The Influence of a Campus-based Culinary, Nutrition Education Program, "College CHEF," on College Students' Self-efficacy with Cooking Skills and Nutrition Behaviors

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ABSTRACT

Background: College students tend to have poor dietary habits. Self-efficacy is important in promoting positive behavior change and may be impactful when targeting college students' eating and cooking habits.
Aim: To evaluate the influence of a campus-based culinary nutrition education program, the College CHEF, on participants' self-efficacy for cooking skills and techniques and fruit and vegetable (FV) use and consumption.
Methods: Study subjects comprised intervention ($N = 15$) and control participants ($N = 17$). The mean age of the intervention group was 18 ($SD = 0.00$) with a mean age for control group participants of 18.3 ($SD = 0.59$). The intervention group participated in four weekly hands-on cooking/nutrition sessions. Pre- and post-surveys to assess changes with self-efficacy were administered through Qualtrics to both groups (Qualtrics Inc., 2013). Subscale responses were compared utilizing *t*-tests, apriori $p < .05$.
Results: Intervention participants reported significant improvements as compared to the control group for the Self-Efficacy for using Fruits, Vegetables, and Seasonings subscale ($p = .015$).
Conclusion: Findings support the implementation of campus-based programming to improve college students' self-efficacy for using fruits, vegetables, and seasonings with cooking to promote healthier eating and cooking behaviors. Future research should explore the various means to promote self-efficacy (i.e., vicarious experiences, mastery experience, verbal persuasion, and physiological feedback) among college students as part of similar programming.

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Of college students in the United States, 35% are considered overweight or obese (American College Health Association [ACHA], 2016). Further contributing to overweight and obesity in college students, only 6.5% of college students consume five or more fruits and vegetables per day; evidence indicates that consuming the daily recommended number of fruits and vegetables may decrease the risk for obesity (World Health Organization, 2017; ACHA, 2016). Obese individuals are at an increased risk for: Hypertension, dyslipidemia, type 2 diabetes, heart disease, stroke, gallbladder disease, osteoarthritis, some types of cancer, low quality of life, and mortality (U.S. Department of Health and Human Services, National Institutes of Health, 2013; National Heart, Lung, and Blood Institute and National Institute of Diabetes and Digestive Kidney Disease, 1998).

When individuals leave home to attend college, their healthy dietary habits often decrease (Harris, Gordon-Larsen, Chantala, & Udry, 2006) and their unhealthy dietary habits tend to worsen (Grace, 1997). Conveniently, college campuses

provide an ideal environment in which to promote behavior change and educate students on the importance of making healthy behaviors become life-long habits (Sparling, 2007). Various health promotion initiatives, such as *Healthy Campus 2020* which aims to improve the health status on campuses, support positive health behaviors and supportive environments for the college population. *Healthy Campus 2020* can be used as a framework to establish campus-based health promotion programming to improve the health of college students (Healthy Campus 2020, 2016). Campus-based programming which incorporates both cooking and nutrition education components has emerged as a means to improve cooking and eating behaviors, attitudes, knowledge, and self-efficacy related to cooking skills and techniques and healthy eating practices (Levy & Auld, 2004; Warmin, 2009; Warmin, Sharp, & Condrasky, 2012; Kerrison, 2014). When education is combined with other factors such as a skill-based approach and emphasis on self-efficacy and goal achievement, behavior change is more likely to occur (Lockwood & Wohl, 2012).

Self-efficacy is an important construct of the social cognitive theory (SCT) and refers to individuals' beliefs in their ability to carry out behaviors to produce specific outcomes (Bandura, 1977). SCT suggests that self-efficacy is a key component to behavior change (Strong, Parks, Anderson, Winett, & Davy, 2008). Culinary nutrition education programming often utilizes the SCT, as it purports that learning occurs within a social context with an influence of cognitive, behavioral, and environmental factors, and that much of what is learned is gained through the observation of others (Warmin, 2009; Warmin et al., 2012; Kerrison, 2014; Bandura, 1977). Since cooking classes largely rely on observation and subsequent skill practice, the use of this theory is practical.

It has been indicated that participating in meal preparation may increase an individual's self-efficacy for cooking and simultaneously improve diet quality of adolescents (Larson, Story, Eisenberg, & Neumark-Sztainer, 2006). Self-efficacy aids with achieving one's goal as it perpetuates planning and behavioral initiative. Those who boast self-efficacy tend to feel more comfortable with trying a new and/or difficult behavior, and often put more into working toward and maintaining a behavior (Brug, Lechner, & De Vries, 1995). The more self-efficacious an individual feels, the higher the personal goals they are inclined to set, and the stronger their commitment to behavior to achieve those goals (Locke & Latham, 1990). In previous studies, it has been reported that self-efficacy has routinely been associated with fruit and vegetable consumption and a decrease in fat intake in adults (Brug et al., 1995; Anderson, Winett, Wojcik, & Williams, 2010). Steptoe and colleagues found that improvements in fruit and vegetable consumption over a one-year period of time were predicted by changes in knowledge, encouragement, anticipated regret, and self-efficacy (Steptoe, Perkins-Porras, Rink, Hilton, & Cappuccio, 2004). Thus, an individual's self-efficacy may be impactful in fruit and vegetable consumption. Given the impact that self-efficacy may have with behavior change, constructs operationalizing self-efficacy should be incorporated and emphasized in nutrition programming among college students.

PURPOSE

The purpose of this study was to evaluate the impact of the College CHEF, "Cooking Healthfully, Educating for Life-Long Change," a program intended to teach students about cooking skills and techniques to help them make more healthy food choices. Researchers sought to determine if there was a significant difference from pre- to post-intervention in participants' self-efficacy for: (1) fruit and vegetable consumption, (2) cooking, (3) using basic cooking techniques, and (4) using fruits, vegetables, and seasonings.

METHODS

The study's design was a quasi-experimental, pre-test post-test design which utilized a control group and convenience sample. The intervention group was comprised of college students from three Living Learning Programs (LLPs), and a control group consisted of participants from three LLPs, for a total of six LLPs involved in the study. LLPs are programs in which undergraduate college students live and participate in academic or social programming within the same dormitory (National Study of Living Learning Programs, 2007). This provided a distinctive sample for the study, as program participants had occasions beyond programming to impact one another's self-efficacy with cooking, using cooking techniques, and with fruit and vegetable use and consumption. Program recruitment and data collection were followed in accordance with IRB protocol (McMullen, Ickes, Erwin,
Noland, & Helme, 2017).

The research study took place at a large, co-educational, southeastern public university. Participants lived on-campus in a dormitory with individuals from the same LLP, were undergraduate college students at the university, and were 18 years or older. Table 1 provides the demographic summary for participants. Due to small sample size and after comparing baseline characteristics, intervention groups were combined for data analysis purposes. For the combined intervention groups, there were thirty participants who completed the baseline survey, twenty-four individuals who attended the first session, and fifteen participants who attended at least three sessions and completed the pre- and post-surveys. Within the control group, there were forty-seven participants who completed the baseline survey and seventeen who completed both the baseline and post-survey.

The College CHEF was a campus-based culinary nutrition education evidence-based program emphasizing self-efficacy and driven by the social cognitive theory. SCT focuses on goal-setting behavior, enforced throughout sessions to promote and reinforce behavior that could be maintained over time. SCT also concentrates on the importance of self-efficacy, an integral component of behavior change (Strong et al., 2008). Several SCT constructs were operationalized throughout programming in an effort to maximize the impact of using this theory (McMullen, Ickes, Erwin, Noland, & Helme, 2017).

The College CHEF was held weekly for 2-hour increments for a total of four weeks. All sessions took place in a brand-new campus-based kitchen intended for programming of this kind. Participants had workspace to execute cooking skills and techniques in groups of two. Each workspace included a portable burner, cutting boards, knives, pots, pans, and other basic cooking tools and equipment. The classes were led by a health education doctoral candidate and aided by a dietician/health educator employed through the campuses' health services and an undergraduate senior-level dietetic student. At the beginning of each session, two randomly chosen participants were awarded attendance incentives. Local businesses and on-campus establishments had been contacted asking for donations oriented toward promoting health. Giveaways included: Campus dining gift cards, lunchboxes, fitness-related tee shirts, thermometers, and for the final session, two-$100 gift cards to a local health-oriented restaurant.

The nutrition education session consisted of an interactive review of nutrition information and skills/techniques. Further, participants were encouraged to both share how they were applying concepts learned in class to their daily lives and to discuss progress in working toward a personal class-related goal they had established for themselves at the start of the College CHEF. Program strategies reinforced outcome expectations throughout the education component of each session, in hopes that if participants were informed of the positive outcomes associated with eating and cooking healthfully, that they would be motivated to more readily engage in the behaviors.

This was followed by a hands-on component where participants carried out skills learned to prepare two to three recipes per session. Throughout, behavioral capability was promoted through reinforcing skills and techniques. Further, feedback from the instructors served as reinforcements to participants in promoting improved self-efficacy and behavior change. Throughout all facets of programming, observational learning occurred through which new behaviors and skills were observed and translated into participants' practice (McMullen, Ickes, Erwin et al., 2017).

The measures used at the pre- and -post- assessment were previously validated (Condrasky, Williams, Catalano, & Griffin, 2011; Michaud, 2007). There were a total of four self-efficacy subscales on the survey comprised of a total of twenty-six questions and twelve demographic questions. All subscale questions asked participants to rank their responses on a 5-point Likert-scale: *Extremely confident* = 5; *confident* = 4; *neither confident nor unconfident* = 3; *unconfident* = 2; and *extremely unconfident* =1 (Condrasky et al., 2011).

Demographic Variables. Individual items assessed were: age (years), college-level status (freshman/sophomore/junior/senior), gender (male, female, transgender, other), and race/ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic or Latino; Asian or Pacific Islander; American Indian/Alaskan Native, or other).

Fruit and Vegetable Consumption Self-efficacy subscale. This subscale consisted of three statements regarding how confident participants felt eating fruits and vegetables as a snack, at every meal and consuming nine half cup servings per day. For each statement, participants were asked to choose a response indicating the extent of confidence they felt. An example of a statement was, "indicate the extent to which you feel confident with eating fruits and vegetables at every meal, every day." The possible point range for responses on the Fruit and Vegetable Consumption Self-efficacy subscale was 3-15, with higher scores indicating higher self-efficacy for fruit and vegetable consumption.

Cooking Self-efficacy subscale. This subscale consisted of six statements concerning how confident participants felt about performing certain cooking activities like following a recipe and using knife skills. For each statement, participants were asked to choose a response indicating their extent of confidence. An example of a statement was, "Indicate the extent to which you feel confident with planning nutritious meals." The possible point range for responses on the Cooking Self-efficacy subscale was 6 - 30, with higher scores indicating higher self-efficacy for cooking.

Self-efficacy for Using Basic Cooking Techniques and Skills subscale. This subscale consisted of nine cooking skills and techniques statements of which participants were asked to select the extent of confidence they felt with performing each, including boiling, simmering, and sautéing. An example of a skill was, "Grilling." The possible point range for the Self-efficacy for Using Basic Cooking Techniques and Skills subscale was 9 - 45, with higher scores indicating higher self-efficacy for using basic cooking techniques and skills.

Self-efficacy for Using Fruits, Vegetables, and Seasonings subscale. This subscale was comprised of eight questions pertaining to self-efficacy for using fruits, vegetables, and seasonings. Statements prompted participants to select how confident they felt with cooking with these ingredients, which included root vegetables, fruits, herbs, and spices. For each food/seasoning item, participants were prompted to select their associated level of confidence. An example was, "herbs (e.g., basic, thyme)." The possible point range for the Self-efficacy for Using Fruits, Vegetables, and Seasonings subscale was 8 - 40 with higher scores indicating higher self-efficacy for using fruits, vegetables, and seasonings.

Scores from each item and subscale were calculated for both the intervention and control groups to determine composite scores, means, and standard deviations at pre- and post-survey. Paired *t*-tests were conducted to assess changes among participants pre- to post-intervention. Differences between groups were assessed through independent

sample *t*-tests. Significance was set at $p < .05$ apriori. Analysis was conducted in SPSS version 23.0 (IBM Corp, released 2013).

RESULTS

A total of thirty-two participants were included in data analysis: seventeen control group and fifteen combined intervention participants. The mean age of the intervention group was 18 ($SD = 0.00$) with a mean age for control group participants of 18.3 ($SD = 0.59$). All intervention participants were freshman, while the control group consisted of 82% freshmen ($n = 14$) and 18% sophomores ($n = 3$). The majority of the intervention group consisted of females, though there were no significant differences at baseline before combining these groups for data analysis purposes: 27% male ($n = 4$) and 73% female ($n = 11$), while the control group consisted primarily of males: 71% males ($n = 12$), 29% females ($n = 5$). All control and intervention participants reported their ethnicity as "White."

Fruit and Vegetable Consumption Self-efficacy subscale. Using paired *t*-tests, pre- ($M = 8.8$; $SD = 3.5$) to post-scores ($M = 10.4$; $SD = 3.02$) among intervention participants for the Fruit and Vegetable Consumption Self-efficacy subscale were significant ($p = .04$). Pre- ($M = 9.24$; $SD = 3.85$) to post-scores ($M = 9.18$; $SD = 3.13$) for control participants were not significant ($p = .17$). Unpaired *t*-tests indicated that a comparison of mean change scores between groups was nonsignificant ($p = .11$). See Table 2 for a comparison of Fruit and Vegetable Consumption Self-efficacy items and subscale scores for intervention and control groups, and Table 3 for comparisons between groups.

Cooking Self-efficacy subscale. Using paired *t*-tests, pre- ($M = 24.23$; $SD = 4.4$) to post-scores ($M = 25.33$; $SD = 3.31$) among intervention participants for the Cooking Self-efficacy subscale were not significant ($p = .27$). Similarly, pre- ($M = 21.24$; $SD = 6.50$) to post-scores ($M = 22.8$; $SD = 5.42$) for control participants were not significant ($p = .96$). Unpaired *t*-tests indicated that a comparison of mean change scores between groups was nonsignificant ($p = .80$). See Table 2 for a comparison of Cooking Self-efficacy items and subscale scores pre, post- for intervention and control groups, and Table 3 for comparisons between groups.

Self-efficacy for Using Basic Cooking Techniques and Skills subscale. Using paired *t*-tests, pre- ($M = 31.27$; $SD = 6.0$) to post-scores ($M = 37.2$; $SD = 5.94$) among intervention participants for the Self-efficacy for Using Basic Cooking Techniques and Skills subscale were significant ($p = .006$). Pre- ($M = 31.18$; $SD = 10.55$) to post-scores ($M = 32.24$; $SD = 7.85$) for control participants were not significant ($p = 0.90$). Unpaired *t*-tests indicated that a comparison of mean change scores between groups was nonsignificant ($p = .20$). See Table 2 for a comparison of Self-efficacy for Using Basic Cooking Techniques and Skills items and subscale scores pre-, -post- for intervention and control groups, and Table 3 for comparisons between groups.

Self-efficacy for Using Fruits, Vegetables, and Seasonings subscale. Using paired *t*-tests, pre- ($M = 25.80$; $SD = 5.66$) to post-scores ($M = 33.4$; $SD = 5.37$) among intervention participants for the Self-efficacy for Using Fruits, Vegetables, and Seasonings subscale were significant ($p = .001$). Pre- ($M = 27.47$; $SD = 8.57$) to post-scores ($M = 27.59$; $SD = 7.83$) for control participants were not significant ($p = .12$). Unpaired *t*-tests indicated that a comparison of mean change scores between groups was significant ($p = .015$). See Table 2 for a comparison of Self-efficacy for Using Fruits, Vegetables, and Seasonings items and subscale scores pre-, -post- for intervention and control groups, and Table 3 for comparisons between groups.

DISCUSSION

The purpose of this study was to evaluate the impact of a campus-based culinary nutrition education program, the College CHEF, to determine if there were significant differences from pre- to -post- intervention with participants' self-efficacy for cooking skills and techniques and fruit and vegetable use and consumption. Findings from this study indicated significant improvements in self-efficacy for using fruits, vegetables, and seasonings in the intervention group as compared to the control group and additional significant improvements within the intervention group for self-efficacy of fruit and vegetable consumption, self-efficacy for using basic cooking techniques, and self-efficacy for using fruits, vegetables, and seasonings. These results are promising given that the majority of college students do not engage in regular consumption of the daily recommended fruits and vegetables (ACHA, 2016) and that a lack of cooking skills serves as a main barrier with young adults carrying out healthy dietary practices (Larson et al., 2006). In addition, results are encouraging as self-efficacy impacts sustained behavior change. Also, an increase in self-efficacy supports individuals in feeling more comfortable in the future with trying new associated tasks, and exerting more effort toward them (Bandura, 1977; Brug et al., 1995). Given that many students within the intervention group had high self-efficacy scores at baseline, they may have associated higher motivation and persistence in general, which may have impacted the hypothesized improvement in the related self-efficacy outcomes as compared to the control group. Future research is warranted to include a broader segment of the college population, not just those who volunteer for such a program.

Bandura (1993) suggests that self-efficacy beliefs affect college students by increasing their motivation and persistence to master challenging tasks. A previous campus-based cooking program found that improvement in cooking skills in college students was associated with increased vegetable consumption (p <.001), lending support to cooking skills as a means to improve self-efficacy with fruit and vegetable consumption (Kourajian & Stastny, 2015). Another intervention, which used the same measures as the College CHEF, found that three of the eight scales on the pre- and -post-surveys showed significant differences between the treatment and control groups: Cooking Self-efficacy (p =.002), Self-efficacy for Using Basic Cooking Techniques (p <.0001), and Self-efficacy for Using Fruits, Vegetables, and Seasonings (Warmin, 2009). More significant findings in this study as compared to the College CHEF may have been attributed to the fact that the cooking classes were part of a required component of a credited course and that the study was comprised of six sessions, further supporting a longer duration to allow for more hands-on practice in an effort to promote cooking self-efficacy (Warmin, 2009).

Since three of the self-efficacy subscales were not significant for the intervention group as compared to the control group, it is important to determine what additional strategies could be incorporated to improve these areas for future programming. With previous programming, it was determined that improvements in self-efficacy subscales were associated with increased cooking terms and technique knowledge with participants which translated into improved cooking behaviors, as the more participants know about cooking, the more likely they are to cook, and the more self-efficacious they may feel (Warmin, 2009). This lends support to additional emphasis on imparting knowledge through a nutrition education component to improve cooking behaviors and related self-efficacy with participants. Further, those participants with lower self-efficacy may have dropped out of programming. Future research may incorporate additional tactics to improve self-efficacy to combat this. In addition, follow-up measures should encourage participants to share ways in which they could have been helped to feel more self-efficacious with participating in programming.

With using basic cooking techniques, there were several items for intervention participants which improved significantly pre- to –post-, even though the subscale itself did not have significant improvements. These included: sautéing (p =.00), stir-frying (p = .001), and roasting (p = .001). Previous research indicates that spending extra time with

instruction to ensure that concepts which may not be as familiar to college students are adequately covered may be beneficial in significantly improving their understanding (Warmin, 2009). Programming emphasized sautéing and stir-frying through a hands-on approach in three of the four sessions, and demonstrated and discussed roasting on multiple occasions, perhaps explaining why there were significant improvements in these areas. Items from the subscale which did not significantly improve such as boiling, simmering, and poaching, were not adequately practiced by all participants in programming; poaching was only discussed due to time constraints and not everyone brought their soup to a boil, only a simmer. Thus, not all participants were able to practice the technique of "boiling." In future programming, researchers should ensure that all techniques and skills being measured are adequately covered with opportunity to practice so that participants might feel more efficacious in these areas. This is especially important given that a link exists between self-efficacy with cooking skills and healthful eating habits (Lawrence. Thompson, & Margetts, 2000).

As previously mentioned, a longer duration of programming may be necessary to allow for individuals to have more practice with executing basic techniques, which may contribute to increased self-efficacy in this area. The potential effectiveness of increasing the duration of programming is supported by previous behavior change research which indicates that longer interventions tend to be more effective in improving outcomes (Hendrickson & Chaiken, 1993). Increasing the duration to one or two additional sessions, for a total of five or six instead of four, may allow for extra time to practice skills and receive feedback, potentially leading to self-efficacy gains (Bandura, 1977). However, programs of a longer duration need to be evaluated to determine benefits versus barriers to implementation. Further, attrition needs to be considered, so programs of a longer duration need to be balanced with appropriate recruitment and retention strategies.

The four sources of information which aid in improving self-efficacy should be further reinforced throughout future programming. Performance outcomes were enhanced by positively contributing to participants' experiences in class through making the experience engaging and entertaining. With regard to verbal persuasion, instructors continually provided positive verbal feedback when participants performed tasks correctly during programming, to aid in individuals' self-efficacy gains. When instructors praised participants' execution of tasks, they brought attention to it for fellow participants to observe, emphasizing verbal persuasion. Lastly, physiological feedback occurred when participants' personal reactions to programming, such as increased heart rate as a reaction to excelling at a task, had the ability to impact their performance within sessions. Physiological feedback, though the least impactful of the four facets and difficult to measure, still had the ability to make individuals more self-efficacious. If participants felt excited and motivated by physiological feedback, it had the potential to make them more confident in carrying out skills and techniques (Bandura, 1977). This could be enhanced in future programming by asking participants to reflect on physiological feedback at the end of each session, and encouraging them to channel those feelings into continued practice, in an effort to become more efficacious and elicit similar, stronger feedback. Additional ways to build self-efficacy through these four sources should be capitalized upon to help participants address and work on overcoming impediments related to healthy eating and cooking (Bandura, 2004). This may include having additional instructors to provide more frequent reinforcement and verbal persuasion, which may improve outcomes for students. Self-efficacy may take a while to develop, further necessitating the need for longer programming and follow-up and to determine if improve self-efficacy translated into changed behaviors. Another way to promote self-efficacy might be to further build upon vicarious reinforcement by having upperclassmen participate in programming. This might allow for freshman-level participants to be influenced by the actions and attitudes of slightly older peers. In addition, future programming should include comprehensive measures of self-efficacy throughout the program duration.

Previous research with adolescents indicates that perceived fruit and vegetable consumption barriers, such as not having enough time or money to eat healthy food can be overcome, which can lead to an increase in self-efficacy with fruit and vegetable consumption (Bruening, Kubik, Kenyon, Davey, & Story, 2010). The College CHEF's sessions sought to provide participants with information and skills on how to plan, budget, shop for, and cook healthy meals in an effort to help participants in overcoming perceived associated barriers. Given that there were significant improvements pre- to -post- for self-efficacy for using fruits, vegetables, and seasonings, it can be surmised that intervention participants were provided information to help them in feeling more self-efficacious in overcoming barriers associated with incorporating fruits, vegetables, and seasonings when cooking. However, to further improve self-efficacy in these areas, it may be of value for future programming to further emphasize and measure constructs for overcoming obstacles associated with healthy cooking and eating.

Cross-campus collaborations are a means to promote cohesiveness and provide resources among organizations/departments to support college students' well-being, such as through behavior change, and may be beneficial in future programming (Fullerton, 2011). Such examples of collaborations include: offering the College CHEF through a campus-based, credited nutrition education course, as research suggests that a credited freshman-level college class in which students were instructed and given opportunities to carry out cooking skills and techniques may result in significant improvements with participants' food preparation skills and in increasing self-efficacy with vegetable consumption (Kobler, 2013). Credited nutrition education classes which teach college students how to cook through hands-on practice and/or through having participants view instructional videos may be effective in promoting fruit and vegetable consumption (Brown, Wengreen, Vitale, & Anderson, 2011). Also, having dietetic students/staff offer individualized nutrition counseling for participants, emphasizing ways to incorporate fruits and vegetables into one's diet in relation to their personal dietary needs may be beneficial. All students residing on the campus where the study took place were required to choose from one of five meal plans (University of Kentucky [UK] Dining, 2017). As all intervention and control participants lived on campus and had mandatory meal plans, it can be assumed they ate at least some of their meals on campus. However, questions pertaining to on-campus dining were not asked in the surveys; these are questions future research of this kind may consider exploring. Further, all control and intervention participants had access to a kitchen in their place of residence, as all on-campus housing has at least one kitchen (Undergraduate Housing and Residence Life, Living Learning Program, UK Dining, & The UK Plus Account, 2015). Future studies may find it beneficial to include additional survey questions pertaining to participants' use of campus-based kitchens.

The positive findings from this study support the implementation of campus-based culinary nutrition education programming with future strategies to impact self-efficacy. Given that self-efficacy is a key component of behavior change, improved associated outcomes are promising, especially given that there were significant results in such a short amount of time (Strong et al., 2008). Considerations for future programming include: ensuring that all skills/techniques included within the measures are adequately practiced in class, increased strategies to improve self-efficacy throughout programming by ensuring that the four mechanisms which support self-efficacy are continually emphasized and encouraged, cross-campus collaborations providing additional resources in support of creating a campus culture which promotes healthy nutrition behaviors and skills, incorporating programming into a credited-nutrition education course, a longer duration of programming to allow participants additional opportunities to carry out skills learned to promote self-efficacious beliefs, and the incorporation of follow-up measures to assess long-term impact.

LIMITATIONS

Limitations for this study included (1) small sample size; (2) self-reported behavioral outcomes; (3) more females than males completing the surveys; and (4) a homogenous study sample, as both intervention and control groups were comprised of participants who all identified as "White." Thus, results may not be generalizable to other college campuses. However, the promising findings support programming and additional research in this area. The baseline comparison of demographics between intervention groups to ensure that there were no significant differences was important prior to combining intervention groups for data analysis purposes. Also, ensuring that programming was as identical as possible between the two intervention groups supported the justification of combining intervention groups. However, further process evaluation could be conducted during each session to reinforce the similarities. Self-reporting of outcomes related to behavior serves as a limitation in these kinds of studies, but it was the only feasible way to assess programming's impact.

CONCLUSION

The findings from this study support health educators in implementing future campus-based culinary nutrition education programming. Healthy Campus 2020 supports initiatives which promote healthy behavior, including strategies which aim to improve nutrition and weight status among college students, further lending merit to the College CHEF and its findings (Healthy Campus 2020, 2016). College campuses provide a distinctive setting in which to offer health education programming in an effort to promote positive behavior change. For many students, college marks the first time they independently make major lifestyle choices, and they may become more adaptable to behavior change (Sparling, 2007). Effective, innovative strategies to be considered in future programming to further promote self-efficacy may include: reinforcing strategies meant to improve self-efficacy, including goal-setting and measuring of goal-attainment with regard to self-efficacy, and cross-campus collaborations to promote a culture of healthy nutrition options, behaviors, and skills. Such partnership may occur through offering nutritional counseling to program participants and partnering with an agriculture department to allow students to learn more about the benefits of cooking and eating whole foods in an effort to boost related self-efficacy. In addition, the Breaking Bread strategy in which participants and instructors dined together at each session's end seemed important to building rapport. Future research might measure the impact of this strategy on group dynamics.

Table 1: *Demographics for Combined Intervention Group (N = 15) and Control Group (N =17)*

Variable	*Intervention Group*	*Control Group*
Sex		
Male	27 % (*n* = 4)	71% (*n* = 12)
Female	73 % (*n* = 11)	29% (*n* = 5)
Age: Mean (*SD*)	18.0	18.3 (0.59)
Ethnicity		
White	100% (*n* = 15)	100% (*n* = 17)
Year in College		
Freshman	100%	82% (*n* = 14)
Sophomore		18% (*n* = 3)

Table 2: *Self-Efficacy Subscale Comparison with Paired t-Test Pre-, -Post-Test Within Control (N = 17) and Intervention Groups (N = 15)*

	Pre-Test		*Post-Test*		
Scale/Items	*Mean (SD)*	*Range (Observed)*	*Mean (SD)*	*Range (Observed)*	*p*
Intervention					
FV Consumption SE	8.8 (3.5)	3-15	10.4 (3.02)	5-15	**0.04***
1. Eat FV at every meal, every day.	3.27 (1.33)		3.33 (1.29)		
2. Eat F or V as snack, even if everybody else were eating other snacks.	2.73 (1.44)		3.53 (1.13)		
3. Eat the recommended 9 half cup servings of FV per day.	2.47 (1.36)		3.33 (1.08)		
Cooking Self-Efficacy	24.23 (4.4)	16-30	25.33 (3.31)	21-30	0.27
1. Cook from basic ingredients.	3.93 (1.33)		4.07 (0.59)		
2. Follow a written recipe.	4.47 (0.83)		4.40 (0.51)		

3. Prepare dinner from items you currently have in your pantry and refrigerator.	4.07 (1.22)		4.07 (0.80)		
4. Use knife skills in the kitchen.	4.2 (0.77)		4.53 (0.84)		
5. Plan nutritious meals.	3.33 (1.4)		4.13 (0.84)		
6. Use basic cooking techniques.	4.27 (0.88)		4.4 (0.51)		
SE Using Basic Cooking Techniques	31.27 (6.0)	22-45	37.2 (5.94)	31-45	**0.006***
1. Boiling	4.53 (0.92)		4.6 (.80)		
2. Simmering	3.60 (1.45)		4.4 (.63)		
3. Sautéing	2.40 (1.35)		4.4 (.83)		
4. Stir-frying	2.80 (1.26)		4.27 (.80)		
5. Grilling	3.7 (1.3)		4.00 (1.00)		
6. Poaching	2.27 (1.1)		3.53 (1.41)		
7. Baking	4.4 (0.99)		4.4 (.83)		
8. Roasting	2.67 (1.29)		4.13 (.83)		
9. Microwaving	4.93 (0.26)		4.93 (0.26)		
SE FV & Seasonings	25.8 (5.66)	16-39	33.4 (5.37)	25-40	**0.001***
1. Fresh or frozen vegetables	3.93 (1.10)		4.20 (0.94)		
2. Root vegetables	3.53 (1.13)		4.4 (0.63)		
3. Fruit	4.13 (0.92)		4.2 (1.01)		
4. Herbs	3.13 (1.13)		4.4 (0.74)		
5. Spices	3.33 (1.23)		4.53 (0.64)		
6. Vinegars	2.33 (0.98)		3.87 (0.92)		
7. Citrus juices	2.73 (1.16)		4.07 (1.03)		
8. Hot sauces	2.73 (1.33)		4.00 (0.93)		
Control					
FV Consumption SE	9.24 (3.85)	3-15	9.18 (3.13)	4-15	0.17
1. Eat FV at every meal, every day.	3.29 (1.49)		3.18 (1.51)		
2. Eat F or V as snack, even if everybody else were eating other snacks.	3.29 (1.49)		3.53 (1.23)		
3. Eat the recommended 9 half cup servings of FV per day.	2.65 (1.37)		2.46 (1.46)		

Cooking SE	21.24 (6.5)	6-30	22.8(5.42)	15-30	0.96
1. Cook from basic ingredients.	3.35 (1.37)		3.71 (1.16)		
2. Follow a written recipe.	3.88 (1.36)		4.35 (0.61)		
3. Prepare dinner from items you currently have in your pantry and refrigerator.	3.29 (1.53)		3.71 (1.21)		
4. Use knife skills in the kitchen.	3.35 (1.46)		3.17 (1.33)		
5. Plan nutritious meals.	3.59 (1.30)		.53 (1.12)		
6. Use basic cooking techniques.	4.06 (1.07)		4.06 (0.83)		
SE Basic Cooking Techniques	31.18 (10.55)	3-43	32.24 (7.85)	23-45	0.90
1. Boiling	4.47 (1.07)		4.41 (0.80)		
2. Simmering	3.71 (1.16)		3.53 (1.07)		
3. Sautéing	3.18 (1.47)		3.29 (1.26)		
4. Stir-frying	3.47 (1.28)		3.63 (1.15)		
5. Grilling	3.22 (1.45)		3.47 (1.28)		
6. Poaching	2.47 (1.23)		2.63 (1.20)		
7. Baking	4.18 (1.01)		4.35 (0.70)		
8. Roasting	3.06 (1.25)		3.18 (1.38)		
9. Microwaving	4.71 (0.77)		4.82 (0.39)		
SE FV & Seasonings	27.47 (8.57)	9-40	27.59 (7.83)	16-40	0.12
1. Fresh or frozen vegetables	3.53 (1.18)		3.71 (1.16)		
2. Root vegetables	3.71 (1.31)		3.76 (1.15)		
3. Fruit	3.76 (1.15)		3.76 (1.15)		
4. Herbs	3.53 (1.33)		3.65 (1.17)		
5. Spices	3.53 (1.46)		3.65 (1.17)		
6. Vinegars	3.06 (1.20)		3.12 (1.17)		
7. Citrus juices	3.00 (1.19)		3.00 (1.22)		
8. Hot sauces	3.35 (1.37)		3.24 (1.25)		

***** Significant difference within group ($p < .05$)

Table 3: *Change Scores within Intervention (N = 15) and Control (N = 17) Groups and Significance Between Groups Using Unpaired* t-*Tests*

Scale	*Intervention Mean Difference (SD)*	*Control Mean Difference (SD)*	*p*
FV Consumption SE	1.6 (2.8)	-.06 (2.84)	0.11
Cooking SE	1.07 (3.58)	1.59 (7.42)	0.80
SE Basic Techniques	6.00 (7.2)	1.06 (13.46)	0.20
SE FV & Seasonings	7.6 (7.38)	0.12 (9.03)	**0.015***

* Significant difference between groups ($p < .05$)

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