

Relationships among Diet Quality, BMI, Cooking Skills and Frequency of Food Preparation: A Pilot Study

Jenna Kourajian, Sherri Stastny*, Ardith Brunt

Department of Health, Nutrition & Exercise Sciences, North Dakota State University, Fargo, ND, USA

*Corresponding author: sherri.stastny@ndsu.edu

Abstract Background: Many college students do not have the knowledge to make traditional dishes from simple ingredients, or cook a meal from scratch. **Purpose:** To evaluate the association between participants' perceived cooking skills, food preparation frequency, selected indicators of diet quality and BMI. **Methods:** Non-experimental cross sectional survey design using questionnaire evaluating confidence in cooking skills (PCSS), food preparation frequencies (FPFS), diet quality (frequency of consumption of vegetables, fruits, whole grains, and low-fat dairy), and anthropometrics among 968 students at one Midwestern university. Correlations and chi square were performed to determine the relationships of PCSS/FPFS, indicators of healthy eating and BMI, and differences in response per variable, respectively. **Results:** Over half reported feeling very confident in their cooking skills; 15% report preparing meals daily. Higher PCSS was correlated to higher vegetable intake ($P<0.001$) and meeting the recommendations for vegetables ($P<0.001$). PCSS was not associated with meeting recommendations for fruits, whole grains, or low-fat dairy. Higher PCSS was correlated with higher BMI ($P=0.001$). PCSS was positively associated with FPFS ($P<0.001$). Although higher PCSS was not associated with fruit, whole grain, and low-fat dairy intake, students with higher PCSS may be more likely to prepare and consume vegetables.

Keywords: nutrition education, cooking skills, diet quality

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1. Introduction

The transition from cooking from scratch to use of convenience or purchased prepared foods in the past few decades has impacted weight and overall health of adults and children internationally. [1] It is well known that young adults often fall short on fruits, vegetables, whole grains, and low-fat milk or milk products. [2] In the United States, increased consumption of convenience foods may contribute to this lowered quality diet and an individual's failure to meet recommendations for nutrient-rich foods such as vegetables, fruits, whole grains, and low-fat dairy. According to data presented as part of the USDA Dietary Guidelines for Americans 2015-2020, about three-fourths of the U.S. population have an eating pattern low in vegetables, fruits, low-fat dairy, and oil. Also, most meet or exceed needs of overall grains, but are not meeting recommendation to get half of grains from whole grain sources. [3] When considering overall health, it is also important to consider nutrients consumed in excess. Home cooked meals generally provide fewer calories and less total fat, saturated fat, and sodium than meals purchased away from home. [4]

Extensive use of convenience foods may result in poorly developed, infrequently practiced food preparation skills. If food preparation skills were performed more often, consumers could have a higher quality diet because

nutrient-rich foods such as fruits and vegetables often require more challenging preparation techniques (e.g. knife skills) than purchased, ready-to-eat foods. Being involved in food preparation was associated with improved diet quality in both children and young adults. [4,5]

Measurement of cooking skill level (outside of face-to-face culinary lab instruction) is not widely reported in the literature. [6,7] Some researchers have used infrequent food preparation and confidence in cooking skills as a means to gauge the "food deskilling process". [4] The term "deskilling" originated from Braverman's theory of deskilling of laborers in industry. [8] There, each worker performs only a certain task or portion of a task; and therefore become disconnected from the complete process, resulting in deskilling. [8] Deskilling applies directly to the decline of the cooking process when consumers lack of cooking knowledge or skills impacts all aspects of food preparation frequency. Many consumers now do not have the skill or knowledge to make traditional dishes from simple ingredients, or cook a meal from scratch. [9,10] Consumers' dependence on convenience foods or eating meals outside of the home continues if necessary skills needed to prepare foods are not learned. Emerging adults (19 to 23 years of age), along with adolescents (11 to 18 years of age), viewed as some of the formative periods of human development⁵ may be extremely susceptible to the food deskilling process. However, literature is limited defining what cooking skills actually involve and how this

may affect emerging adults such as college students. Moreover, based on the literature, there is no evidence that the word “cook” refers to only the use of fresh and raw foods. [7] As Short (2003) concludes, cooking with raw, fresh, and already prepared foods requires and utilizes cooking skills [7]. In a study by Stockton (2013), the definition of “home cooked meals” was defined as “a meal where at least one or more fresh ingredients were processed into cooked food.” [11]

Few studies outline associations among perceived cooking skills, confidence in food preparation, and making healthy food choices, nevertheless, most were conducted among middle-school, adolescent, or young adult populations. [12,13,14,15] Results of those studies are reported here to attempt to find comparison studies. As perceived cooking skills increase, confidence in food preparation and selecting healthy food, an interest in cooking, and fruit and vegetable consumption are likely to increase. [12] For middle school aged children, helping with meal preparation was associated with higher fruit and vegetable intake and higher self-efficacy for selecting healthful food. [13] Adolescents who helped with food preparation daily ate one half serving more of fruit and one half serving more of vegetables than those with less involvement. In female children and adolescents, helping with food preparation was positively correlated with lower intake of fat and higher intake of key nutrients such as folate, fiber, and vitamin A. [14] Of those who reported high food preparation skills, 31% were consuming five servings of fruits and vegetables. [15] In a follow-up study, preparing food as adolescents predicted higher dietary quality five years later. [5]

To add more depth to the above study methods, a health screening such as BMI could be used to predict current and future overweight and obesity and how these conditions related to cooking and food choice patterns. Few studies have reported the relationship between frequency and/or level of cooking or food preparation skills and BMI; however, one study reported that overweight and obese individuals were more likely to be involved in cooking than normal weight individuals. [14]

2. Purpose

There is evidence that involvement in food preparation and possessing cooking skills may help incorporate more healthful food choices such as vegetables, fruits, whole grains, and low-fat dairy for overall improved diet quality. Therefore, the purpose of this study was to ascertain the relationship between perceived cooking skills and reported food preparation frequency with diet quality and BMI among college students. The study was designed to answer the following research questions: does adequate food preparation knowledge and cooking skills facilitate intake and meeting recommendations of fruit, vegetables, whole grains, and low-fat dairy (i.e. diet quality)? Is there a relationship between perceived cooking skills, frequency of cooking, and BMI? This study was also designed to test the hypothesis: college students with perceived higher cooking skills are more likely to have BMI in the normal weight category. The rationale for this study includes the assumption that diet quality can be measured by increased

use of nutrient-dense foods such as vegetables, fruits, whole grains, and low-fat dairy; and that those who tend to cook more tend to eat more nutrient-dense foods which help to maintain a healthy BMI.

3. Methods

The study utilized a cross-sectional survey design to gather information about perceived cooking skills, frequency of food preparation, and estimated consumption of vegetables, fruits, whole grains, and low-fat dairy. This study was approved by the North Dakota State University Institutional Review Board. All students aged 18 or older and enrolled at a Midwestern university Fall, 2014 were invited to complete an online questionnaire distributed via a campus-wide email. Students choosing to participate clicked on the Qualtrics survey link which opened the informed consent form. Continuing to the questionnaire indicated consent.

3a. Measures

A 38-item questionnaire was composed of questions from several previously tested surveys which addressed demographic and anthropometric measures, current cooking habits (e.g., “indicate the extent to which you feel confident about performing each of the following activities”) [13], food purchasing and preparation habits (e.g., “prepared an entire meal for two or more people”) [16], previous food preparation education, dietary intake, and perceived food preparation frequency [16] and ability to perform food preparation tasks. [13] BMI was calculated from self-reported height and weight.

The survey was piloted with a paper version among a group of students (n=42) enrolled in a university foods course composed of sophomore, junior, and senior class level enrollees. Students in this entry-level foods course were majoring in dietetics, hospitality, or family and consumer science education so had at least some experience with cooking terms. Questions were tested among the class to further test validation and readability of previously used questions before final survey launch. [13,14,15,16] The survey took between five to fifteen minutes for students to complete. The wording in the final survey was modified per student feedback prior to launch of the online Qualtrics survey.

As part of the Qualtrics questionnaire instructions, cooking was defined as “the practice or skill of preparing food by combining, mixing, and heating ingredients.” [10] Students rated their perceived confidence to perform 19 different cooking skills (or habits) using a Likert scale (1=not confident, 2=somewhat confident, 3=confident, 4=very confident) adapted from the self-efficacy of cooking scale developed by Condrasky et al. [13] The tool was tested on parents, caregivers and cooks from varied venues including Head Start, faith-based and public elementary schools, and thus the cooking scale was intended for diverse groups. [13] Reported test-retest correlations for this question (with 19 categories) ranged from 0.63 to 0.88 after Cronbach alphas were used to compute the final psychosocial scales. [13] Following Condrasky et al. scoring methods, the numerical values of

these 19 skills were summed to form a Perceived Cooking Skills Score (PCSS), which could range from 19 to 76. A PCSS ≤ 38 was considered to be “not confident”, scores from 39 to 59 “confident”, and ≥ 60 as “very confident”. [13] To assess perceived attitude toward cooking, a similar 4-point scale was used.

To determine a Food Preparation Frequency Score (FPFS), participants were asked four questions: how often they purchased fresh vegetables, prepared a green salad, prepared a dinner with chicken, fish, or vegetables, or prepared an entire meal (more than one dish) for two or more people in the last year. Possible responses and assigned numerical values were never=1, one to five times per year=2, monthly=3, weekly=4, or daily=5. These numerical values were summed to form a FPFS which could range from four to twenty. FPFS below eight was considered “low”, scores from nine to twelve were “moderate”, and above thirteen as “high”. These four questions and scoring were modeled from a study by Larson, Perry, et al. among emerging adults, found to have test-retest reliability ranging from 0.591 to 0.960. [17] Additional questions were adapted from Woodruff and Kirby, but not included in either PCSS nor FPFS. [14]

Diet quality was assessed by asking how frequently students consumed a serving of fruit, vegetables, whole grains, and low-fat dairy products within the past week. Serving size was provided with possible frequency of intake ranging from none to five servings per day. Students met or did not meet recommendations based on a 2000 calorie diet set by Healthy People 2020. [2]

3b. Statistical Analysis

All analyses were conducted with SAS Institute Inc. 9.2, 2011 (Cary, NC). Chi-squares analyses were used to determine frequencies and differences in responses per variable. Pearson correlation analyses were performed to determine the relationship of the independent variables (vegetables, fruits, whole grains, and low-fat dairy intake, and BMI) with the dependent variables, FPFS, and PCSS. The significance level was set at $P < 0.05$ for all estimates. Spearman correlations were compared to the Pearson’s values and were found to be relatively similar. Additionally,

histograms (not shown) illustrate somewhat normal distributions, most of them unimodal and symmetric, so one can surmise that the Pearson’s values are reasonable.

4. Results

A total of 968 valid questionnaires were received with an estimated student response rate of 4.8%. The majority of the participants were female (57.0%) and white (92.7%). Other demographic variables are found in Table 1. About 78% of participants reported completion of a basic cooking skills or other similar course in middle or high school.

Table 1. Age, class, BMI, living situation and status of participants

| Characteristic | % | n |
|---|------|-----|
| Age (n=966) ^a | | |
| 18 years | 15.3 | 148 |
| 19 years | 20.0 | 193 |
| 20 years | 15.4 | 149 |
| 21 years | 12.5 | 121 |
| 22 years or older | 36.8 | 355 |
| Class (n=965) ^a | | |
| Freshmen | 24.0 | 234 |
| Sophomores | 18.0 | 176 |
| Juniors | 16.8 | 164 |
| Seniors | 22.5 | 215 |
| Graduate students | 18.7 | 182 |
| Body Mass Index (BMI) (n=968) ^a | | |
| Underweight (<18.5kg/m ²) | 4.6 | 45 |
| Normal weight (18.5-24.9kg/m ²) | 59.0 | 571 |
| Overweight (25-29.9kg/m ²) | 21.5 | 208 |
| Obese or morbidly obese (≥ 30 kg/m ²) | 14.9 | 144 |
| Living Situation (n=972) ^a | | |
| On-campus –residence hall (limited kitchen) | 26.2 | 255 |
| On-campus- apartment (full-kitchen) | 11.5 | 112 |
| Off-campus- apartment | 21.5 | 209 |
| Off-campus-house | 39.1 | 380 |
| Other | 1.7 | 16 |
| Living Status (n=972) ^a | | |
| Alone | 11.8 | 115 |
| With Parents | 4.6 | 45 |
| With Roommates/Others | 83.6 | 812 |

^a Sample sizes vary slightly due to missing data.

Table 2. Percentage of overall perceived cooking skills score (PCSS) of participants and by sex, class, and BMI group (n=968).

| PCSS | Not confident (19-38) % | Confident (39-59) % | Very Conf. (≥ 60) % | P-value |
|---------------------------|----------------------------|------------------------|-------------------------------|-------------------|
| Total (n) | 5.2 | 37.1 | 57.7 | |
| Sex | | | | .001 ^a |
| Males | 7.4 | 40.9 | 51.7 | |
| Females | 3.6 | 34.2 | 62.2 | |
| Class | | | | <.001 |
| Freshmen | 10.3 | 45.7 | 44.0 | |
| Sophomores | 5.1 | 43.8 | 51.1 | |
| Juniors | 3.7 | 36.0 | 60.3 | |
| Seniors | 2.8 | 35.9 | 61.3 | |
| Graduate Students | 3.3 | 22.0 | 74.7 | |
| BMI Group | | | | .003 |
| Underweight (<18.5) | 2.0 | 51.0 | 46.7 | |
| Normal weight (18.5-24.9) | 6.0 | 38.0 | 55.8 | |
| Overweight (25-29.9) | 5.7 | 36.8 | 57.5 | |
| Obese (>30) | 2.0 | 29.2 | 68.8 | |

^a Chi Square analysis between variables sex, class, and BMI Group.

The mean PCSS was 58 (range 22-76). Overall, the majority of participants were confident or very confident in their cooking skills with only 5.0% (n=51) of the participants scoring in the “not confident” category. As seen in Table 2, significant differences were found between sex, class, and BMI groups in their PCSS. As BMI increased, percentages of students who scored “very confident” in reporting cooking skills also increased. Fifty-five percent (n=318) of normal weight students compared to sixty-nine percent (n=99) of obese students scored “very confident” in their cooking skills; however, there were over twice the percent of normal weight participants compared to those in the obese category. Moreover, 28% of the participants disagreed with the statement, “I have confidence in my cooking skills”.

The mean FPFS was 13.6 and ranged from five to twenty out of a possible four to twenty, which showed participants prepared food relatively frequently. See Table 3 for response rates to specific questions to determine FPFS. Chi square analysis revealed that FPFS was associated with student class ($P<.001$) and sex ($P<.001$). FPFS scores increased as student class increased with 19.2% (n=45) of freshmen and 58.0% (n=107) of graduate students scoring high (≥ 13). Females also had higher FPFS with 40.8% (n=225) of female participants scoring high whereas, 24.3% (n= 101) of males scoring high for FPFS.

The percentage of participants who met fruit intake did not differ by sex, but other food groups were significantly different by sex. The percentage of males who met recommended intake was higher for whole grains ($P=.04$) and low-fat dairy ($P=.004$) whereas, the percentage of females who met recommended intake of vegetables was higher ($P<.001$). The PCSS was higher for the percentage of students who met vegetable recommendations ($P<.001$); however, there were no differences in meeting recommendations for fruit ($P=.22$), whole grains ($P=.06$), or low-fat dairy ($P=.25$), and PCSS.

As seen in Table 4, the PCSS was shown to be moderately positively correlated with FPFS ($r=.45$, $P<.001$). Those who had higher PCSS had higher BMIs, though the correlation was low ($r=0.12$, $P<0.001$). PCSS was moderately correlated with higher vegetable intake

($r=0.29$, $P<.0001$), but not necessarily with other food groups. Higher PCSS was significantly related to meeting the recommendations for fruit intake ($r=0.07$, $P=.02$) and whole grains ($r=.07$, $P=.04$) compared to the guidelines of Healthy People 2020. [2]

The frequency of food preparation did not have a significant relationship with a student’s BMI or weight status, since the FPFS was not associated with BMI ($r=.06$, $P=.07$). A higher FPFS showed a moderate positive correlation to higher vegetable intake ($r=0.44$, $P<.001$) and a positive low correlation to higher fruit intake ($r=.19$, $P=<.001$). The percentage of participants who met the recommendations for fruit trended down as BMI category increased.

After excluding 329 students who reported being on a university residence hall meal plan, the same data was analyzed to determine if PCSS changed among the smaller filtered sample (n=639). These results show BMI no longer correlated with PCSS ($r=.13$, $P=.08$). The correlation of fruit to PCSS increased slightly and was significant, but correlation was still low ($r=.15$, $P<.001$). Both the FPFS and PCSS remained moderately correlated ($r=0.44$, $P<0.001$). The relationship between FPFS and vegetable intake ($r=.49$, $P<.001$) and fruit intake ($r=0.27$, $P<.001$) strengthened.

5. Discussion

This paper focuses on whether college student participants perceive their cooking skills as adequate and how that relates to frequency of food preparation and meeting recommendations for certain food groups. This pilot study was a first attempt to define cooking skills by asking college student participants to identify both their confidence in various cooking techniques, level of involvement in food preparation and their associations with diet quality (meeting recommendations for vegetables, fruits, whole grains, and low-fat dairy), as well as frequencies of food preparation compared to BMI. In the United States, 24 million individuals are enrolled in a college (the majority of young adults); our convenience sample of college students was intended to represent emerging adults (aged 18-24). [18].

Table 3. Frequency of food purchase and preparation behaviors that determined Food Preparation Frequency Score (FPFS)

| Behavior | Never % | 1-5 times per year % | Monthly % | Weekly % | Daily % |
|--|---------|----------------------|-----------|----------|---------|
| Purchase fresh vegetables ^a | 9.8 | 7.0 | 52.3 | 29.3 | 1.6 |
| Prepare a green salad | 15.8 | 10.2 | 26.5 | 38.7 | 8.8 |
| Prepared a dinner with chicken, fish, or vegetable | 3.6 | 2.9 | 16.3 | 48.9 | 28.3 |
| Prepared an entire meal for 2 or more people | 12.0 | 14.8 | 24.7 | 32.8 | 15.7 |

^a Scoring modeled from Larson, Perry et al. (2006)

Table 4. Correlations, p values and number of participants comparing BMI, perceived cooking skills score, and food preparation frequency and dietary intake score among college students

| | Perceived Cooking Skill Score (PCSS) | Food Preparation Frequency Score (FPFS) | BMI | Vegetable | Fruits | Whole Grains | Low-fat dairy |
|------|--------------------------------------|---|-------|-----------|--------|--------------|---------------|
| | 1.000 | .45 | .13 | .29 | .07 | .07 | -.28 |
| PCSS | --- | <.001 | <.001 | <.001 | .02 | .04 | .38 |
| | 968 | 956 | 968 | 965 | 967 | 965 | 968 |
| | .45 | 1.000 | .06 | 0.44 | .19 | .04 | -.03 |
| FPFS | <.001 | --- | .07 | <.001 | <.001 | .23 | .35 |
| | 968 | 968 | 948 | 965 | 967 | 965 | 968 |
| | .13 | .06 | 1.000 | -.02 | -.10 | .02 | .03 |
| BMI | <.001 | .0713 | --- | .64 | .003* | .47 | .41 |
| | 948 | 948 | 948 | 946 | 948 | 945 | 948 |

As previously stated, there is a dearth of research regarding the impact of cooking skills on dietary quality and BMI regardless of setting or study design. With the possibility of deskilling of cooking in emerging adults, it becomes important to estimate the level of participant confidence in personal cooking skills to determine if this affected dietary intake. Most participants scored “confident” or “very confident” in their ability to use their cooking skills; with only 5.2% indicating low level of confidence in their cooking skill abilities. This is similar to findings from a recent study of adolescent cooking abilities among secondary school students in New Zealand, where most participants reported they were able to cook a meal from basic ingredients. [19] In the current study, most participants reported taking some food preparation laboratory course in secondary school, so lack of cooking skills may have not been as large of barrier as anticipated. Though this may indicate they perceived they had adequate skills at one point, it may have been beneficial to ask the length of the classes or when the class was taken relative to the questionnaire to get a better understanding of their skills level and possibility of becoming divorced from the process. This prior exposure to food preparation curriculum may decrease the possibility of deskilling from cooking. However, if students no longer utilize these skills regularly, this phenomenon could still be present.

Although a majority of the participants reported feeling “confident” or “very confident” in their cooking skills, this did not necessarily correlate with dietary intake of important food groups. Few students actually met the recommendations for vegetables, fruits, whole grains, and low-fat dairy. Of all of the food groups, fruit was most likely to be met, but still was only met by 50% of the participants. Reporting higher confidence in cooking skills correlated with a higher intake of vegetables and the ability to meet the recommendations for vegetables.

Surprisingly, over half of the students reported cooking with more than three ingredients at least “often” and “almost always”. (It should be noted that only freshmen students lived in the residence halls, and that other subjects would have had access to a full kitchen.) However, only 38% reported cooking a meal from scratch without the use of convenience ingredients at least “often” or “all of the time”, with only 12.4% reported doing this task “all of the time”. This may indicate that cooking may rely heavily on convenience foods for this sample of college students. Though most convenience foods do not require much more than heat and rehydration (or simply holding hot/cold), many products still may require three ingredients or more (e.g. water, one other ingredient and a “purchased” mix); thus, these foods would still be considered convenience products. This reliance on convenience foods could result in deskilling, separating students from the process of cooking from scratch and from using nutrient-dense whole foods such as fruits, vegetables, whole grains, and low-fat dairy.

A higher FPFS correlated to a higher fruit and vegetable intake. This is consistent with a previous study [16] where more involvement in food preparation seemed to help participants meet the dietary objectives of Healthy People 2020; and by Laska et al. [5] who found more involvement in cooking as an adolescent correlated with higher preparation of meals that included vegetables as an

emerging adult. Nevertheless, an Australian study of young adults did not show any association between meal preparation involvement and better diet quality. [20] FPFS and PCSS was also found to be positively correlated, consistent to the results of another study, [13] although cooking score and food frequency were measured differently.

Female students reported performing more food preparation tasks than males among the 968 participants who completed the survey. This is consistent with Laska et al. [5] and the general trend that women tend to prepare food more frequently than men. Intake of food groups seemed unaffected by class rank other than for low-fat dairy, where younger classmen had higher intakes than upperclassmen. The higher percentages in younger students meeting dairy recommendations is reasonable since younger students were more likely to have meal plans giving them easy access to milk.

As one of the few studies examining whether cooking skills has an effect on BMI, this study suggests a strong association between perceived cooking skills and a higher BMI. However, since most students ranked their skills as at least adequate, BMI may not be the best overall indicator. FPFS, however, was not associated with a higher BMI, contrary to findings by Larson, Perry et al. [17] in which underweight and normal-weight participants reported lower food preparation activities than participants who were overweight or obese. This indicates cooking skills and food preparation frequency may not necessarily be a factor for weight status.

Strengths of this study included utilization of validated questions from the Youth and Adolescent Food Frequency Questionnaire and Project EAT III to analyze dietary intake and other previously used survey questions. Information regarding psychometric properties of the Project EAT III survey can be found at www.sph.umn.edu/eat.

5a. Limitations

The current study established a method for quick screening of cooking skills and their relationship with diet quality and food preparation frequency. Some limitations of this pilot study included a single non-diverse university sample. Another limitation included the untested or novel cooking skills survey instrument. Our abbreviated survey may have revealed deeper understanding of cooking skills if it also included probes regarding what was cooked or prepared and how the specified skill was utilized. Also, the participant’s propensity to complete the consent and subsequently the survey could have been due to a self-selected interest in cooking, and therefore may have skewed results by calling it a “cooking” study.

As mentioned earlier, the term cooking is not universally defined throughout the research, making it difficult to compare studies equally. Cooking may refer to the mere preparation of food, the application of heat or the use of cooking with the use of fresh, raw foods. The terms ‘from scratch’, ‘use of basic ingredients’ were also used to describe the term cooking in many studies. [7] We attempted to minimize this limitation by defining cooking skills for participants before they completed the questionnaire.

The FPFS may have not been the best indicator of food preparation due to the nature of the questions. Questions regarding cooking or food preparation skills are self-reported, and self-perceived skill may not be comparable to culinary skills (by definition). Though the questions asked about confidence in these skills, the questionnaire did not address how often participants utilized these specific skills. It may have been beneficial to ask both confidence and frequency of performing these skills. In addition, when asked about attitude toward cooking, nearly 28% of the students disagreed with the statement, "I have confidence in my cooking skills", which was a much larger difference than what the cooking skills score revealed. Confidence in these skills were ranked on a four-point Likert scale; it may have been more revealing to rank each skill on a ten-point scale to better distinguish perceived confidence in cooking skills.

Level of income or socio-economic status, level of family support, and other background information were not mentioned in the questionnaire in order to keep the survey brief. Lastly, the self-reported weight, height, and other aspects of this questionnaire rely on honesty of subjects—a common limitation in the collected literature reported as part of this manuscript for comparison. We are unable to verify accuracy of answers; to do so would undermine the integrity of the answers and perhaps the willingness of subjects to participate. Nevertheless, we are unsure of the truth of reported responses.

6. Conclusions

Many cooking intervention studies, which attempt to increase knowledge and importance of cooking skills, already exist in hopes of improving diet quality of children, adolescents, and adults. Cooking interventions may be a way to increase intake of nutrient-dense food groups, especially vegetables, as outlined in this study. Given past research on this topic has shown that those who had more involvement in food preparation were more likely to have better diet quality and given our somewhat supportive results regarding food frequency preparation and diet quality, family consumer science and other health educators should include the "how" when advocating for increased use of nutrient-dense foods. However, more research is needed in this area, so health educators are urged to collect outcomes or impact that results as a part of food preparation curriculum, lesson plans, workshops, etc. The results of this study revealed high levels of perceived confidence in performing cooking skills. As outlined in previous research, other factors such as the use of convenience foods, time scarcity, and finances can also contribute to lack of food preparation and failure to meet recommendations. For example, Meah and Watson [21] assert that it is perhaps the "foodscape", changed over many generations with a particularly recent dramatic increase in pre-processed/prepared foods that may undermine cooking confidence and motivation. Interventions that teach cooking skills still would be beneficial for emerging adults to maintain these skills in their daily and lifelong food preparation routine. Further, Meah and Watson [21] are optimistic that the popular television cooking programs may somehow engage the current emerging adults to bring cooking back into their lives.

The current study did show confidence in cooking skills was related to meeting the recommendations for vegetables, but not other food groups. Perhaps more cooking skills are required to prepare vegetables. Few identified studies have examined cooking skills, and their relationship with diet quality, but rather have studied relationship between food preparation involvement and diet quality. An emphasis should be placed on "how to purchase, store, prepare" vegetables, but adding education to prepare other nutrient-dense food is needed as well.

Further research concerning cooking skills and diet quality in a more diverse sample is warranted. Only a few studies have been reported on this topic and revealed more associations with cooking skills confidence and meeting recommendations for not only vegetables, but fruit, low-fat dairy, and whole grains as well.

This pilot study was designed to examine the relationships between perceived cooking skills in college students and their diet quality. Another purpose was to examine whether BMI was related to perceived cooking skills and frequency of cooking among these college students. Food preparation may help with meeting recommended intake for food groups such as vegetables, fruits, whole grains, and low-fat dairy, part of a healthy diet. Currently, many college students fail to meet these recommendations. This may be related to the increased use of convenience foods: generally nutrient-poor, calorie-dense options. As established, many factors could act as barriers to home food preparation from scratch including the increase in convenience foods, perceived time barriers, financial barriers, gender/sex differences, and lack of cooking skills. Now more than ever, there appears to be a disconnect between food preparation and the consumer due to the heavy reliance on processed foods causing a deskilling of cooking process.

In this study, many students reported some food preparation at least weekly, if not two to four times per week. This may indicate limited cooking skills may not have been the major factor in inability to meet recommendations. The study revealed most students perceived their confidence in cooking skills as adequate or very adequate. However, higher confidence in cooking skills was only strongly associated with meeting the recommendations for vegetables.

The results revealed higher cooking skills score was correlated to a higher BMI, though the correlation was low. Further research needs to be done regarding BMI and cooking skills to further understand this relationship. Also, in this group of college students, higher cooking skills did not correlate to meeting most of the recommendations for a healthy diet; higher confidence in cooking skills was associated with higher intake of vegetables. The relationship between cooking skills, diet quality, and BMI need to be further researched as only a few studies exist at this time.

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