=0.001$) as well as had higher self-reported Cooking Skills ($P<0.001$), compared to parents that did not identify as the primary food preparer.

In parents, Nutrition Misperception score was negatively related to Item Use Knowledge and positively related to Cooking Involvement, Woman's Task and Price (Table 3.4A). The strongest relationship was between Value for Money and Sociability in parents ($r=0.573$, $P<0.001$) and Cooking Involvement and self-reported Cooking Skills in children ($r=0.658$, $P<0.001$). Cooking Involvement also was significantly associated with Item Use Knowledge ($r=0.270$, $P<0.001$), Value for Money ($r=0.409$, $P<0.001$), Sociability ($r=0.228$, $P<0.01$) and Price ($r=0.254$, $P<0.01$) in children (Table 3.4B).

Parents and children in food insecure households were more likely to have higher attitudes toward Price of foods. Children in food insecure households had lower knowledge (more Nutrition Misperception), compared to children in food secure households (Table 3.3). Household food security status was associated with more positive attitudes toward Value for Money and Sociability among parents in households that were food secure.

DISCUSSION

Both hypotheses were supported by the results. The hypothesis pertaining to socioeconomic characteristics influencing the number of correct food items was supported by these data, as food insecure households reported owning fewer items than households classified as food secure. The association between parent and child attitude was supported in each subcategory, except for Cooking Involvement.

The positive relationship between number of food preparation items available in the household and income was previously reported by Appelhans et al.¹⁰ who also found that households with higher income had more items than households with lower income. Presence of equipment within the household is similar to that of other studies that focused on specific low-income populations including rural, urban and suburban residences^{10,11}.

Similarly both studies^{10,11} found similar associations between household food security status and caregiver attitude towards cooking. In the current study, parent and child attitudes toward food preparation were significantly associated in all but one subcategory, suggesting that parent/guardian attitudes are similarly reported by their 11-14 year-old children⁵. The age at which such attitudes are observed, learned or otherwise manifested remains unclear. Adult values of time and value for money as influences were similarly supported by a Canadian report²⁶.

Several limitations existed for the current study. The overall response rate for this survey was lower than desired; however, it was not outside the acceptable scope for electronic survey panel studies and mailed surveys²⁷. The use of a survey panel limited the control that the researchers had over key elements of response rate including: invitation design, contact delivery modes, notification reminders and exact incentives^{27,28}. While this survey was not exclusive to food insecure households, generalizability was limited due to the proportion of food insecure

households not being representative of the U.S. population. Generalizability of this sample to larger audiences was limited, due to lack of ethnic diversity among participants. Additional limitations were in the lack of consensus on what food preparation items are essential for healthful meal preparation¹⁴. For example, if a whisk were not present, a fork may serve as a substitute, making the essentiality of a whisk unnecessary^{14,29}. The term “own” may have been perceived as ambiguous for parents and children in rental homes or in households with shared kitchens. For example, a parent that does not own pots and pans for cooking but has access to them through a roommate may not be limited by ownership of pots and pans for household food production. Additionally, a rental unit that includes appliances such as a refrigerator, stovetop, oven and microwave, provides the occupant with access to the equipment, although ownership is not present.

CONCLUSIONS

The number of unique household food preparation items is associated with sociodemographic factors including income and household food security status. Influence of parental attitudes toward cooking on their child appears to be present in early adolescence in nearly all subcategories of attitudes, supporting the hypothesis of youth and parent attitude association at age 11-14 years. Food preparation items available in the household related to child’s food preparation item use knowledge, but this was not associated with any attitudes in parents or children.

TABLES AND FIGURES

Table 3.1. Sample characteristics of survey respondents

Characteristic	Parents (n=135) n (%)	Children (n=135) n (%)
Sex		
Male	42 (31.1)	61 (45.2)
Female	93 (68.9)	74 (54.8)
Race/Ethnicity		
Non-Hispanic White	108 (80.0)	108 (80.0)
Non-Hispanic Black	16 (11.9)	13 (9.6)
Latino(a)	7 (5.2)	6 (4.4)
Other	3 (2.2)	4 (3.0)
Multiple	1 (0.7)	4 (3.0)
Composition Classification		
Underweight	8 (5.9)	2 (1.5)
Normal	49 (36.3)	65 (48.1)
Overweight	39 (28.9)	48 (35.6)
Obese	39 (28.9)	20 (14.8)
Body Mass Index (kg/m²)	27.8 ± 8.1 ^a	---
Body Mass Index z-score	---	0.88 ± 1.1 ^a
Annual Income		
>\$25,000	19 (14.1)	---
\$25,000 to \$49,999	25 (18.5)	---
\$50,000 to \$74,999	25 (18.5)	---
\$75,000 to \$99,999	19 (14.1)	---
\$100,000 to \$124,999	23 (17.0)	---
\$125,000 to \$149,999	12 (8.9)	---
\$150,000 or more	12 (8.9)	---
Household Food Security Level		
High Food Security	71 (52.6)	---
Marginal Food Security	23 (17.0)	---
Low Food Security	17 (12.6)	---
Very Low Food Security	24 (17.8)	---
Adult Age		
18-29 years	7 (5.2)	---
30-39 years	38 (28.1)	---
40-49 years	61 (45.2)	---
50-59 years	27 (20.0)	---
60-69 years	2 (1.5)	---
Adult Education Level		
Some High School	3 (2.2)	---
High School/G.E.D.	27 (20.0)	---
Some College	27 (20.0)	---

Table 3.1. Sample characteristics of survey respondents (*cont.*)

Characteristic	Parents (n=135) n (%)	Children (n=135) n (%)
Associates/Technical	14 (10.4)	---
Bachelors	47 (34.8)	---
Post-Graduate/Professional	17 (12.6)	---
Marital Status		
Married	102 (75.6)	---
Domestic Partnership	8 (5.9)	---
Divorced	10 (7.4)	---
Separated	1 (0.7)	---
Single	14 (10.4)	---
Assistance Programs		
SNAP ^b	24 (17.8)	---
WIC ^c	8 (5.9)	---
NSLP ^d	34 (25.2)	---

^a Mean \pm SD

^b Supplemental Nutrition Assistance Program

^c Special Supplemental Nutrition Program for Women, Infants and Children

^d National School Lunch Program

Table 3.2. Household food preparation equipment availability and frequency of item usage

Item	Own	Use Mean (SD)	Frequency Measure ^a						
			1	2	3	4	5	6	7
Baking Pan	95	2.1 (1.6)	43	34	0	7	4	6	1
Baking Sheet	91	2.3 (1.6)	37	34	1	8	3	6	2
Blender	83	1.9 (1.5)	48	24	1	2	1	5	2
Can Opener	106	3.0 (2.0)	26	40	3	4	11	18	4
Colander	87	2.1 (1.6)	40	33	0	1	5	6	2
Cookbook	79	1.7 (1.4)	52	17	2	0	5	1	2
Crockpot	85	1.4 (0.9)	62	18	2	2	0	0	1
Cutting Board	95	2.4 (1.8)	36	38	2	2	4	9	4
Dishes	107	4.8 (2.5)	4	42	0	0	0	4	57
Electric Grill/Griddle	43	1.5 (1.1)	29	11	1	0	0	2	0
Electric Mixer	77	1.7 (1.4)	50	18	1	1	3	2	2
Food Processor	48	1.4 (1.0)	37	9	0	0	1	1	0
Food Thermometer	56	1.4 (1.0)	43	11	0	0	1	0	1
Freezer	105	3.9 (2.3)	6	50	1	2	5	18	23
Grater	71	1.9 (1.5)	40	19	3	3	2	1	3
Grill	90	1.3 (0.9)	72	14	1	1	1	0	1
Hot Plate	21	1.5 (1.1)	14	6	0	0	0	1	0
Kitchen Plate	109	4.4 (2.5)	5	48	0	0	1	7	48
Knife Set	92	2.9 (2.1)	26	40	0	0	5	15	6
Ladle	66	1.8 (1.4)	37	22	0	1	2	3	1
Large Pot	100	1.8 (1.5)	62	27	1	1	2	4	3
Liquid Measuring Cup	83	2.4 (1.7)	30	36	1	1	6	6	3
Measuring Cup	100	2.4 (1.8)	37	40	1	7	2	10	3
Measuring Spoon	92	2.0 (1.5)	47	30	1	3	6	4	1
Microwave	119	5.2 (2.1)	2	30	0	4	5	31	47
Mixing Bowls	88	2.4 (1.8)	36	32	2	4	4	5	5
Mixing Spoon	94	2.5 (1.9)	36	37	0	3	3	10	5
Oven	109	2.8 (2.0)	30	44	3	3	9	15	5
Oven Mitt	99	3.0 (2.1)	21	44	3	4	2	18	7
Peeler	84	2.1 (1.7)	41	29	0	4	2	3	5
Potato Masher	53	1.8 (1.5)	31	16	0	2	1	1	2
Refrigerator	122	6.2 (1.7)	0	17	0	0	1	6	98
Rolling Pin	79	1.5 (1.1)	55	19	1	2	0	0	2
Saucepan	92	2.6 (2.0)	31	39	0	2	4	10	6
Sink/Dishwasher	109	4.5 (2.4)	6	42	0	0	6	14	41
Skillet/Wok	92	2.3 (1.8)	37	37	0	3	4	7	4
Spatula	94	2.5 (1.8)	30	42	2	1	5	11	3
Specialty Machine	44	1.8 (1.2)	23	16	2	1	1	0	1
Spice Rack	53	2.3 (1.8)	22	22	0	2	0	3	4
Storage Container	92	3.1 (2.2)	18	44	0	2	4	13	11
Stove/Range	105	3.3 (2.2)	18	42	2	3	12	18	10
Toaster	103	4.0 (2.1)	8	39	1	5	7	31	12
Toaster Oven	67	1.8 (2.0)	21	31	0	0	3	9	3
Tongs	79	2.0 (1.6)	38	30	0	1	2	7	1
Waffle Iron	52	1.6 (1.3)	35	12	1	1	1	0	2

Table 3.2. Household food preparation equipment availability and frequency of item usage (*cont.*)

<u>Item</u>	<u>Own</u>	<u>Use</u> Mean (SD)	<u>Frequency Measure</u> ^a						
Whisk	82	1.9 (1.5)	49	22	1	1	2	6	1

^a Item Use Frequency Measures; 1=Owned but not used in the last 6 months; 2=Used less than once per month; 3=Used once per month; 4=Used 2-3 times per month; 5=Used once per week; 6=Used 2-4 times per week; 7=Used everyday

Figure 3.1. Equipment item usage in high-income (>\$125k/year) households (n=24)

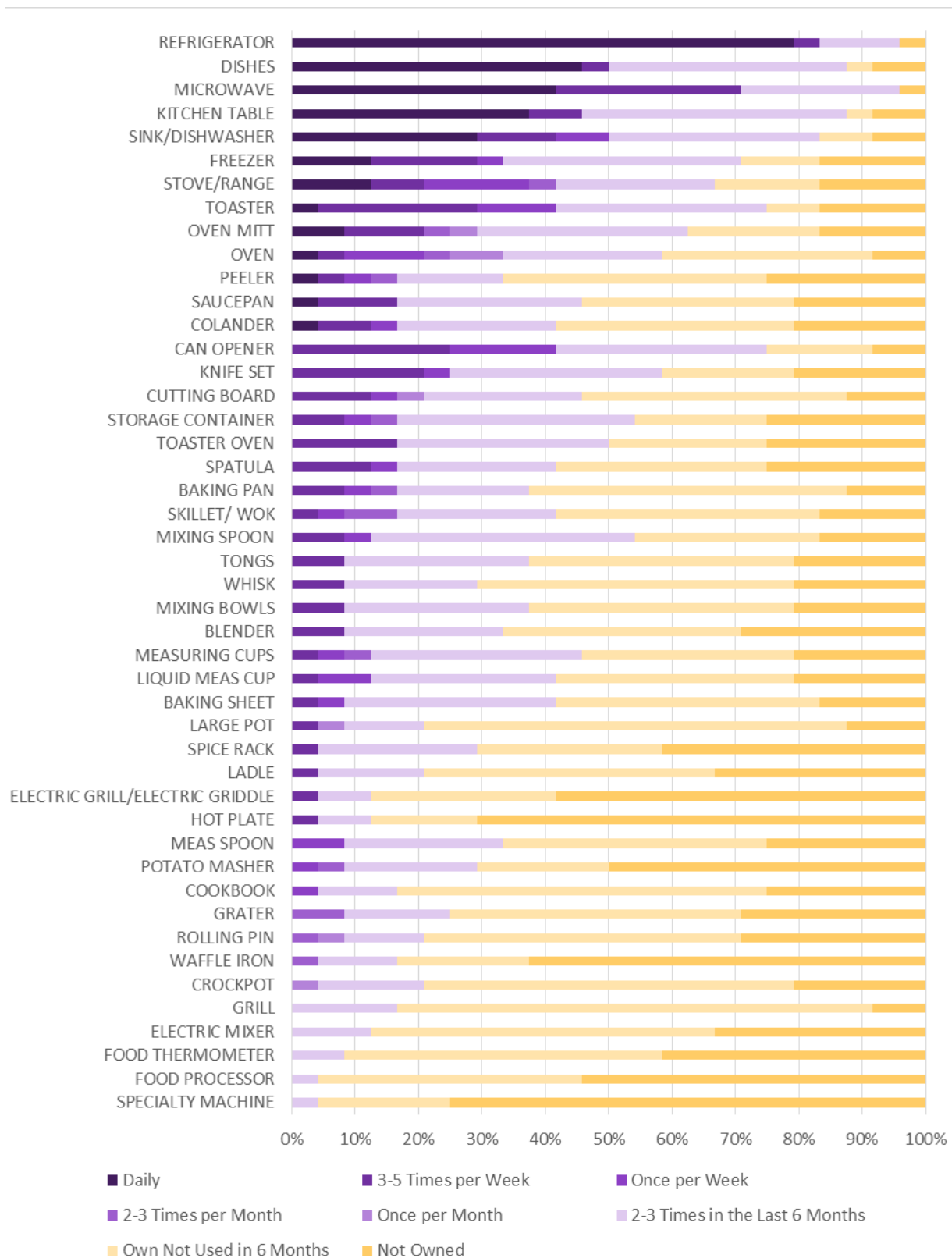


Figure 3.2. Equipment item usage in low-income (<\$25k/year) households (n=19)

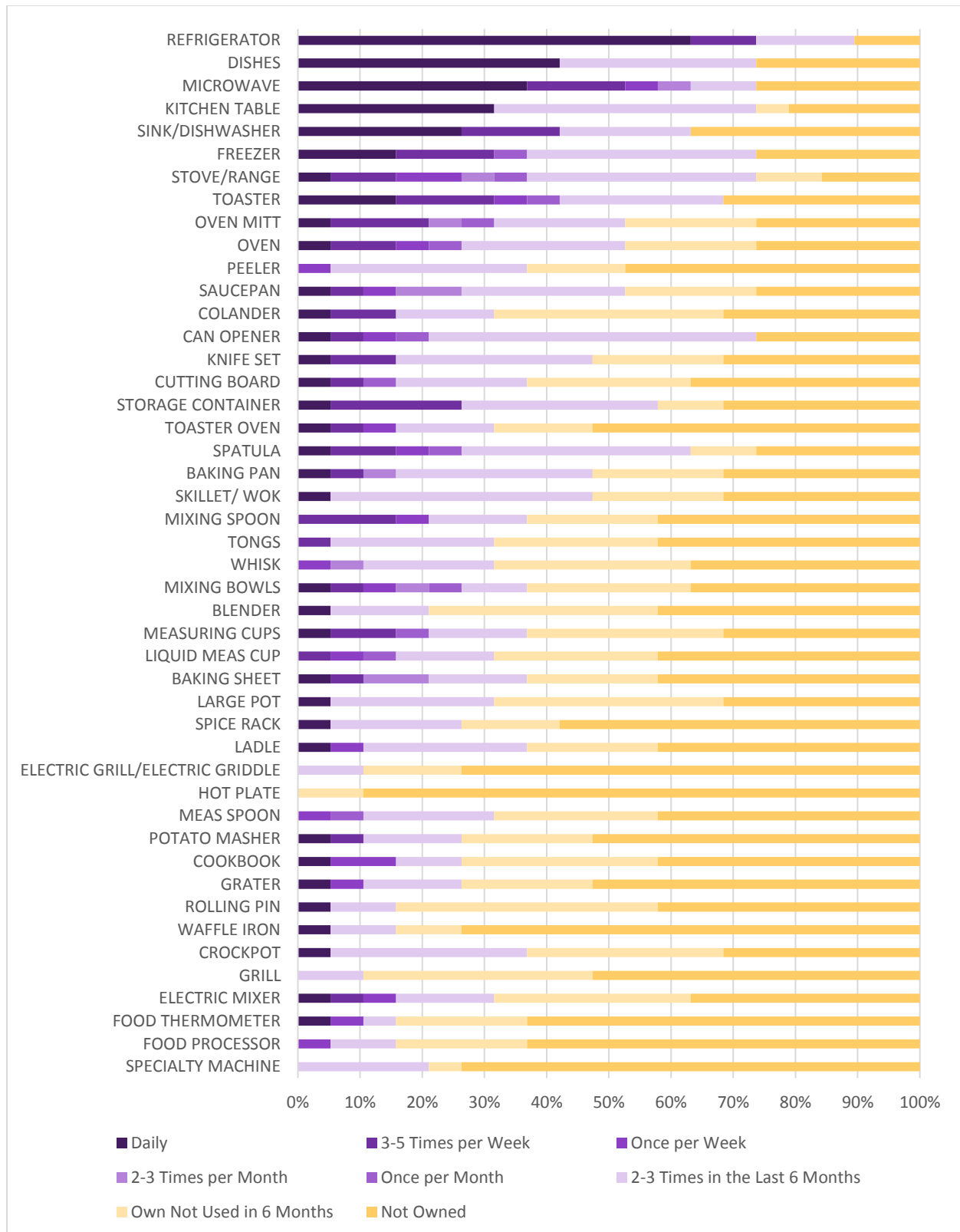


Figure 3.3. Equipment items of interest in high-income (>\$125/year) households (n=24)

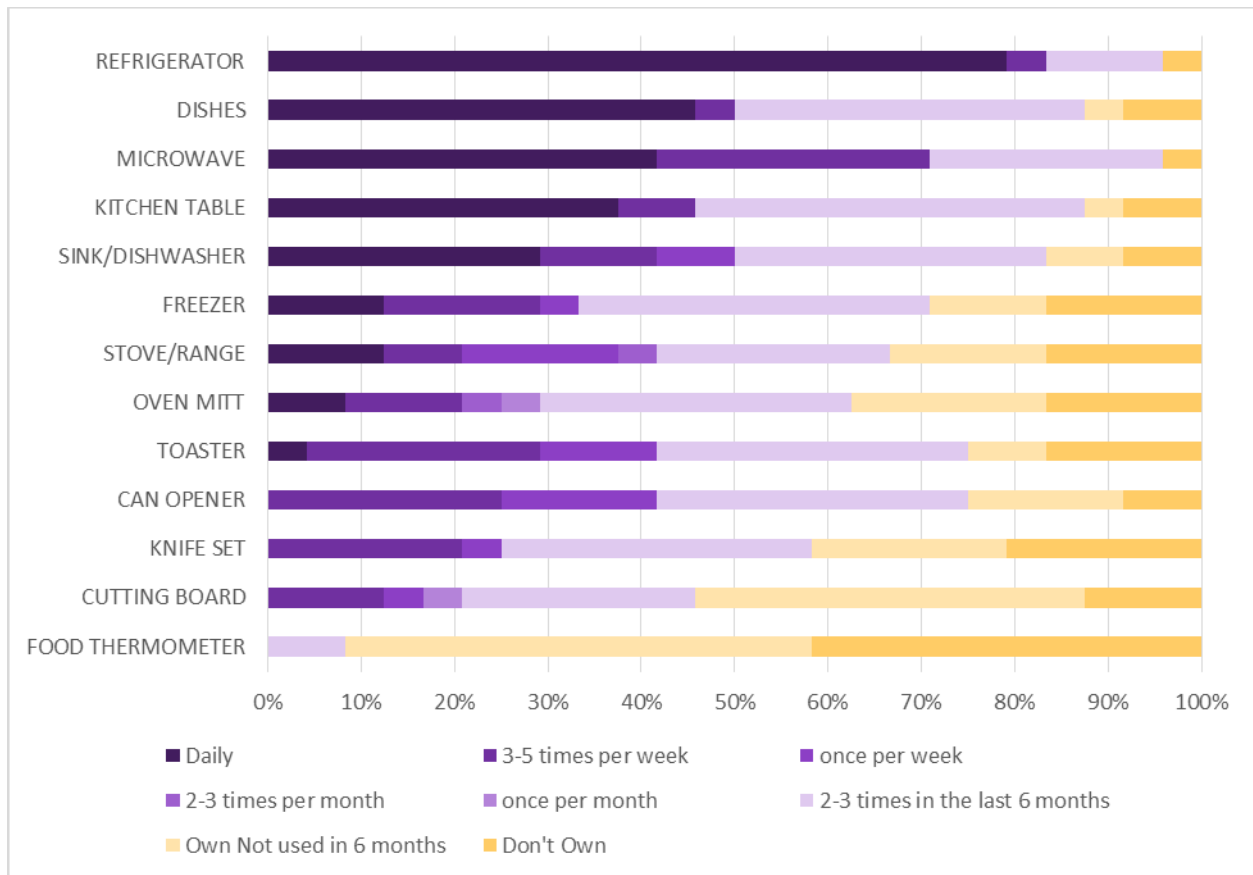


Figure 3.4. Equipment items of interest in low-income (<\$25k/year) households (n=19)

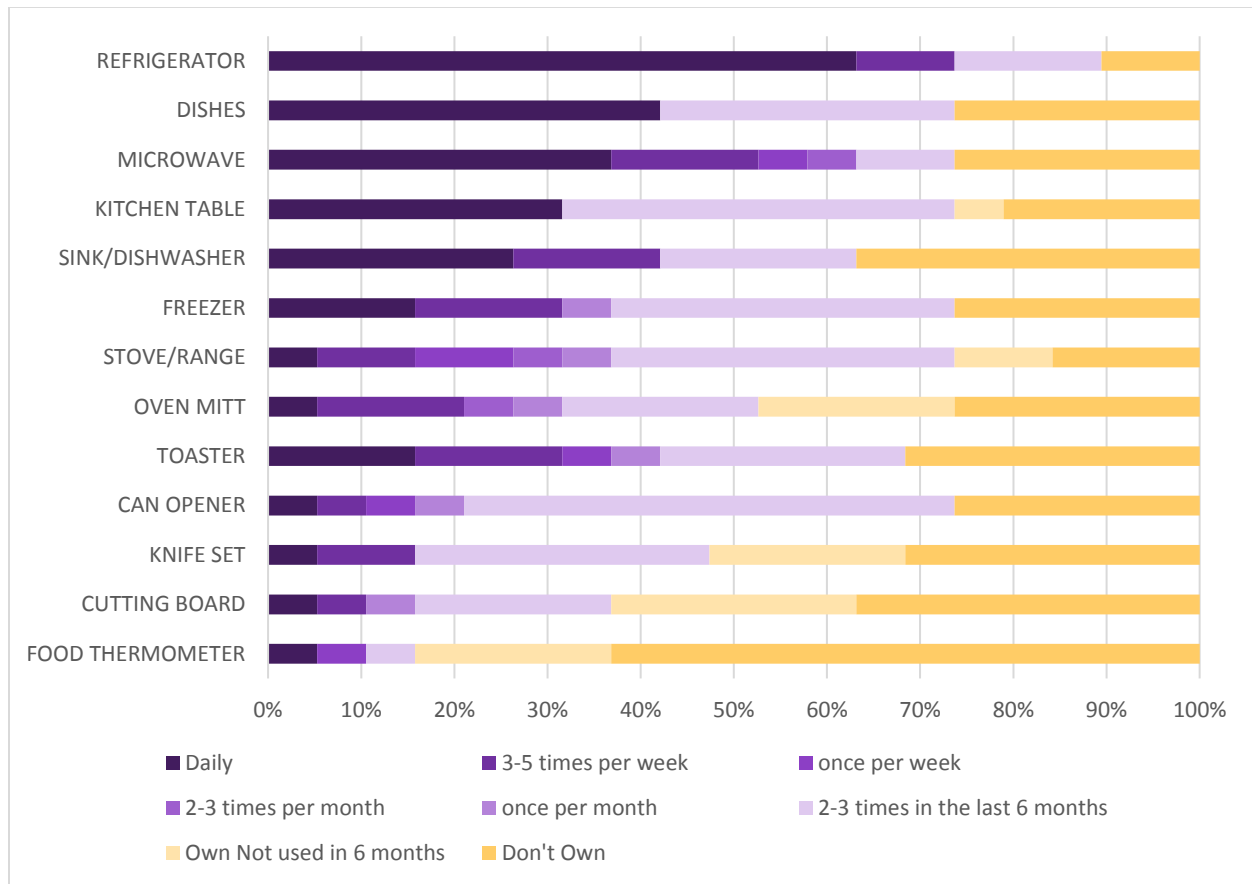


Table 3.3. Relationships between parent-child dyads in attitudes toward food preparation and between attitudes and food security status, items owned and food preparer status

Attitudes Toward Food Preparation (Number of statements: possible score)	Parent Mean (SD)	Child Mean (SD)	Correlation	Items Owned		Food Security Status ^a		Food Preparer Status ^a
				Parent	Child	Parents	Child	
Time Influence (9:63)	33.9 (9.9)	33.9 (10.5)	0.350 P<0.001	-0.008 P=0.926	-0.008 P=0.926	P=0.018	P=0.017	P=0.880
Cooking Involvement (10:70)	46.6 (17.9)	34.0 (17.0)	0.209 P=0.015	0.057 P=0.511	0.068 P=0.432	P=0.221	P=0.946	P<0.001 [^]
Woman's Task (3:21)	9.6 (4.5)	10.7 (1.3)	0.395 P<0.001	-0.054 P=0.530	-0.058 P=0.508	P=0.141	P=0.260	P=0.626
Value for Money (6:42)	35.3 (6.7)	22.7 (8.6)	0.273 P=0.001	0.117 P=0.176	0.067 P=0.440	P=0.002 [†]	P=0.070	P=0.025
Cooking Skills (5:35)	26.2 (8.3)	12.9 (9.0)	0.500 P<0.001	0.145 P=0.094	0.032 P=0.715	P=0.295	P=0.628	P<0.001 [^]
Sociability (3:21)	17.9 (3.4)	16.7 (3.6)	0.476 P<0.001	0.097 P=0.261	0.0139 P=0.109	P=0.007 [†]	P=0.010	P=0.001 [^]
Price (4:28)	18.5 (5.4)	15.4 (5.5)	0.505 P<0.001	0.029 P=0.742	0.012 P=0.886	P=0.001*	P=0.008*	P=0.053
Nutrition Misperception (9:63)	29.6 (12.0)	32.3 (11.1)	0.400 P<0.001	-0.004 P=0.959	-0.132 P=0.126	P=0.015	P=0.004 [†]	P=0.208
Item Use Knowledge (20:20)	18.0 (1.9)	15.2 (3.3)	0.362 P<0.001	0.064 P=0.460	0.245 P=0.004	P=0.819	P=0.328	P=0.313
Parenting Sense of Competency (5:20)	8.2 (2.5)	----	----	0.029 P=0.742	----	P=0.569	----	P=0.608

[†] Attitude significantly greater for food secure households

* Attitude significantly greater for food insecure households

[^] Attitude significantly greater for food preparer compared to non-preparer

^a *t*-test association value

Table 3.4. Bivariate relationships for parent (A) and child (B) attitudes toward home meal preparation

3.4A. Parents	Item Use Knowledge	Time Influence	Cooking Involvement	Woman's Task	Cooking Skills	Value for Money	Sociability	Price	Knowledge (Nutrition Misperception)	Parenting Sense of Competency
Item Use Knowledge										
Time Influence	-0.076									
Cooking Involvement	0.089	-0.161								
Woman's Task	0.016	0.147	0.031							
Cooking Skills	0.134	-0.286*	0.528**	-0.017						
Value for Money	0.073	-0.025	0.319**	0.025	0.443**					
Sociability	0.242*	-0.072	0.297**	-0.140	0.500**	0.573**				
Price	-0.023	0.186	0.119	0.137	0.210*	0.261*	0.212			
Nutrition Misperception	-0.346**	0.205	0.256*	0.249*	0.096	0.034	-0.010	0.320**		
Parenting Sense of Competency	0.100	0.232*	-0.119	0.014	-0.128	-0.206	-0.186	0.053	0.092	

3.4B. Children	Item Use Knowledge	Time Influence	Cooking Involvement	Woman's Task	Cooking Skills	Value for Money	Sociability	Price	Knowledge (Nutrition Misperception)
Item Use Knowledge									
Time Influence	-0.057								
Cooking Involvement	0.270**	0.105							
Woman's Task	-0.160	0.156	0.022						
Cooking Skills	0.104	0.054	0.658**	0.119					
Value for Money	0.186	0.183	0.409**	-0.062	0.407**				
Sociability	0.427**	0.050	0.228*	-0.090	0.025	0.246*			
Price	0.122	0.258*	0.254*	0.168	0.264*	0.404**	0.124		
Nutrition Misperception	-0.081	0.360**	0.100	0.274**	0.106	0.247*	-0.073	0.421**	

*P<0.01

**P<0.001

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CHAPTER 4: Peer-Led Culinary Skills Intervention: Impacts on Knowledge, Attitude and Self-Efficacy towards Culinary Skills in Adolescents¹

ABSTRACT

Objective: To assess the impact and feasibility of a culinary skills intervention led by peer-educators compared to adult-educators in adolescents.

Design: Adolescents randomized to peer-educator (n=22) or adult-educator (n=20) groups. Participants attended two, 2-hour culinary skills lessons.

Setting: University classroom with kitchen units and tables for demonstrations and activity-based discussions.

Participants: Adolescents, aged 11-14 years, from the Champaign-Urbana, Illinois, area.

Intervention: Two culinary skills lessons addressing knife skills, cooking methods and following recipes, along with food tastings.

Main Outcome Measures: Knowledge, attitude and self-efficacy measures were taken pre-lesson, post-lesson, 3-months post-lesson and 6-months post-lesson. Fidelity checklists were used to assess feasibility of program delivery.

Analysis: Descriptive statistics characterized all measures. Independent *t*-tests assessed baseline differences between groups and between sessions within each group. Differences within and between groups over time were assessed using analysis of variance (ANOVA).

Results: All adolescents (N=42) increased scores in knowledge [3.7 ± 2.6 points (mean \pm SD), $P < 0.001$] and attitudes (0.8 ± 4.5 , $P < 0.05$) of culinary skills and in cooking (2.6 ± 5.3 , $P < 0.001$)

¹ To be submitted to the Journal of Nutrition Education and Behavior

and cooking method self-efficacy (1.7 ± 4.6 , $P < 0.01$) immediately following the intervention. Peer- and adult-educators were equally able to deliver the intervention.

Conclusions and Implications: A culinary skills program can impact knowledge and self-efficacy and can be led by peers or adults.

INTRODUCTION

Poor dietary intake has been identified as a potential risky behavior in adolescent youths^{1,2}. Adolescents have also been found to select foods based on visual appeal without consideration of nutritional value³. Recent federal position statements suggest culinary skills knowledge and utilization contribute to dietary quality and may serve as one tool in the fight against obesity⁴⁻⁶. Additionally, culinary skills education within public schools has decreased in recent decades leaving a noticeable skills gap⁷⁻⁹. Numerous education programs addressing culinary skills have been implemented, yet few have collected and reported any measurable outcomes, and even fewer measured outcomes beyond the conclusion of the intervention¹⁰⁻³¹. Of those with recorded and published outcomes, culinary skills interventions have been linked to increased intake of fruits and vegetables, but little evidence exists on the longevity of such behavioral change^{11,12,16,27}. Change in culinary skills knowledge is the most commonly reported measure of culinary-based interventions^{10,13,14,16,21,29}. Increases in knowledge and cooking skills self-efficacy, among other factors, have been connected to the foods that adolescents select³². There is also a lack of evidence linking dose of culinary skills education to behavioral change and maintenance of any change.

Peer-education as an education strategy for community-based programming has been in place for decades through various extension programs³³⁻³⁵. It has been suggested that peer

leaders could positively impact adolescent attitudes and behaviors following culinary skills lessons⁸. The feasibility and acceptability of culinary skills nutrition education by means of peer leaders has not been formally evaluated in adolescent populations.

The purpose of this study was to test the impact and feasibility of two culinary skills lessons for adolescents on knowledge, attitude and self-efficacy. Researchers hypothesized that peer educators would lead lessons as well as adult educators, with similar participant outcome measures (knowledge, attitude and self-efficacy) and process observations.

METHODS

Curriculum Fidelity Testing and Modification

The culinary skills lessons were developed using the Social Cognitive Theory (SCT) and Theory of Experiential Learning (TEL). Each session consisted of two sequential lessons. Sessions were led by a peer- or adult-educator. Lessons were designed to be approximately two hours in length while teaching the topics of knife skills, cooking methods and following recipes related to fruits and vegetables³⁶. The intention behind the culinary skills lessons was to provide a hands-on fruit and vegetable preparation application that could serve as a stand-alone program as well as contribute to a multi-lesson after school nutrition program about weight steadiness. The culinary skills lessons were two of twelve lessons with the base eight lessons previously established³⁷. Both culinary skills lessons were reviewed by eight content experts and fidelity tested with seven female adolescents led by one adult with focus group follow-up to complete the preliminary pilot test³⁶.

Each lesson included pre-test measures, instruction, hands-on practice, review, time for participants to ask questions and post-test measures. The instructional portion of each lesson

included activity-based discussions with educational handouts and leader demonstration. Lesson one (*Culinary Skills*) focused on knife skills including knife safety, knife selection and knife use as well as cooking methods. Lesson two (*Culinary Skills in Action*) focused on hands-on knife skills and recipe following with review activities to reinforce concepts covered in the *Culinary Skills* lesson.

Lessons were modified from the fidelity testing based on process observation checklist comments and themes reflected from participant focus group session in the preliminary lesson testing³⁶. Lesson time was lengthened to 2.5 hours as some activities were noted to not be completed due to limited time³⁶. Three hours were allotted for each lesson to account for all activities and collection of pre- and post-tests. Pre- and post-tests were not collected on the initial seven participants³⁶; the time increase also was made to allow ample time for participants to complete measures in the allotted time. Activities in the *Culinary Skills* lesson that were modified during fidelity testing due to limited time included omitting the stir-frying food preparation demonstration and omitting the opportunity for students to have hands-on experience with knives³⁶. Demonstrations were modified to eliminate those that were of concerning safety for leaders, specifically peeling and cutting raw butternut squash³⁶. Modifications were also made to include an opportunity for adolescent participants to receive individualized feedback on knife holding while dicing a slice of pineapple. The individualized feedback was added to reinforce knife safety and to correct adolescent participant knife use as needed. Additional knife skills practice was incorporated in *Culinary Skills in Action* to allow youth participants the opportunity to further refine such skills. Food preparation equipment was an additional barrier in the fidelity testing as a steamer pot was not available³⁶. For the pilot test, a saucepan was used with a small amount of water in the bottom with explanation that specialty equipment is not

required for steaming broccoli. Handouts were modified to include interactive blanks for adolescents to fill in during the lesson and included additional graphics (Figure 4.1). The cooking methods handout was modified to include images of the equipment used in each method. Physical activity was not initially included in the *Culinary Skills* lesson in the fidelity testing due to limited time. The physical activity section in *Culinary Skills in Action* was modified to include a short team relay competition due to initial participant requests for jumping obstacles and fitness competitions³⁶. Lesson objectives previously established by Nelson³⁶ remained unchanged and included:

- (1) “Using different cutting methods to cut fruits and vegetables;
- (2) Practicing food safety principles;
- (3) Using different cooking methods to cook fruits and vegetables;
- (4) Executing fruit and vegetable recipes.”³⁶ (p. 132)

Within the TEL, Culinary Skills focused primarily on the constructs of Reflective Observation and Concrete Experience as participants had the opportunity to watch demonstrations and practice cutting methods while receiving individualized feedback³⁷. *Culinary Skills in Action* focused on the constructs of Active Experimentation when participants prepared recipes in small groups and Abstract Conceptualization as each topic was reviewed with group discussion or games³⁸.

Self-efficacy was the primary SCT construct reinforced by lesson content and activities³⁶. Within the dimension of self-efficacy, magnitude and strength were emphasized with limited regard to generality. Magnitude was referred to as the difficulty level of a certain task, while Strength referred to the individual’s perceived ability to perform a set task, and Generality referred to the generalizability of the given task³⁹.

Setting

All sessions were held in a university classroom with tables for lecture and demonstrations as well as several small kitchen units each of which included an oven with range, sink, measuring cups, mixing bowls, skillets and other kitchen utensils. The classroom setting allowed for participants to work in small groups in the kitchen units while also having space to sit around a table to watch demonstrations and participate in review discussions and games. The physical activity portion of the lessons was conducted outdoors as weather permitted, adjustments to outdoor games were made for inclement weather and used as needed.

Educators

Peer-educators and adult-educators were recruited through electronic mailings describing an opportunity to lead culinary skills lessons for 11-14 year-olds, covering the topics of basic knife skills, cooking methods and following recipes. Eligible peer-educators, aged 14-15 years, and adult-educators aged >25 years expressed interest and were screened for availability. Prospective leaders were excluded if they had received professional culinary training as the lessons were designed for a lay community leader. Educators successfully completed a background check and attended a 3-hour training before leading the lessons. Training addressed all technical components of lessons, kitchen familiarization, and group discussion of presentation methods including interactive demonstrations, pausing to ask for questions and addressing participant safety (Figure 4.2). Educators were compensated with gift certificates of \$50 for training and \$45 per lesson led. No measures were collected from educators.

Participants and Recruitment

In late spring and summer 2015, adolescents in 6th and 7th grades or 11-14 years of age who were interested in learning about culinary skills were recruited from the Champaign-Urbana, Illinois area. Individuals were reached through electronic mailings and flyers distributed to community sites where youth activities occurred. Each interested youth and his or her parent or guardian attended an informational meeting to learn about the culinary skills lessons. Questions were answered before the parent or guardian and child participant completed the informed written consent and assent form, respectively. Exclusion criteria included adolescents not scheduled to complete 6th or 7th grade in 2015 or not of 11-14 years of age and parent or guardian inability to transport his/her child to the program site. Participants were assigned to groups, peer-educator group (PEG) or adult-educator group (AEG), based on their schedule preferences and availability. Times of PEG and AEG lessons were randomized and included options in the morning, afternoon and evening. All lessons were scheduled during the week; no weekend lessons were offered. Participants received a \$5 gift certificate for each lesson that was completed. Three-month and 6-month post-test data were collected by mail or in person at the preference of the parent or guardian. No additional compensation was provided for these measures. The study protocol was approved by the Institutional Review Board for the Protection of Human Subjects of the University of Illinois at Urbana-Champaign (IRB #15443).

Measures

Adolescents completed measures at four time-points: pre-lesson, post-lesson, 3-months post-lesson and 6-months post-lesson. Measures included questions pertaining to culinary skills knowledge, attitude towards cooking, cooking self-efficacy and cooking methods self-efficacy³⁶.

Demographic data were collected following the collection of parent/guardian consent and youth assent at the informational meeting.

Knowledge was measured using the sum of correct responses to 19 multiple-choice questions (range=0-19 points). Questions focused on the constructs covered within the lessons including knife selection, knife safety, cooking methods and recipe following. Attitude towards cooking was measured using responses from 11 statements on a 5-point Likert scale (range=11-55 points), with higher scores indicating a more positive attitude towards cooking. Cooking self-efficacy was measured using responses from 10 statements on a 5-point Likert scale (range=10-50 points), with higher scores indicating higher self-efficacy towards cooking. Cooking method self-efficacy was measured from responses to 7 statements on a 5-point Likert scale (range=7-35 points), with higher scores indicating higher self-efficacy of the cooking methods discussed. Cooking methods included in the measure corresponded to those covered in the lesson: microwaving, sautéing, steaming, boiling, simmering, baking and stir frying.

Fidelity checklists were completed for each lesson. Checklist items included lesson length, completion of each activity and overall lesson comments. Additional statements included: “leaders asked if participants had any questions”, “leader was familiar with lesson” and “leader was able to keep participants on topic/task”. All checklist items were selected to understand lesson flow and contained “yes” or “no” responses with a column for comments to eliminate observer subjectivity.

Data Analyses

Descriptive statistics were performed on demographic data and measures at each of the four intervention intervals. Demographic data and baseline measures were compared using

independent *t*-tests and chi-square to determine group variance and variance between sessions of the same intervention group. Differences within and between groups over time were assessed using a 2x4 (2 intervention groups x 4 intervals) analysis of variance (ANOVA) with repeated measures on the time factor. In the case that sphericity was violated, the Greenhouse-Geisser correction was used. Data from missing time points was filled using last observation carried forward method⁴⁰. Significance was set at $P < 0.05$. All data analyses were conducted using the Statistical Package for the Social Sciences (SPSS version 22.0, 2013, IBM Corp, Armonk, NY, USA).

RESULTS

Contact was made by 116 parents/guardians of adolescents, with 50 youth-parent pairs attending informational meetings. After 49 completed informed consent and assent, 46 youth attended the first lesson, with 42 completing both lessons. Only measures from adolescents completing both culinary skills lessons were included in analyses. Figure 4.3 depicts participant recruitment and retention from initial contact through 6-month post-lesson testing.

Forty-two adolescents were enrolled, assigned to groups based on schedule availability and completed both culinary skills lessons. There were 22 participants who completed the PEG and 20 participants who completed the AEG. Of the 42 participants that completed both lessons, the racial/ethnic background included non-Hispanic white, $n=24$; Asian, $n=2$; non-Hispanic Black, $n=6$; other including multiracial, $n=10$. There was an equal balance of male, $n=21$, and female, $n=21$ participants. Children in the PEG were not significantly different in age ($n=22$; mean \pm SD, 12.4 ± 1.1 years) from children in the AEG ($n=20$; 11.9 ± 1.0 years) ($P=0.098$). Participant and group demographics are displayed in Table 4.1.

There were two PEG and two AEG to accommodate for all participants while keeping the lesson attendance at a level appropriate for the educational space so all adolescents could actively observe and participate in lesson activities. Lesson attendance ranged from 9-13 participants per lesson.

Measures

There were no significant differences between intervention groups in the measures of knowledge ($P=0.84$), attitude ($P=0.76$), cooking self-efficacy ($P=0.33$) or cooking methods self-efficacy ($P=0.28$) at baseline. There was a significant difference in baseline knowledge score within the PEG between the two sessions ($P=0.04$); however, there were no significant differences observed at post-test, 3-month post-test or 6-month post-test, with any other measures, or between the AEG sessions.

There was a significant effect of time on knowledge ($P<0.001$), culinary skills self-efficacy ($P=0.001$) and cooking methods self-efficacy ($P=0.005$) but not for attitude ($P=0.060$) (Table 4.2). Within the PEG, knowledge was the only measure that was significantly increased from pre-test to post-test; this increase was maintained at 3-month post-test and 6-month post-test (Figure 4.4). The AEG was similar to the PEG for knowledge, but attitude and both self-efficacy measures had significant increases from pre-test to post-test, though these increases were not sustained at 3-month or 6-month post-test (Figures 4.5-7, respectively). Self-efficacy measures for all participants significantly decreased from post-test to 3-month post-test for cooking self-efficacy and from post-test to 6-month post-test for cooking methods self-efficacy. There were no significant group by time interactions for any measures.

Process Observation

Fidelity checklists completed during each of the lessons indicated an average lesson length of 154 ± 11.9 minutes (mean \pm SD) for PEG lessons and 155 ± 15.8 minutes for AEG. Both peer- and adult-educators kept participants on task and completed all planned activities during each of the lessons. Items of concern from the fidelity checklist are summarized in Table 4.3. Process observation checklist comments indicated that peer-educators occasionally had a fast pace when completing worksheets and that their demonstrations were not always easy for all participants to see. Additionally, peer-educators were noted to be more informal when leading the lessons compared to adult-educators. Both peer- and adult-educators incorporated methods of review to reinforce lesson content. While all activities were completed, peer-educators did not always discuss the “why” behind certain correct answers in game activities, while the adult-educators did explain correct answers to participants. Peer-educators were occasionally noted to have briefly used incorrect cutting form while leading some lesson activities.

DISCUSSION

Culinary skills and self-efficacy towards cooking have been shown to influence adolescent selection of food items³². One study suggests that adolescents first select food items based on anticipated taste and not on nutritional value, even when knowledge is present; moreover, by teaching and introducing healthful foods with appealing taste, intake can be altered³. Learning through observation has also been linked to increased self-efficacy when an adult demonstrates a given task⁴¹. Little evidence exists on the link of observational learning and self-efficacy increases when peer-educators demonstrate comparable skills.

Numerous extension and other community-based programs in place do not include mechanisms for formal evaluation; however, the program topics are relevant. Emphasis on fruits and vegetables⁴², basic cooking principles⁴²⁻⁴⁵, knife skills⁴⁶ and direct correlations to classroom learning standards⁴⁶.

Culinary skills programs with evaluations have assessed additional measures including various dietary intake behaviors, in addition to those assessed in this intervention. Of previous program interventions¹⁰⁻³¹, there was only one program³⁰ that included follow-up testing beyond post intervention; 6-month post-test data were collected, but significance level not was reported. Five interventions reported increases in knowledge and included significant¹⁰, unspecified^{14,16} and non-significant¹³ changes compared to baseline. An intervention of approximately five hours is sufficient for significant and sustained increases in knowledge from baseline through 6-months after the intervention. Attitude towards cooking was assessed by three programs^{10,25,29} with no significance levels noted. Increases in self-efficacy from pre-test to post-test were observed in four interventions, with two reporting significant increases^{12,13}, one unspecified increase²⁹ and one non-significant increase¹⁰. The current intervention showed similar mixed results in regards to self-efficacy with overall significant increases in self-efficacy measures from pre-test to post-test; however, these increases were not maintained at 3-month or 6-month post-intervention. Additionally, the focus on simplified equipment and the ability to substitute equipment has been described as an important culinary skill⁴⁹.

The lack of sustained attitude and self-efficacy scores over time could be a result of the length of the intervention or the lack of reinforcement, not measured. Reinforcement could have occurred in the home via parents but was not a measured parameter of this intervention. Further

studies are needed to determine if the lack of sustained increase in attitude and self-efficacy measures could be eliminated with parental reinforcement of skills taught within the lessons.

Peer education not only proved to be feasible but also comparable to that of adult education, supporting that adolescent peer culinary skills education can serve as novel education technique³⁵. The peer-educators may require additional training, beyond three hours, to further understand presentation skills and the technical skills of the lessons. Presentation skills of peer-educators could be enhanced by proper pacing of lessons, explaining correct answers during reviewing types of games and demonstrating so that all participants can see. In regards to technical skills, peer-educators may require additional training primarily centered on knife handling and safety. Additional training would likely further develop the confidence of peers to lead the lessons to their counterparts. It is possible that the peer-educators may have received additional personal or professional development benefits from leading the lessons, but no such measures were collected. Future studies should examine the benefits or perceived benefits of leading culinary skills lessons.

Limitations

Participation was limited to youth with access to the testing site via a parent or guardian, which could have limited adolescents who did not have available transportation. There was no control group within this intervention as the unit of comparison was the mode of education delivery. Lessons held in a university classroom could have impacted the seriousness of participants compared to a community site. In contrast, the lessons being held during the summer likely contributed to a more casual feel than if they had followed a full day of classroom instruction. It is unclear whether the dose of culinary skills education (5 hours), the lack of

reinforcement or a combination of the two was the reason attitude and self-efficacy measures were not sustained over time. One limitation of psychometric data collection includes that of social desirability, particularly in an early adolescent population.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Culinary skills training can impact knowledge and self-efficacy in adolescents. Peers and adults are both capable of leading culinary skills lessons for 11-14 year-olds. Peer-educators may need additional training for specific aspects such as knife safety and presentation skills compared to adult-educators.

TABLES AND FIGURES

Figure 4.1. Cooking methods handout from the *Culinary Skills* lesson

P.A.W.S



Cooking Methods 101



Simmering – The process of cooking in a liquid just _____ the boiling point (100°C)

Boiling – The process of cooking food _____ (100°C)

Steaming – The process of cooking in a _____ container _____ boiling water (100°C)

Stir-frying – The process of cooking in a _____ on _____ heat in a small amount of fat (e.g., oil) while stirring constantly



Sautéing – The process of cooking or browning in a _____ with a small amount of fat (e.g., oil) on _____ heat




Baking – The process of cooking with _____ in an oven





Microwaving – The process of cooking quickly in a _____ with little or no fat (e.g., oil) or water in a _____ microwave-safe dish

Figure 4.2. Sample page from educator's guide

P.A.W.S


Lesson 1: Culinary Skills

Overview of Lesson Activities

	Knives 101 50 min	<ul style="list-style-type: none"> - <u>Knives 101</u> handout p. A2 - Knife Set & cutting board - Peeler - Apple, potato, pepper, orange, squash, pineapple 	<ul style="list-style-type: none"> - Identify the parts of a knife - Demonstrate how to properly hold a knife - Identify and define Chef's, Paring, and Serrated knives - Name the key principles of knife and food safety - Describe the different methods for cutting fruits and vegetables and identify the knife used for each method
Physical Activity 30 min.			
	Cooking Fruits and Veggies 10 35 min.	<ul style="list-style-type: none"> - See supplies with each demonstration - pencils - <u>Cooking Methods 101</u> handout p. A3 	Name different methods for cooking fruits and vegetables
Wrap Up 5 min.			

KEY:





	Game
	Demonstration
	Ask for Questions
	Remember Safety

Figure 4.3. Participant recruitment and retention

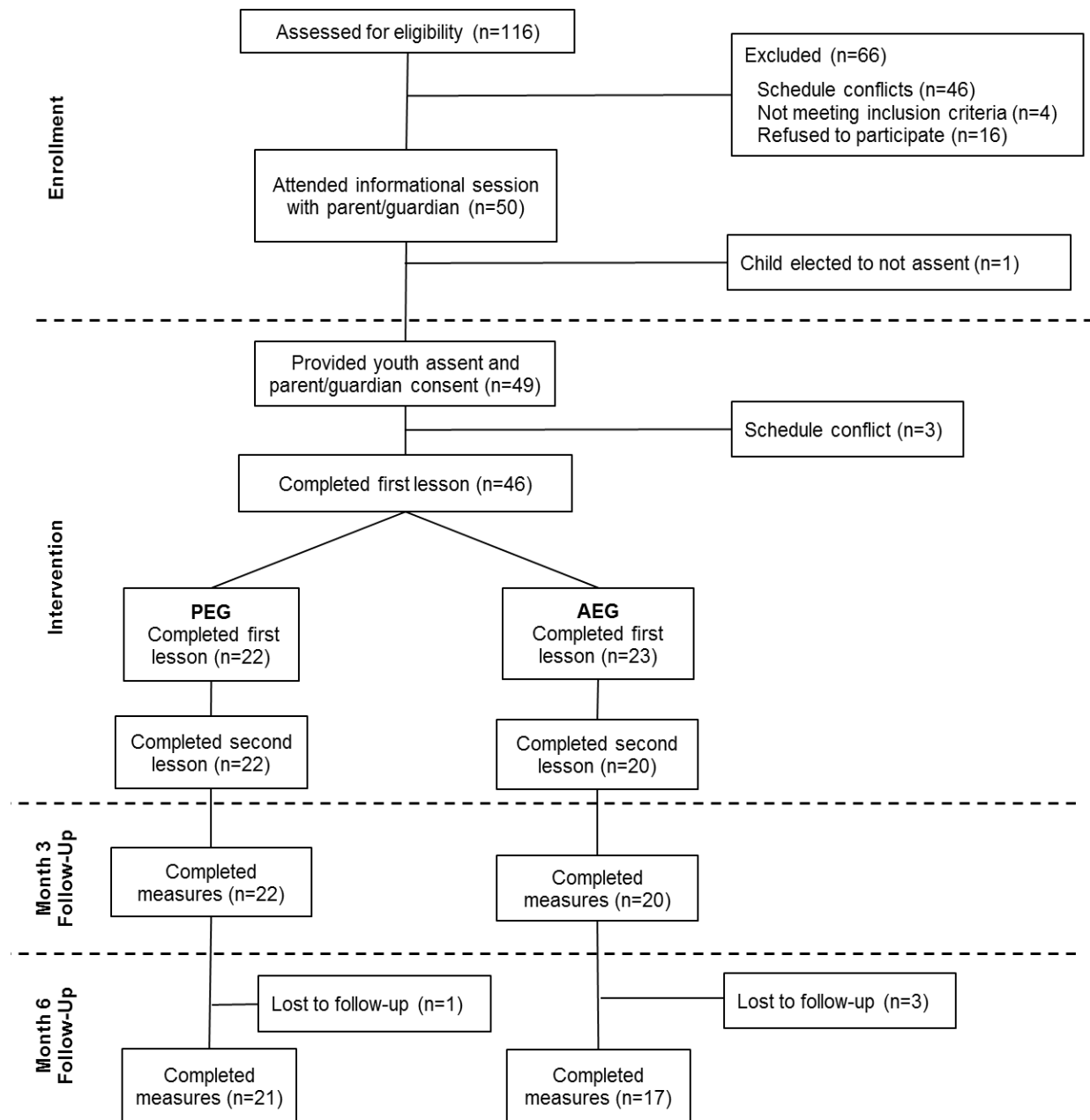


Table 4.1. Demographic characteristics of participants (N=42)

Measure	All Participants (N=42)	PEG (n=22)	AEG (n=20)	Significance
Age ^a (years)	12.1 ± 1.1	12.4 ± 1.1	11.7 ± 0.9	0.10
Gender ^b (female)	21 (50)	12 (55)	9 (45)	0.54
Race ^b (Caucasian)	24 (57)	12 (55)	12 (60)	0.72

^a Displayed as mean±SD, with corresponding P-value

^b Displayed as count(%), with corresponding chi-square significance

Table 4.2. Outcome measures reported as mean (SD)

Variable	Pre	Post	3-Month Post	6-Month Post	P-Value
Knowledge (score range = 0 to 19)					
All (n=42)	12.0 (2.3)	15.7 (2.0) ^a	16.3 (1.6) ^a	16.5 (1.6) ^a	Group = NS
PEG (n=22)	12.1 (2.3) [†]	15.2 (1.9) ^a	15.7 (2.1) ^a	16.3 (1.8) ^a	Time <0.001
AEG (n=20)	11.9 (2.6)	16.2 (2.0) ^a	16.7 (1.5) ^a	16.7 (1.5) ^a	G X T = NS
Attitude (score range = 11 to 55)					
All (n=42)	44.2 (4.2)	45.4 (4.7)	44.5 (5.6)	43.7 (5.3)	Group = NS
PEG (n=22)	43.4 (4.4)	43.8 (4.1)	44.5 (5.3)	43.3 (4.7)	Time = NS
AEG (n=20)	45.2 (4.0)	47.1 (4.7) ^a	44.7(5.9)	44.5 (5.8)	G X T = NS
Cooking Self-Efficacy (score range = 10 to 50)					
All (n=42)	41.8 (5.6)	44.4 (5.1) ^a	42.1 (5.3) ^b	43.3 (5.3)	Group = NS
PEG (n=22)	41.4 (5.0)	43.4 (5.1)	41.9 (5.0)	43.0 (5.9)	Time = 0.001
AEG (n=20)	42.2 (6.3)	45.5 (5.0) ^a	42.2 (5.6)	43.7 (4.9)	G X T = NS
Cooking Methods Self-Efficacy (score range = 7 to 35)					
All (n=42)	28.0 (4.7)	29.7 (4.5) ^a	28.4 (4.3)	27.9 (4.7) ^c	Group = NS
PEG (n=22)	27.8 (5.6)	29.1 (3.3)	28.6 (4.3)	27.2 (5.2)	Time = 0.005
AEG (n=20)	28.2 (4.9)	30.5 (4.4) ^a	28.7 (4.5)	28.2 (4.2)	G X T = NS

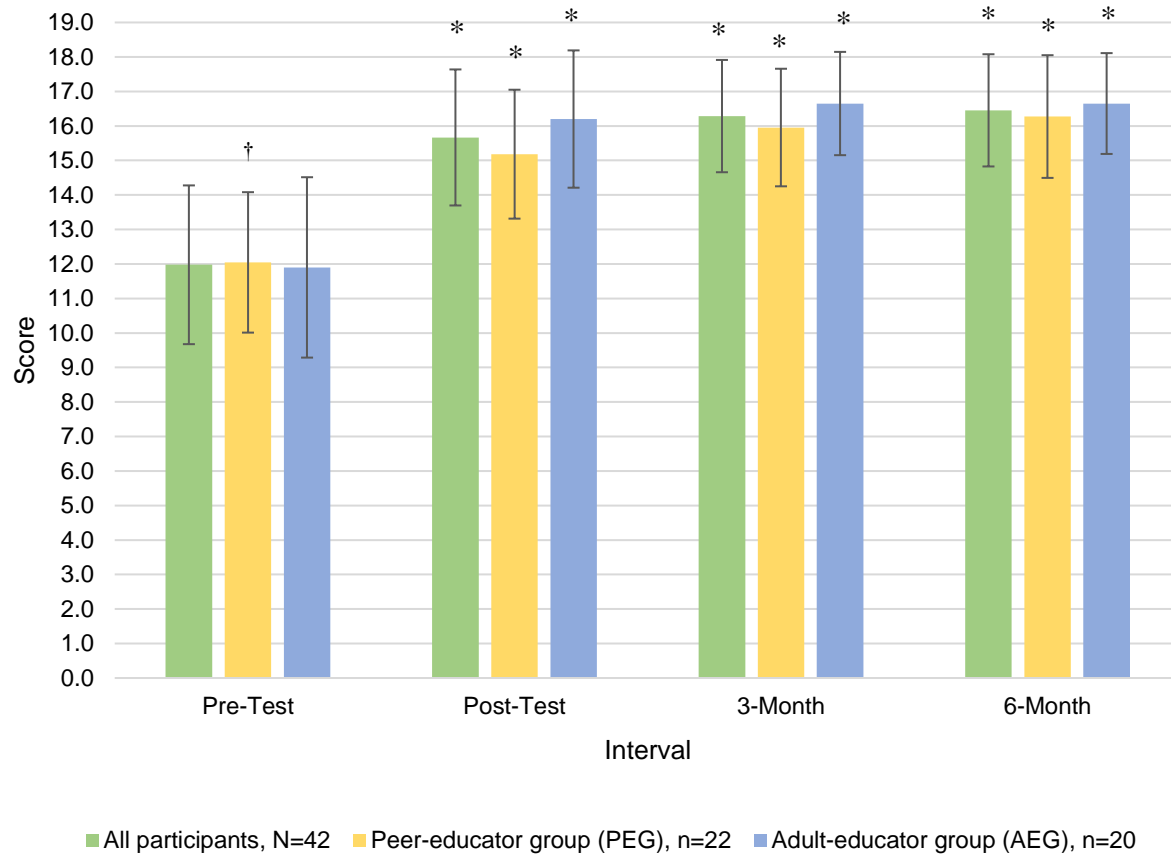
^a P<0.001 increase from pre-test

^b P<0.05 decrease post-test to month-3

^c P<0.01 decrease post-test to month-6

[†] P<0.05 between session of the same group at baseline

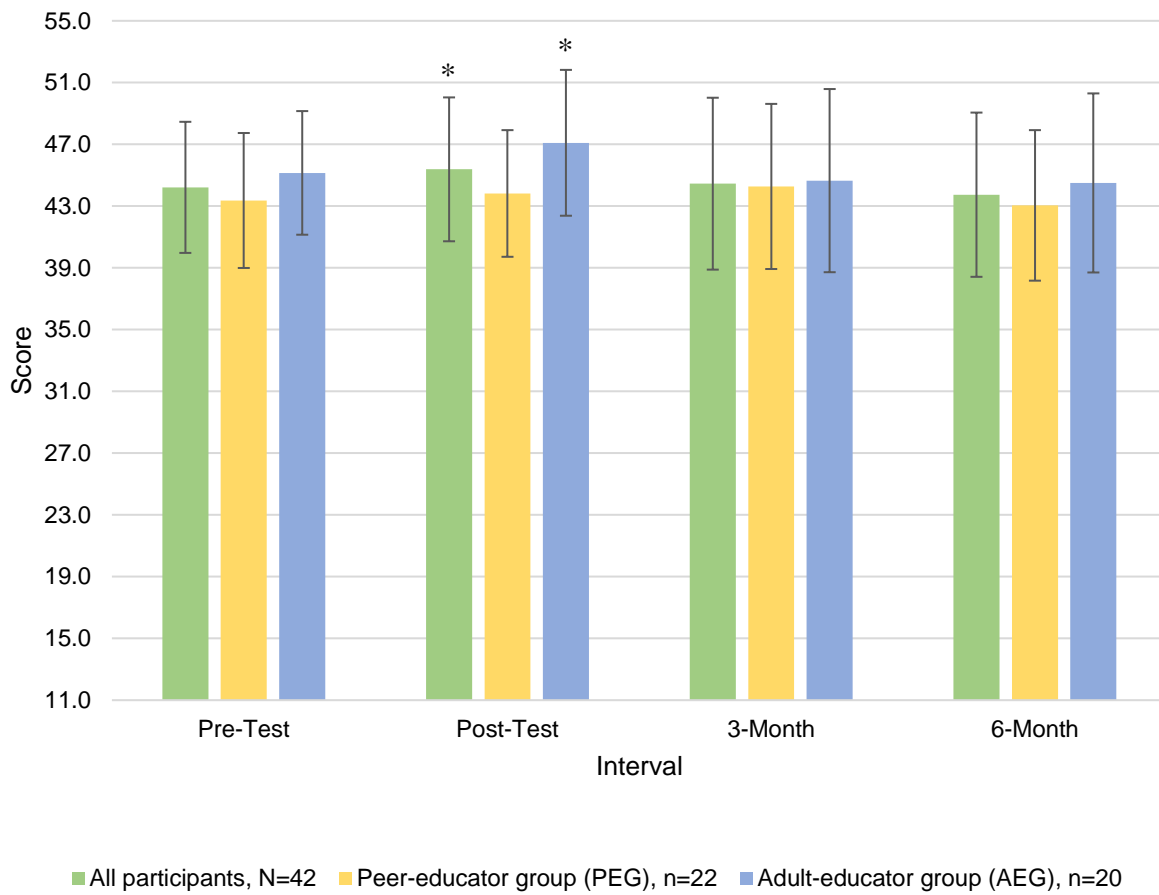
Figure 4.4. Participant knowledge scores at pre-test, post-test, 3-month and 6-month by intervention group



* $P < 0.001$ increase from pre-test

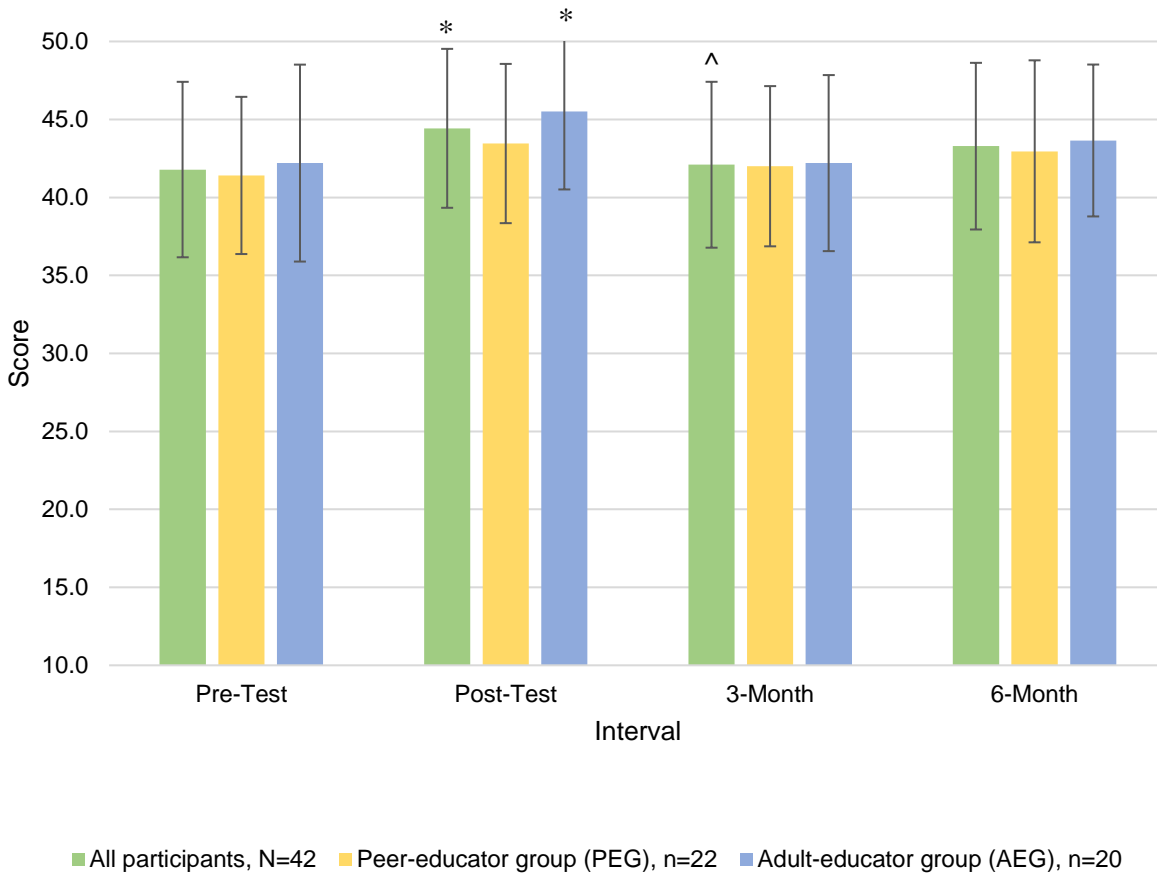
† $P < 0.05$ between session of the same group at baseline

Figure 4.5. Participant attitude scores at pre-test, post-test, 3-month and 6-month by intervention group



* $P < 0.05$ increase from pre-test

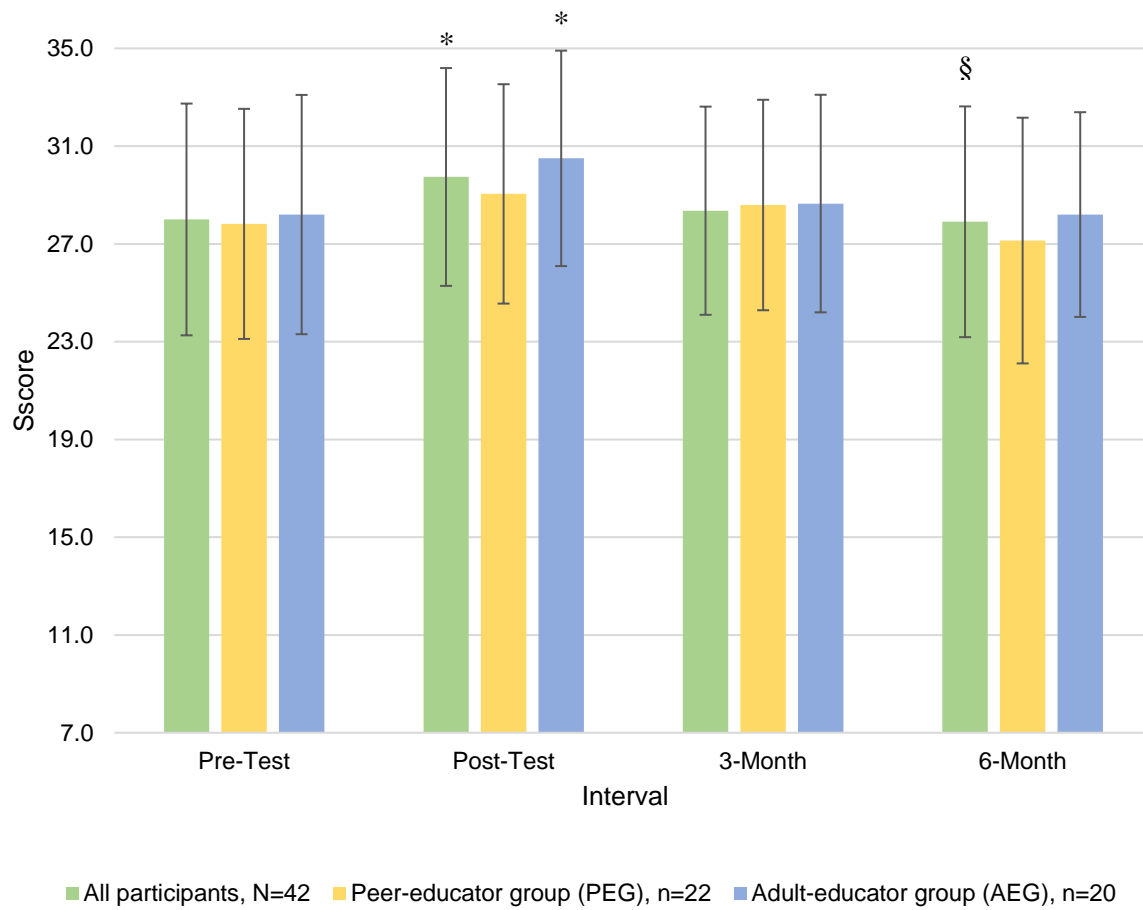
Figure 4.6. Participant cooking self-efficacy scores at pre-test, post-test, 3-month and 6-month by intervention group



* $P < 0.001$ increase from pre-test

^ $P < 0.05$ decrease from post-test

Figure 4.7. Participant cooking methods self-efficacy scores at pre-test, post-test, 3-month and 6-month by intervention group



* $P < 0.001$ increase from pre-test

§ $P < 0.01$ decrease from post-test

Table 4.3. Fidelity checklist items. Reported as count (%).

Measure	Peer-Educator Group (PEG) Count (%)	Adult-Educator Group (AEG) Count (%)
Emphasized fruit and vegetable consumption	2 (50)	3 (75)
All planned lesson activities were completed	4 (100)	4 (100)
Leaders maintained appropriate pace through most of lesson	4 (100)	4 (100)
Leaders were able to keep participants on task	4 (100)	4 (100)
Leaders asked if participants had any questions	3 (75)	3 (75)
Total	17 (85)	18 (90)

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CHAPTER 5: Conclusions and Future Directions

Results from the parent-child attitudes toward food preparation and household food preparation equipment availability survey illustrates three main points:

1. Children, 11-14 years of age, have attitudes toward household food preparation that are related to one parent;
2. Sociodemographic variables, including household food security status, impact some attitudes of parents and youths; and
3. Additional research is needed to determine that household food preparation equipment is required to prepare a healthful meal.

The understanding of associations between youth and parent attitudes at the age of 11-14 years further defines the development of similarities of child-parent dyad attitudes, previously noted as occurring by 16-17 years of age¹.

The culinary skills intervention, while successful in demonstrating that peer-educators can feasibly lead culinary skills lessons compared to adult-educators, was not successful in showing intermediate retention of self-efficacy towards the culinary skills. Participants in both peer-educated group (PEG) and adult-educated group (AEG) showed significantly increased knowledge scores compared to baseline and this knowledge increase was sustained at 6-months post-intervention. The sustained increase in knowledge paired with lack of sustained increase in self-efficacy measures indicates that additional follow-up is needed. Additionally it can be speculated that youths that attended the culinary skills lessons did not have a sustained behavior change as self-efficacy is the intermediary between knowledge and behavior². Future research regarding youth culinary skills education should focus on the frequency and type of

reinforcement needed to sustain self-efficacy and should examine what interventional dose is required for sustained behavioral change. By understanding the dose of culinary skills required for sustained behavior change, policy recommendations^{3,4} would follow to provide the platform for such programs to operate with the needed reinforcement.

The feasibility of peer-educators for the culinary skills lessons proved both feasible and comparable to that of adult-educators in regards to participant changes in psychosocial markers. These results support use of peer-educators for culinary skills lessons to an early adolescent population⁵. However, the use of peer-educators should include additional training on the technical components of the lessons as well as lesson presentation and group facilitation would likely enhance the fidelity of the lessons. Further research should also examine the benefit to the educators, as it is likely that the presentation skills used by the peer-educators could be transferable to other avenues⁶.

Together, the results of these projects indicate a strong need for further family-based nutrition and culinary skills education research. Incorporating the family allows children to have additional reinforcement as well as a deeper understanding of what food preparation items are needed to prepare a healthful meal, along with acquiring the attitudes of their parents. A mixed methods approach would likely be needed as qualitative work would better define individuals that children interact with and the types of interactions that occur with care-givers outside the home. Understanding the interactions that occur outside the home and how those attitudes differ from parental attitudes would further characterize attitude variances between parents and their children.

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APPENDIX A: IRB Approval Letters

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January 30, 2015

Sharon Nickols-Richardson
Food Science & Human Nutrition
260A Bevier Hall
905 S. Goodwin Ave
Urbana, IL 61801
M/C 182

RE: *PAWS Club: Peer-education About Weight Steadiness Culinary Skills pilot testing*
IRB Protocol Number: 15443

EXPIRATION DATE: January 29, 2018

Dear Dr. Nickols-Richardson:

Thank you for submitting the completed IRB application form for your project entitled *PAWS Club: Peer-education About Weight Steadiness Culinary Skills pilot testing*. Your project was assigned Institutional Review Board (IRB) Protocol Number 15443 and reviewed. It has been determined that the research activities described in this application meet the criteria for exemption at 45CFR46.101(b)(1).

This determination of exemption only applies to the research study as submitted. Please note that additional modifications to your project need to be submitted to the IRB for review and exemption determination or approval before the modifications are initiated.

We appreciate your conscientious adherence to the requirements of human subjects research. If you have any questions about the IRB process, or if you need assistance at any time, please feel free to contact me at the OPRS office, or visit our website at <http://www.irb.illinois.edu>.

Sincerely,

A handwritten signature in blue ink that reads 'LeaAnn Carson'.

LeaAnn Carson, MS
Human Subjects Research Specialist, Office for the Protection of Research Subjects

c: Amanda Oakley
Cassandra Nikolaus

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Office of the Vice Chancellor for Research

Office for the Protection of Research Subjects
528 East Green Street
Suite 203
Champaign, IL 61820



January 26, 2015

Sharon Nickols-Richardson
Food Science & Human Nutrition
260A Bevier Hall
905 S. Goodwin Ave
Urbana, IL 61801

RE: *Parent and Child Behaviors Knowledge and Attitudes Towards Food Preparation*
IRB Protocol Number: 15425

Dear Dr. Nickols-Richardson:

This letter authorizes the use of human subjects in your project entitled *Parent and Child Behaviors Knowledge and Attitudes Towards Food Preparation*. The University of Illinois at Urbana-Champaign Institutional Review Board (IRB) approved, by expedited review, the protocol as described in your IRB-1 application. The expiration date for this protocol, IRB number 15425, is 01/22/2016. The risk designation applied to your project is *no more than minimal risk*. Certification of approval is available upon request.

Copies of the attached date-stamped consent form(s) must be used in obtaining informed consent. If there is a need to revise or alter the consent form(s), please submit the revised form(s) for IRB review, approval, and date-stamping prior to use.

Under applicable regulations, no changes to procedures involving human subjects may be made without prior IRB review and approval. The regulations also require that you promptly notify the IRB of any problems involving human subjects, including unanticipated side effects, adverse reactions, and any injuries or complications that arise during the project.

If you have any questions about the IRB process, or if you need assistance at any time, please feel free to contact me at the OPRS office, or visit our Web site at <http://www.irb.illinois.edu>.

Sincerely,

A handwritten signature in black ink that reads "Anita Balgopal".

Anita Balgopal, PhD
Director, Office for the Protection of Research Subjects

Attachment(s)