



# HHS Public Access

Author manuscript

*Health Behav Policy Rev.* Author manuscript; available in PMC 2017 July 01.

Published in final edited form as:

*Health Behav Policy Rev.* 2016 July ; 3(4): 336–347. doi:10.14485/HBPR.3.4.5.

## Diet and Physical Activity Intervention Strategies for College Students

### **Yannica Theda S. Martinez, MS [Student],**

Department of Human Nutrition, Food and Animal Sciences, University of Hawaii, 1955 East-West Road, AgSci 216, Honolulu, HI 96822; Phone: 516-348-4717, yannica.martinez@gmail.com

### **Brook E. Harmon, PhD, RD [Assistant Professor],**

Division of Social and Behavioral Sciences, School of Public Health, University of Memphis, 200 Robison Hall, School of Public Health, University of Memphis, Memphis, TN 38152, bharmon1@memphis.edu, Phone: 901-678-1687, Fax: 901-678-1715

### **Claudio R. Nigg, PhD [Professor],**

Office of Public Health Studies, University of Hawaii, 1960 East-West Road, BioMed C-105A, Honolulu, HI 96822; Phone: 808-956-2862, cnigg@hawaii.edu

### **Erin O. Bantum, PhD [Associate Professor], and**

Cancer Prevention and Control Department, University of Hawaii Cancer Center, 701 Ilalo Street, Honolulu, HI, 96813; Phone: 808-441-3491, ebantum@cc.hawaii.edu

### **Shaila Strayhorn, MPH [Student]**

Division of Social and Behavioral Sciences, School of Public Health, University of Memphis, 214 Robison Hall, School of Public Health, University of Memphis, Memphis, TN 38152; Phone: 901-678-1706, sstryhrn@memphis.edu

## Abstract

**Objectives**—To understand perceived barriers of a diverse sample of college students and their suggestions for interventions aimed at healthy eating, cooking, and physical activity.

**Methods**—Forty students (33% Asian American, 30% mixed ethnicity) were recruited. Six focus groups were audio-recorded, transcribed, and coded. Coding began with *a priori* codes, but allowed for additional codes to emerge. Analysis of questionnaires on participants' dietary and physical activity practices and behaviors provided context for qualitative findings.

**Results**—Barriers included time, cost, facility quality, and intimidation. Tailoring towards a college student's lifestyle, inclusion of hands-on skill building, and online support and resources were suggested strategies.

---

Correspondence to: Claudio R. Nigg.

### **Human Subjects Approval Statement**

The University of Hawaii Manoa Institutional Review Board approved all recruitment protocols and materials before recruitment began.

### **Conflict of Interest Declaration**

The authors declare there are no conflicts of interest.

**Conclusions**—Findings provide direction for diet and physical activity interventions and policies aimed at college students.

### Keywords

nutrition; exercise; young adults; multiethnic

Various chronic diseases including hypertension and type 2 diabetes have been linked to obesity,<sup>1,2</sup> which has been on the rise in the United States (US) since the 1980's.<sup>3,4</sup> In 2012, 40% of college-aged adults (typically ages 18–24) were classified as either overweight or obese.<sup>5</sup> This high rate of obesity coincides with a trend towards even larger percentages of overweight and obesity among adults later in life.<sup>6,7</sup> However, interventions aimed at the rise in obesity have largely overlooked college-aged adults.<sup>8–11</sup>

The diet and physical activity behaviors of college-aged adults are marked by low physical activity rates, high television/computer viewing, and poor dietary habits.<sup>6,7,12</sup> College students, in particular, do not meet recommendations for foods and nutrients such as whole grains, fruits, vegetables, and calcium<sup>9,12</sup> and consume excessive amounts of sugar-sweetened beverages<sup>13,14</sup> as well as foods high in fat and salt.<sup>15</sup> According to students, their dietary choices are influenced by the availability of less healthy foods on-campus, in restaurants and fast food establishments, and in their dorm rooms.<sup>14–17</sup> Less is known about barriers related to cooking, but studies suggest lack of time and motivation are barriers even though positive attitudes and an interest in cooking as a way to eat healthy have also been reported.<sup>18–20</sup> College students report the quality of on-campus facilities, lack of time, lack of motivation, and the need for social support to encourage exercise as barriers to being physically active.<sup>16,18</sup> Despite this past research, little guidance and few examples are found in the literature on how to develop successful diet and physical activity behavior change interventions for college students.

Theory and previous interventions suggest increasing self-efficacy and skills related to taking action are important in helping individuals adopt healthier diet and physical activity behaviors.<sup>21–23</sup> To-date, there have been only small-scale, scattered approaches to developing interventions aimed at college students with few of them focused on skill building<sup>8</sup> or changing both diet and physical activity behaviors.<sup>24–26</sup> Also problematic in past research is the use of programs and strategies not developed for college students,<sup>24</sup> not developed for 2-year students, who are often older, more racially diverse, economically challenged, and independent than 4-year students,<sup>6,27–29</sup> and a lack of studies recruiting diverse populations.<sup>13,16,18,26</sup> To begin addressing these gaps in the literature, we examined whether perceived barriers to eating healthy, cooking, and being physically active were similar between an ethnically diverse population of 2-year and 4-year college students and those expressed in the literature by students with less diverse backgrounds. We also aimed to understand the student perspective on what strategies are necessary for the development of successful diet and physical activity behavior change interventions by asking them to help build an ideal curriculum that included both face-to-face and online components.

## METHODS

### Participants and Setting

Recruitment occurred at two 2-year campuses and one 4-year campus between September 2013 and January 2014. Recruitment efforts included posting multiple flyers and setting-up recruitment tables at each campus one to two times a month. Participation criteria included being enrolled in the University of Hawaii (UH) system and being 18 years of age or older. Participants were compensated with a \$15 gift card. Seventy-four students registered to participate, 40 students completed questionnaire data, and 38 students attended a focus group. Focus groups were held at a variety of times that were noted as acceptable by participants and were held in meeting rooms on the 4-year campus as well as the 2-year campus where the most recruitment occurred.

### Data Collection and Analysis

**Focus groups**—Participants joined one of six focus groups (group size ranged from 3–9 participants). Each focus group lasted 1–1.5 hours and consisted of an open-ended discussion moderated by the study’s principal investigator (BEH), assisted by the first author (YTM), and facilitated by a discussion guide (Table 1). Despite the presence of the focus group guide, discussion was allowed to evolve with little interruption from the moderator except to keep conversation on topic and ensure all sections of the guide were covered. All focus group discussions were audio recorded, transcribed, and coded using NVivo 10 (QSR International 2012).

The following steps were taken to ensure the credibility and trustworthiness of the findings from the focus groups: 1) review of interview transcripts and field notes to discuss possible discrepancies and observe new findings; 2) development of an initial codebook with *a priori* codes developed from the discussion guide; 3) BEH and YTM coded one focus group transcript together to ensure similar code interpretation and add emergent codes to the initial codebook; 4) BEH and YTM coded a second transcript separately and obtained an overall inter-rater reliability of 0.88 as measured using Cohen’s kappa (range of 0.54–1.00 for each code); 5) the remaining focus groups were coded by YTM and peer debriefings held with BEH and other co-authors to discuss emergent themes, refinement of the codebook, and categorization after every two focus group transcripts.

**Survey questions**—Demographic and psychosocial characteristics of focus group participants were collected. Students were also asked to provide feedback on their current diet and physical activity behaviors as well as attitudes, knowledge, interest, and past experiences with cooking. This data was collected to provide context and an understanding of participants’ past and present dietary and physical activity practices and behaviors.

The National Cancer Institute Fruit and Vegetable Screener<sup>30</sup> and the National Cancer Institute Percentage Energy from Fat Screener<sup>31</sup> were used to assess dietary intake. Both screeners were developed and validated for use with diverse adult populations.<sup>32,33</sup> Questions on physical activity and sedentary behaviors came from Project EAT, a longitudinal study of adolescents and young adults.<sup>8,31</sup> Project EAT’s physical activity

questions were adapted from previously validated questionnaires,<sup>34</sup> and their test-retest correlations for the sedentary items ranged from 0.66–0.80.<sup>35</sup> These questions have been used to report on the physical activity and sedentary behaviors of adolescents and young adults in several publications.<sup>34,36</sup> A survey previously developed for use with college students to assess attitudes, knowledge, interest, and past experiences with cooking was also used.<sup>25</sup> Questions related to attitudes towards cooking were scored using a Likert-scale where 1 is “strongly disagree” and 5 was “strongly agree,” questions related to knowledge and interest in cooking were yes/no, and questions about past experience cooking asked about frequency of engagement, which was categorized as once a week or more/less than once a week. During development, the survey was assessed for content validity and good internal reliability was seen between test-retest.<sup>25</sup> Questionnaire data was analyzed using SPSS software (v 22, IBM Corp. 2013).

## RESULTS

### Participant Characteristics

Of the 40 participants who completed questionnaires, the mean age was 25.4±7.9 years (Table 2). Most students were female (65%), 4-year students (78%), and Asian American (33%) or of mixed ethnicity (30%). Among participants who identified themselves as mixed ethnicity, Asian American, white, and Hawaiian had the highest frequencies. The majority of students were from Hawaii (58%), and approximately half lived with their parent’s (55%). Most participants meet recommendations related to fat intake (73%), physical activity (55%), and sedentary behaviors (75%), but did not meet recommendations for fruit and vegetable intake (13%).

Many of the participants agreed with the statement “I like to cook healthy food” (see Table 3). In addition, 92.5% of participants reported engaging in grocery shopping and 85% buying fruits and vegetables when shopping. Fewer participants reported knowing how to budget for groceries (53%) or store food (68%). Past engagement in cooking included owning cookbooks (60%), taking a nutrition course (45%), and taking a cooking class (25%). Also, most participants grew up in environments where they helped with grocery shopping and meal preparation once a week or more (55% and 65%, respectively).

### Barriers to Healthy Eating, Cooking, and Physical Activity

The focus groups consisted of 38 participants as two people were not able to attend any of the scheduled focus group sessions. Time was noted as the primary barrier to healthy cooking (19 mentions). Participants discussed the amount of time spent at school and work as contributors to their habit of eating “*on-the-go*” and turning to fast food, instead of cooking or seeking out healthier options. One participant noted: “*I have a jam packed course load then work load. So, like usually eating is at the bottom of my list.*” Many participants also felt their “student budget” and the high cost of healthy eating were barriers to cooking and purchasing healthy foods (18 mentions), “*The cost of nutrition is high, especially in Hawaii.*”

In addition to time and money, participants reported knowing how to cook, but noted intimidation and a lack of skills related to food storage and preservation were obstacles to implementing their cooking knowledge (18 mentions). They expressed a desire to cook healthier with a variety of foods, but noted a lack of skills related to cooking vegetables and local foods, “*There’s a lot of like local Hawaiian ingredients that I don’t know how to cook with and I’m like ‘wow that looks yummy, but what am I supposed to do with that?’*”

Time and cost were common barriers for physical activity as well (22 and 10 mentions, respectively). Because of “*hectic*” schedules, participants noted being too tired and stressed to exercise, “*We don’t have time...I’m tired and I have so much to do.*” Participants with gym memberships discussed canceling memberships because they were not going often enough and it cost too much, “*I used to have a gym membership, but then I couldn’t afford it anymore.*” Those without gym memberships noted the cost of memberships as well as other resulting costs such as laundry, parking, and transportation kept them from signing up.

Participants also reported the accessibility and quality of free on-campus facilities as barriers to use (20 mentions), “*And the [University] has a gym, but no parking, and if I take the bus, it’s like an all-day affair just to go to the gym.*” Intimidation and lack of skills were additional reasons participants gave for not using gyms or taking exercise classes (13 mentions). Students expressed feelings of anxiety and judgment related to not knowing how to use equipment or not feeling up to the skill level of a class, “*Sometimes the gym atmosphere is very intimidating...if you’re a newbie you’re like ‘oh wow, these people know what they’re doing.’*”

### Curriculum Suggestions

**Nutrition focus (42 mentions)**—Participants felt having educational sessions focused on nutrition was important in learning how to cook healthier, “*...learning about the nutrition side...how can I make this meal more delicious and also more nutritious ‘cause I feel like I miss some things.*” They suggested classes provide information on portion sizes, balance and variety, food safety, and different types of specialized diets, specifically mentioning Paleo, gluten-free, and vegetarian diets. Participants requested help in sorting through mixed health messages and personalizing diet information, and suggested sessions focus on eating on-campus, ways to have a fast-paced yet healthy lifestyle, and on specific meals or foods, specifically mentioning wanting help preparing vegetables and breakfast items.

**Cooking for college students (49 mentions)**—Participants emphasized the need to match class content to the cooking abilities and lifestyles of college students. They operationalized this idea as learning to cook nutritious foods that were cost-effective, quick, and easy, “*The basics...like how to prepare, and how to be cost effective on campus.*”

Participants suggested sessions on cooking basics, grocery shopping, and economical cooking, which was discussed within the context of transitioning to living independently. Participants also suggested offering advanced classes that included more complex and “*adventurous*” cooking, specifically preparing ethnic or local foods and using herbs and spices. The most commonly suggested format for hands-on classes included cooking during class and allowing participants to consume the food there or take it with them, “*... we*

*prepared food and every week we'd leave with containers of food.*" Participants asked that in-class recipes use a limited number of ingredients to save on the time and money needed to recreate them.

**Local focus (26 mentions)**—Participants suggested connecting classes with community resources to benefit local businesses and increase their exposure among students. Specifically, students suggested coordinating with farmers' markets to use their produce in cooking classes or as part of how-to demonstrations, "...*contract with the [farmers' market] guys and say...you will have a guaranteed buy on your vegetables...the students then have to pay less.*" They also suggested having a garden as part of the program with an area for students not participating in the program to use as well.

**Overcoming barriers to physical activity (26 mentions)**—Suggested topics for physical activity sessions included time management, fitting exercise into busy schedules through mini workouts between classes, and home-based workouts. Students were particularly interested in exercises that could be done at home, would require no equipment, and would incorporate more of an all-around active lifestyle as opposed to focusing on gym membership, "...*just basics or even body weight exercises, where you could not need a gym.*" Although, a sub-set of participants did advocate for coordinating with the university gym to provide "...*more open workshops that people can take...*" or to provide passes.

Participants advocated for different venues, "...*something like outdoor activities,*" with parks, beaches, and recreation areas suggested, as well as alternative types of activities to alleviate the burden associated with the word "*exercise.*" Their alternative activity suggestions included surfing, hiking, and airsoft or paintball. They also suggested having group classes and workouts built into the program with lessons on flexibility, weight-lifting, mechanics of different workouts, and aerobic exercises. Participants wanted a balance of different types of workouts across classes and the ability to personalize the workouts based on preference and skill level.

**Face-to-Face component**—Participants emphasized the desire to work in groups and bring a friend (11 mentions), "*exercise for myself is...generally based on availability and availability of others. Generally, I find it really boring to exercise on my own.*" They referred to the "*buddy system*" as a way to stay accountable and to help them feel more comfortable attending the program.

The timing and structure of face-to-face sessions was discussed at length across the focus groups (50 mentions). Most participants advocated for a semester long course consisting of classes 2–4 times per month that would run for 1–1.5 hours on weekdays. To meet students' schedules, participants suggested offering the class multiple times per week or at both a day and night time, "*Have it Monday, Tuesday, Wednesday every week and then if you have time on Monday this week, you go Monday, the next week you go Tuesday.*" They also suggested class topics alternate between diet and physical activity, "*Maybe do it every week but switch up what you're offering each week...the first week is a lecture...third week is a yoga activity...fourth week is a cooking class.*"

Participants were interested in taking the course for credit only if it was a prerequisite or filled a graduation requirement; otherwise, they felt it should be free (20 mentions), *“I wouldn’t take a credit class because I have all these credits that I need to take... unless it’s like a gen-ed type thing that fulfills some type of gen-ed requirement.”*

**Online component**—Participants suggested an online discussion group format, similar to Facebook or GooglePlus, be used to track activity progress, share supplemental information such as additional workouts, recipes, or coupons, share local resources or news articles, and interact with peers and professionals from class (44 mentions), *“A mixture of like a group thing like Facebook, but then also having things posted that we discussed such as recipes and nutrition, maybe link to websites that give out coupons and give nutrition information.”*

Interest in interactions online included holding classes or meet-ups and discussing workouts and cooking attempts outside of class. Emphasis was also given to using videos (16 mentions). Videos oriented towards beginner, intermediate, and advanced level students were suggested. Participants also suggested posting videos of workouts, cooking demonstrations, grocery store tours, and recordings of face-to-face sessions, *“You could either have videos of the demo or how to cook that dish, so you don’t have to demo in class. Or you could record the demo while you’re doing the class.”*

The structure of goal setting and receiving feedback on goals was discussed at length (53 mentions); however, participants were mixed as to whether they preferred receiving feedback on goals and progress from program staff or peers. One suggestion that emerged was to have students share with staff first until they felt comfortable sharing with the group. Feeling comfortable was discussed by participants in terms of knowing the group through face-to-face classes and keeping class sizes small, *“If it’s a smaller class, I think a peer-type and professor-type feedback is best to use ‘cause... you’re around people you see majority of the time whose feedback might be helpful to you versus a larger class setting... where sharing your personal goals with them may be kind of awkward.”* Some participants felt monitoring by staff would be needed throughout to ensure peer suggestions were appropriate and to provide continuing motivation.

Online tracking resources (11 mentions) such as MyFitnessPal.com and BodyBuilding.com were noted as potential sites to emulate or use as part of the program’s goal setting component. Participants also suggested incorporating the use of trackers like FitBits or BodyMedia bands to monitor themselves as well as have a professional review and provide feedback. Participants were open to having reminders/alerts sent to them reminding them to work out or to share a new recipe, *“I would need reminders to check it... daily if possible through your phone or maybe an app that can send you an alert.”* Most participants acknowledged they may have to be held accountable when tracking their progress (15 mentions), *“Accountability for me is important; if I don’t tell someone about it... a lot of times it won’t happen.”* Participants also noted the need to keep online content new and engaging in order to keep students from becoming bored and dropping out.

## DISCUSSION

Obesity prevention and behavior change programs typically overlook college students as an at-risk population. While researchers note poorer health choices and barriers to healthy cooking and physical activity in this population, systematic guidance has not been provided for designing prevention programs. This study aimed to provide that guidance while adding to our understanding of behaviors among students with diverse backgrounds. Our findings support previous studies on barriers conducted with less diverse populations and expands these findings in the area of recommended intervention strategies.

Demographically, our study population matched the larger UH student body.<sup>37</sup> The mean age of participants was  $25.4 \pm 7.9$  years, making our population older than participants in other college-focused studies,<sup>16,18,25</sup> which may be due in part to our inclusion of 2-year students who are often older than students attending 4-year institutions.<sup>29</sup> Overall, fruit and vegetable intake was lower than recommended while fat intake was within the recommended range, which was comparable to other studies of college students.<sup>38-40</sup> Most participants reported moderate-to-vigorous physical activity levels and participation in screen time activities that met recommendations, which makes our population more active than college populations in other studies.<sup>7,10,41</sup> However, focus group findings indicated most students struggled to cook healthier as well as be physically active, highlighting the need for programming that targets even those students who report positive behaviors.

Past experiences may have contributed to participants' overall positive attitudes towards cooking and knowledge of some aspects of cooking. However, time, cost, and facility quality were major barriers for both cooking healthy and being physically active in our focus groups as well as other research with college students.<sup>16,18,42,43</sup> Adding to the literature, participants in our study noted lack of skills and intimidation as additional barriers to cooking and being active. Students perceived cooking as a way to eat healthier, but lacked skills related to cooking healthier foods such as vegetables, using herbs and spices, and storing food. Lack of skills was also a barrier to being active as students felt not up to the skill level of some gyms and classes.

Past research indicated a need<sup>8,10,16,24,27,44</sup> and students in this study indicated an overall interest in having diet and physical activity focused programming on campus. Students in this study noted a model program would include classes that revolve around college students' abilities and way of life. Classes scheduled multiple times during the week give students the option of attending a class that fits their schedule. In addition, the 2-year students advocated for having programs on their own campuses. Two-year students, compared to 4-year students may be older, more racially diverse, economically challenged, and independent<sup>6,27,28</sup>. In addition, 2-year students have been shown to have poorer dietary intake compared to 4-year students, including higher saturated fat and soda intake,<sup>28</sup> with 2-year female college students being particularly at risk for overweight and obesity and poorer diet and physical activity behaviors.<sup>6</sup> These differences suggest the need for programs targeting specific populations versus a one-size fits all approach.<sup>44</sup>



Students suggested a semester-long course format, with classes offered weekly or every other week, and class lengths of 1–1.5 hours. Previous interventions with college students suggest this format can be successful.<sup>45–47</sup> Participants in our study also recommended classes incorporate the health and science side of diet and physical activity, focus on local foods, and include skill-building experiences. A few diet interventions have included similar types of strategies<sup>25,48</sup> and found them impactful. However, these strategies should be tested in combination to examine if they are both feasible and impactful especially on a larger scale for a longer duration than has been tested to-date.

Students suggested alternating classes on diet and physical activity. Few interventions for college students address both diet and physical activity behavior change.<sup>24,49</sup> Our study and others<sup>16,18,42,50</sup> suggest gym passes and emphasis on a buddy system are successful strategies for engaging students in physical activity. Adding to this literature, participants in our study also wanted programming to focus on home-based or outdoor activities. Such alternative exercises may help students overcome barriers and develop active lifestyles.<sup>47,49</sup>

Behavior change studies that included online components<sup>51–53</sup> found improved behaviors among college students. However, few studies have looked at barriers and preferences related to these online programs. Participants in this study highlighted goal setting, interaction with professionals, and personalization as important components of online programming. Formats such as Facebook, text messaging, and email may be effective,<sup>52,53</sup> but additional research is needed on ways to increase sustained engagement and long-term motivation. Findings from our study suggest mixing face-to-face with online components may provide the variability students need to keep them motivated and engaged.

### Limitations

Our recruitment was limited to students attending college in Hawaii who self-selected to participate. However, our findings add to the literature on improving diet and physical activity behaviors among an ethnically diverse college population. While we recruited 2-year (23% of participants) and male students (35% of participants), more work is needed to add to our understanding of program strategies that would attract and engage these populations. Diet and physical activity were assessed using self-report data, which may lead to the underreporting of less healthy practices and the overreporting of healthier practices.<sup>54,55</sup> However, validated screeners and questionnaires designed for young adults were used to reduce self-report bias. In addition, the similarity in findings from the questionnaires and focus groups increases our confidence in the results presented.

### IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

College is a time of expanded autonomy and self-development among young adults; however, it is also a time when poor diet and physical activity behaviors may develop or emerge. Health professionals and administrators on college campuses can become part of the solution through the provision of diet and physical activity behavior change interventions. Despite the scarcity in guidance and examples of successful large scale interventions to-date, successful behavior change programming begins with meeting students' needs and desires while also being theoretically grounded.

Behavior change programs aimed at college students must tap into the transition period students are experiencing. Instead of lectures on healthy eating and being active, linkages need to be made between these behaviors and helping students build skills such as budgeting, cooking for oneself, grocery shopping, and developing an active lifestyle. While the study's focus groups centered on a stand-alone diet and physical activity program, the suggested strategies could be embedded into introduction to college courses that are common on college campuses and are where other transitional skills are often presented. As time is a noted barrier in our study and others, a discussion of time management in the course could involve how to include physical activity and healthy eating in a student's day along with studying and work.

Cost was another barrier discussed by participants in this study and others. Participants provided great insight into the development of a hands-on cooking and healthy eating curriculum that would be desirable to college students. However, cost as well as facility quality are barriers college administrators and health professionals can help students address via both environmental and individual-level change interventions. A previous examination of physical activity promotion on college campuses found few initiatives targeted interpersonal, community, or policy factors.<sup>56</sup> Working to establish high quality, free or low cost gyms, communal kitchen spaces, and healthy eating establishments on or near college campuses would provide critical support to college students attempting to adopt healthier eating, cooking, and physical activity behaviors.

In addition to reducing prominent barriers to healthy eating and physical activity, interventions must also tap into emerging technology as well as alternative ways of thinking about diet and physical activity to engage and keep students' interest. Incorporating online healthy eating, cooking, and physical activity support and resources provides an avenue for improving behaviors that can be offered in conjunction with face-to-face classes or as stand-alone programming. In addition, strategies such as bringing farmer's markets or community gardens to campus, helping students merge healthy eating with specialized diets such as the Paleo diet or being vegetarian or gluten-free, and helping students make their lifestyle more active versus just scheduling time at the gym are needed to engage and then keep students interested in changing their diet and physical activity behaviors.

Behavior change strategies that incorporate diet and physical activity skill building into programs and on-campus systems, such as current gyms and on-campus dining, while also tapping into students' broader life and interest in emerging trends are needed to promote healthy diet and physical activity behaviors among college students. Next steps for researchers include testing these strategies for feasibility and effectiveness as well as examining whether these strategies increase intervention participation and long-term motivation.

## Acknowledgments

This work was supported by a post-doctoral fellowship grant from the National Cancer Institute [R25 CA 90956]. We would like to acknowledge the participants for their contributions.

## References

1. National Institutes of Health: National Heart Lung and Blood Institute. [Accessed May 13, 2014] The practical guide: Identification, evaluation, and treatment of overweight and obesity in adults (online). Available at: [http://www.nhlbi.nih.gov/guidelines/obesity/prctgd\\_c.pdf](http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf)
2. Pi-Sunyer X. A clinical view of the obesity problem. *Science*. 2003; 299(5608):859–860. [PubMed: 12574620]
3. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. *JAMA*. 2011; 303(3):235–241.
4. Finucane MM, Stevens GA, Cowan MJ, et al. National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *Lancet*. 2011; 377(9765):557–567. [PubMed: 21295846]
5. Mokdad AH, Serdula MK, Dietz WH, et al. The spread of the obesity epidemic in the United States, 1991–1998. *JAMA*. 1999; 282(16):1519–1522. [PubMed: 10546690]
6. Laska MN, Pasch KE, Lust K, et al. The differential prevalence of obesity and related behaviors in two-vs. four-year colleges. *Obesity*. 2011; 19(2):453–456. [PubMed: 20966910]
7. Haberman S, Luffey D. Weighing in college students' diet and exercise behaviors. *J Am Coll Health*. 1998; 46(4):189–191. [PubMed: 9519583]
8. Nelson MC, Story M, Larson NI, et al. Emerging adulthood and college-aged youth: an overlooked age for weight-related behavior change. *Obesity*. 2008; 16(10):2205–2211. [PubMed: 18719665]
9. Kasperek DG, Corwin SJ, Valois RF, et al. Selected health behaviors that influence college freshman weight change. *J Am Coll Health*. 2008; 56(4):437–444. [PubMed: 18316289]
10. Keating XD, Guan J, Piñero JC, Bridges DM. A meta-analysis of college students' physical activity behaviors. *J Am Coll Health*. 2005; 54(2):116–126. [PubMed: 16255324]
11. Webb JB, Hardin AS. A preliminary evaluation of BMI status in moderating changes in body composition and eating behavior in ethnically-diverse first-year college women. *Eat Behav*. 2012; 13(4):402–405. [PubMed: 23121798]
12. Krebs-Smith SM, Guenther PM, Subar AF, et al. Americans do not meet federal dietary recommendations. *J Nutr*. 2010; 140(10):1832–1838. [PubMed: 20702750]
13. Nelson MC, Neumark-Sztainer D, Hannan PJ, Story M. Five-year longitudinal and secular shifts in adolescent beverage intake: findings from Project EAT (eating among teens)-II. *J Am Diet Assoc*. 2009; 109(2):308–312. [PubMed: 19167959]
14. Nelson MC, Story M. Food environments in university dorms: 20,000 calories per dorm room and counting. *Am J Prev Med*. 2009; 36(6):523–526. [PubMed: 19356889]
15. Larson N, Neumark-Sztainer D, Laska MN, Story M. Young adults and eating away from home: associations with dietary intake patterns and weight status differ by choice of restaurant. *J Am Diet Assoc*. 2011; 111(11):1696–1703. [PubMed: 22027052]
16. Nelson MC, Kocos R, Lytle LA, Perry CL. Understanding the perceived determinants of weight-related behaviors in late adolescence: a qualitative analysis among college youth. *J Nutr Educ Behav*. 2009; 41(4):287–292. [PubMed: 19508935]
17. Larson N, Neumark-Sztainer D, Story M, et al. Identifying correlates of young adults' weight behavior: survey development. *Am J Health Behav*. 2011; 35(6):712–725. [PubMed: 22251762]
18. LaCaille LJ, Dauner KN, Krambeer RJ, Pedersen J. Psychosocial and environmental determinants of eating behaviors, physical activity, and weight change among college students: a qualitative analysis. *J Am Coll Health*. 2011; 59(6):531–538. [PubMed: 21660808]
19. Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better diet quality. *J Am Diet Assoc*. 2006; 106(12):2001–2007. [PubMed: 17126631]
20. Byrd-Bredbenner C. Food preparation knowledge and attitudes of young adults: implications for nutrition practice. *Top Clin Nutr*. 2004; 19(2):154–163.
21. Prestwich A, Kellar I, Parker R, et al. How can self-efficacy be increased? meta-analysis of dietary interventions. *Health Psychol Rev*. 2014; 8(3):270–285. [PubMed: 25053214]

22. Williams SL, French DP. What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour—and are they the same? *Health Educ Res.* 2011; 26(2):308–322. [PubMed: 21321008]
23. Bandura A. Health promotion by social cognitive means. *Health Educ Behav.* 2004; 31(2):143–164. [PubMed: 15090118]
24. Laska MN, Pelletier JE, Larson NI, Story M. Interventions for weight gain prevention during the transition to young adulthood: a review of the literature. *J Adolesc Health.* 2012; 50(4):324–333. [PubMed: 22443834]
25. Levy J, Auld G. Cooking classes outperform cooking demonstrations for college sophomores. *J Nutr Educ Behav.* 2004; 36(4):197–203. [PubMed: 15544728]
26. Calfas KJ, Sallis JF, Nichols JF, et al. Project GRAD: two-year outcomes of a randomized controlled physical activity intervention among young adults. *Am J Prev Med.* 2000; 18(1):28–37. [PubMed: 10808980]
27. Boyd JK, Braun KL. Supports for and barriers to healthy living for native Hawaiian young adults enrolled in community colleges. *Prev Chronic Dis.* 2007; 4(4):88–99.
28. Nelson MC, Larson NI, Barr-Anderson D, et al. Disparities in dietary intake, meal patterning, and home food environments among young adult nonstudents and 2- and 4-year college students. *Am J Public Health.* 2009; 99(7):1216–1219. [PubMed: 19443824]
29. National Center for Education Statistics. [Accessed January 5, 2016] QuickStats create table: First institutional level 2003-04 (2-yr or 4-yr) by age first year enrolled (18 or younger to 30 or older). Available at: <http://nces.ed.gov/datalab/quickstats/createtable.aspx>
30. National Cancer Institute: Cancer Control and Population Sciences. [Accessed April 3, 2013] Fruit and vegetable screeners: Scoring the all-day screener (on-line). Available at: <http://riskfactor.cancer.gov/diet/screeners/fruitveg/scoring/allday.html>
31. National Cancer Institute: Cancer Control and Population Sciences. [Accessed April 3, 2013] Percent energy from fat screener: Scoring procedures (on-line). Available at: <http://riskfactor.cancer.gov/diet/screeners/fat/>
32. Thompson FE, Midthune D, Williams GC, et al. Evaluation of a short dietary assessment instrument for percentage energy from fat in an intervention study. *J Nutr.* 2008; 138(1):193–199.
33. Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: performance of 2 new short instruments and a food frequency questionnaire. *J Am Diet Assoc.* 2002; 102(12):1764–1772. [PubMed: 12487538]
34. Nelson MC, Neumark-Sztainer D, Hannan PJ, et al. Longitudinal and secular trends in physical activity and sedentary behavior during adolescence. *Pediatrics.* 2006; 118(6):1627–1634.
35. Utter J, Neumark-Sztainer D, Jeffery R, Story M. Couch potatoes or French fries: are sedentary behaviors associated with body mass index, physical activity, and dietary behaviors among adolescents? *J Am Diet Assoc.* 2003; 103(10):1298–1305. [PubMed: 14520247]
36. Nelson MC, Gordon-Larsen P. Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors. *Pediatrics.* 2006; 117(4):1281–1290. [PubMed: 16585325]
37. The University of Hawai'i. The university of Hawai'i system (on-line). [Accessed 05/23, 2014] Available at: <http://www.hawaii.edu/about/>.
38. Racette SB, Deusinger SS, Strube MJ, Highstein GR, Deusinger RH. Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. *J Am Coll Health.* 2005; 53(6):245–251. [PubMed: 15900988]
39. Levitsky DA, Halbmaier CA, Mrdjenovic G. The freshman weight gain: a model for the study of the epidemic of obesity. *Int J Obes.* 2004; 28(11):1435–1442.
40. Irazusta A, Hoyos I, Irazusta J, et al. Increased cardiovascular risk associated with poor nutritional habits in first-year university students. *Nutr Res.* 2007; 27(7):387–394.
41. Gordon-Larsen P, Nelson MC, Popkin BM. Longitudinal physical activity and sedentary behavior trends: adolescence to adulthood. *Am J Prev Med.* 2004; 27(4):277–283. [PubMed: 15488356]
42. Greaney ML, Less FD, White AA, et al. College students' barriers and enablers for healthful weight management: a qualitative study. *J Nutr Educ Behav.* 2009; 41(4):281–286. [PubMed: 19508934]

43. Pan J, Nigg CR. Motivation for physical activity among hawaiian, japanese, and filipino university students in hawai'i. *J Appl Sport Psychol.* 2011; 23:1–15.
44. LaRose JG, Gorin AA, Clarke MM, Wing RR. Beliefs about weight gain among young adults: potential challenges to prevention. *Obesity.* 2011; 19(9):1901–1904. [PubMed: 21738239]
45. Boyle J, Mattern CO, Lassiter JW, Ritzler JA. Peer 2 peer: efficacy of a course-based peer education intervention to increase physical activity among college students. *J Am Coll Health.* 2011; 59(6):519–529. [PubMed: 21660807]
46. DeVahl J, King R, Williamson J. Academic incentives for students can increase participation in and effectiveness of a physical activity program. *J Am Coll Health.* 2005; 53(6):295–298. [PubMed: 15900994]
47. Jackson EM, Howton A. Increasing walking in college students using a pedometer intervention: differences according to body mass index. *J Am Coll Health.* 2008; 57(2):159–164. [PubMed: 18809532]
48. Matvienko O, Lewis DS, Schafer E. A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *J Nutr Educ.* 2001; 33(2):95–101. [PubMed: 12031189]
49. LaRose JG, Tate DF, Gorin AA, Wing RR. Preventing weight gain in young adults: a randomized controlled pilot study. *Am J Prev Med.* 2010; 39(1):63–68. [PubMed: 20537843]
50. Cholewa S, Irwin JD. Project IMPACT: brief report on a pilot program promoting physical activity among university students. *J Health Psychol.* 2008; 13(8):1207–1212. [PubMed: 18987094]
51. Gow RW, Trace SE, Mazzeo SE. Preventing weight gain in first year college students: an online intervention to prevent the “freshman fifteen”. *Eat Behav.* 2010; 11(1):33–39. [PubMed: 19962118]
52. Napolitano MA, Hayes S, Bennett GG, Ives AK, Foster GD. Using Facebook and text messaging to deliver a weight loss program to college students. *Obesity.* 2013; 21(1):25–31. [PubMed: 23505165]
53. Wadsworth DD, Hallam JS. Effect of a web site intervention on physical activity of college females. *Am J Health Behav.* 2010; 34(1):60–69. [PubMed: 19663753]
54. Kipnis V, Subar AF, Midthune D, et al. Structure of dietary measurement error: results of the OPEN biomarker study. *Am J Epidemiol.* 2003; 158(1):14–21. [PubMed: 12835281]
55. Ferrari P, Friedenreich C, Matthews CE. The role of measurement error in estimating levels of physical activity. *Am J Epidemiol.* 2007; 166(7):832–840. [PubMed: 17670910]
56. Milroy JJ, Wyrick DL, Bibeau DL, Strack RW, Davis PG. A university system-wide qualitative investigation into student physical activity promotion conducted on college campuses. *Am J Health Promot.* 2012; 26(5):305–312. [PubMed: 22548426]

**Table 1****Questions and Probes from Focus Group Guide****Barriers:**

When you eat at home or with family and friends, do you get involved in picking out/preparing the food?

Are you interested in cooking?

What do you see as the difference between “healthy” and “unhealthy” cooking?

Are there other things that keep you from eating healthier?

What do you want to see as part of a hands-on cooking class?

How involved are you in physical activity?

What keeps you from being active? – If physical activity was not mentioned a lot

Are there types of physical activity you would like to learn about?

What skills do you think you need to be more active?

What do you think is a good balance of sedentary time and time being active?

Past experience with changing lifestyle

Have you tried to make changes to the foods you eat or your physical activity before?

**Face-To-Face Class Format:**

Would you be more likely to attend classes if they were held on-campus? With or without someone?

How often would you want to attend a healthy lifestyle class?

How long do you think a series of classes on this topic should last?

Credit or no credit? Why?

**Online Portion of Class:**

Have you used online resources to find health information/information to make changes to your diet and/or physical activity before? Why or why not?

What types or resources do you find helpful and not so helpful?

How often do you want to be interacting with the group online?

What type of content would you like shared on these online discussion?

What type of format would you prefer to use?

**Goal Setting:**

Do you prefer to send goals and receive feedback from moderator/staff or from the group? Why?

How would you like your progress to be tracked? Would this be private (via email) or part of the group discussion? Why?

**Table 2**Characteristics of Participants, College Students in Hawaii (N=40)<sup>a</sup>

<b>Age</b> (years), Mean (SD)	25.4 (7.9)
<b>Sex</b>	
Women	26 (65)
Men	14 (35)
<b>Ethnicity</b>	
Asian American	13 (32.5)
Mixed Ethnicity	12 (30)
White	8 (20)
Other	7 (17.5)
<b>College Attended</b>	
4-year full-time	31 (77.5)
2-year full-time	9 (22.5)
<b>Home State/Country</b>	
Hawaii	23 (57.5)
Other US State	16 (40)
International	1 (2.5)
<b>Lived in the Past Year</b>	
Parent's Home	22 (55)
Independent	10 (25)
Residence Hall	4 (10)
Other	4 (10)
<b>Met Recommendations</b>	
Fruit and Vegetable Intake Recommendations (5 cups/day)	5 (12.5)
Fat Intake Recommendations (20–35% of calories/day)	29 (72.5)
MVPA Recommendation ( 2.5 hours/week)	22 (55)
Screen Time Recommendation <sup>b</sup> (< 14 hours/week)	30 (75)

SD=Standard Deviation, MVPA=Moderate-Vigorous Physical Activity

<sup>a</sup>Data are presented as N (%) unless otherwise noted<sup>b</sup>Screen Time = Watching TV or using a computer outside of homework

**Table 3**

Healthy Eating and Cooking Habits of Participants, College Students in Hawaii (N=40)

<b>Attitudes Towards Cooking, Mean (SD)<sup>a</sup></b>	
I feel comfortable in the kitchen	4.0 (1.0)
I like to cook	4.0 (1.0)
I feel comfortable following recipes	4.2 (0.7)
I like to cook healthy food	3.9 (0.8)
Knowing how to cook is important to me	4.3 (0.8)
Knowing how to cook is important for eating healthy	4.3 (0.9)
<b>Feel Knowledgeable About Food Preparation, N(%) agreed</b>	
Grocery Shopping	37 (92.5)
Cooking	35 (87.5)
Buy fruits and vegetables	34 (85.0)
Read food labels	32 (80.0)
Budget for groceries	21 (52.5)
Store perishable foods (fruits, vegetables, meats, dairy)	27 (67.5)
Make a grocery list	35 (87.5)
<b>Cooking Engagement Interest, N(%) yes</b>	
Taken a Cooking Class	10 (25.0)
Owns Cookbooks	24 (60.0)
Taken a Nutrition Class	18 (45.0)
<b>Past Cooking Engagement, N(%) once a week or more</b>	
Helped with Grocery Shopping	22 (55.0)
Helped with Meal Preparation	26 (65.0)

SD=Standard Deviation

<sup>a</sup>Scale ranged from 1-5 with 1=Strongly Disagree and 5=Strongly Agree