Using a Teaching Partnership to Improve Nutrition and Exercise in College Students

Naiman A. Khan[1], Christopher J. Nasti[2], Ellen M. Evans[3] and Karen M. Chapman-Novakofski[4]
University of Illinois
Urbana, IL 61801

Abstract

Developing sustainable obesity prevention strategies is a primary focus for researchers, including those in the college setting. To improve nutrition and exercise beliefs and behaviors among college students a one-semester nutrition and exercise course was created and implemented using an undergraduate faculty-Peer Educator teaching model. The first eight-week session focused on undergraduate Peer Educator training and development of curriculum for the nutrition and exercise course. Six Peer Educators were recruited from undergraduate dietetics and kinesiology classes. A teaching training program was developed based on the WHO: Training of Trainers Manual. Peer Educators provided feedback on topics and course content. During the second eight-week session, Peer Educators (n=6) led weekly discussions with the class (n=39) and faculty (n=2) conducted lectures. At the conclusion of the 8-week class, students reported improved self-efficacy for resisting eating under pressure from others and when physically run down. Students' outcome expectations and intake related to vegetables and fruits improved. Self-reported weekly strenuous and moderate exercise also improved. Despite a small class sample, our results demonstrated that using a peer education model in a class setting can improve some beliefs, attitudes, and behaviors towards healthy eating and exercise.

Introduction

The challenges presented by obesity and being overweight on college campuses are being recognized as important issues by Student Affairs units in the United States. The National College Health Risk Behavior Survey revealed that 30% of college students are overweight or obese and only 7% consume the recommended servings for fruits and vegetables (Lowry, et al., 2000; Hoban, 2006). Additionally, prevalence of obesity increased from 10.9% to 22.1% during the five-year transitional phase between adolescence and adulthood (Gordon-Larsen et al., 2004). These results suggest that transition between adolescence and adulthood, a common age for college students, is frequently accompanied by rapid and inappropriate weight gain.

Indeed, according to the Behavioral Risk Factor Surveillance System, young adults aged 18 to 29 years are the fastest growing sector in the overweight/obese category (Mokdad et al., 1999). There is a general assumption that college students gain weight during their freshman year, a phenomenon that has been called the "freshman fifteen." However, there are only a handful of studies that have actually documented this, with most suggesting gains of four to nine pounds (Levitsky et al., 2004; Racette et al., 2005). While studies have found that the actual weight gain is less than 15 pounds, overweight during late adolescence is most strongly associated with increased risk for overweight in adulthood (Guo et al., 2000; Holm-Denoma et al., 2008).

Interventions that combine healthy diet and exercise behavior modifications that could be maintained throughout the lifespan are recommended for the long-term treatment and prevention of obesity in adults (Centers for Disease Control, 1997; National Heart, Lung and Blood Institute, 1998). Successful interventions in the past have used self-efficacy-based initiatives to improve dietary and exercise habits in the young adult population (Abood et al., 2004; Dishman et al., 2004). Since self-efficacy can be influenced by others, peer education has been used successfully to improve health-related behaviors in smoking cessation (Wechsler et al., 2001) and HIV prevention (Fisher et al., 1996). Peer Educators (PEs) have also been previously used in the college setting to provide nutrition (White et al., 2009) and physical activity education (Khan et al., 2009), as well as supplemental instruction or tutoring in large classrooms (Amstutz et al., 2010) . However, previous studies involving PEs have utilized them for only the implementation phases and no research trials have utilized a PE/faculty collaborative approach to address nutrition and exercise concerns in the classroom setting.

Furthermore, there are limited resources for any program that would attempt to use PEs in nutrition and exercise education specifically in college students. Designing wellness classes for undergraduates has become imperative as the prevalence of obesity continues to increase. This places a particular burden on the colleges of agriculture, where most nutrition programs reside. The research objectives of this

[1]MS, RD, a doctoral student in the Division of Nutritional Sciences
[2]MS, former master's student in Kinesiology and Community Health
[3]PhD, Associate Professor of Kinesiology in the Department of Kinesiology and Community Health
[4]PhD, RD, Professor of Nutrition in the Department of Food Science and Human Nutrition

study, titled Peer education, Exercising and Eating Right (PEER), were to: 1) develop a training model for undergraduate PEs, 2) incorporate PE feedback as faculty and graduate students develop an undergraduate nutrition and exercise curricula, and 3) teach an undergraduate nutrition and exercise class using a PE/faculty collaborative teaching model to study the impact on nutrition and exercise outcomes in a group of undergraduate college students.

Materials and Methods

Development of PE Training Model

The PE training model was based on the United Nations Training of Trainers Manual (ToT) (United Nations, 2003), with nutrition and exercise education-related training content replacing the sexual health focus of the ToT manual. The first four weeks of the one hour/week training program emphasized the role of PEs in educating fellow undergraduate students. The second four-week training period focused on public speaking, co-facilitation, and presentation skills (Khan et al., 2009). The trainers were graduate students, one from nutritional sciences and another from kinesiology. Training topics are listed in Table 1. All PEs were senior-level students in dietetics and kinesiology (three from each discipline), recruited based on class performance and desire to participate. PEs were paired (one from each discipline) and they chose to match themselves with a partner rather than a random or faculty-derived match. It was assumed that pairing the PEs would create effective teaching partnerships since both educators would bring their respective academic training to the class.

Table 1. Peer Educator Training Topics

Week	Training Topics
1	Introduction to training methodology and self-efficacy Introduction to icebreakers, warm-up activities and energizers Peer expectations
2	Evaluation of course content Review of student self-efficacy assessment tools
3	Peer education – theory and practice
4	Motivational tools and techniques in nutrition and exercise behavior Group discussion: What motivates you to change? Group discussion: Barriers to change in nutrition and exercise behavior
5	Introduction to public speaking
6	Co-facilitation skills Develop class activities and discussion questions
7	Practice: Team presentations
8	Practice: Team presentations

Class Curricula Development

Course content for the PE and faculty-delivered class was developed from an eight-week worksite wellness program that had focused on bone health within a theoretical behavior framework (Tussing and Chapman-Novakofski, 2005). Modifications changed the focus to maintaining a healthy weight for this project. Graduate students (n=2) and faculty developed initial power point presentations on proposed topics. During the eight-week training, PEs provided feedback on topics, activities, and overall class structure. Their recommendations were incorporated into the lecture materials before final content validity by a panel comprised of three experts (two faculty members and one Extension Specialist) in the field of nutrition. The major areas for evaluation were appropriateness of content relative to breadth, depth and target audience, accuracy of information, and suggestions for deletion or addition of topics. Table 2 shows that final topics selected.

Table 2. Class Topics for Nutrition and Exercise for a Healthy Living

Week	Topic
1	Balance and Variety Basics of Exercise Prescription
2	Healthy Snacking Fun Physical Activity for Daily Life
3	Portion Control Exercise and Physical Activity
4	Reading Food Labels Popular Fitness Equipment
5	Food for Bone Bone Loading for Peak Bone Mass
6	Review of Popular Diets Energy Costs of Activities
7	Eating Out Alcohol and Nutrition
8	Nutrition to Handle Stress Exercise to Handle Stress

Class Implementation

The eight-week, PE-delivered, self-efficacy-based class on nutrition and physical activity was taught during the second half of spring semester to 39 students. The class was marketed to undergraduates in the departments of Food Science and Human Nutrition, Human and Community Development, and Kinesiology and Community Health by forwarding an email announcement describing the class. The class was titled "Food Science and Human Nutrition 295: Nutrition and Exercise for Healthy Living." Enrollment exceeded the research team's expectations and the cap was raised from 30 to 42 after consulting with the PEs for feasibility and comfort with larger group sizes. Students completed pre-test questionnaires on the first and post-test questionnaires on the last day of class. The questionnaires are described in the instrument section below. The twice/week classes were lecture by faculty for the first day and discussion led by PEs the second day. The structure of the discussions was a five-minute topic review from the previous class lecture followed by two 15-minute activities to enhance self-efficacy, ending with a question-answer period.

The study was approved by the University Institution Review Board. All participants were 18 years of age or older and informed consent was obtained with low risks associated with study participation.

Instrumentation

The investigators were interested in determining whether class participation improved students' self-efficacy, outcome expectations, and behavior with regard to nutrition and exercise behaviors. The evaluation surveys used were Outcome Expectations for Exercise Scale (Steinhardt and Dishman, 1989), Self-Efficacy for Exercise Scale (McAuley, 1993), Weight-Efficacy Lifestyle (Abrams and Follick, 1983), Outcome Expectations for Nutrition Fruits/Vegetables, Low-Fat Foods (Baranowski et al., 2000), Godin Leisure-Time Exercise (Godin and Shephard, 1985), and the Rapid Eating Assessment for Patients (Gans et al., 2003). The questionnaires were chosen because they had been previously validated and used in the adult population, reflected the topics chosen for the class, and surveys specific for college-age adults in these topic areas had not been validated and published. An Undergraduate Faculty Teaching Partnership (UFTP) learner questionnaire was used to evaluate the demographics as well as the students' response to the peer-driven structure of the class, as outlined by the funding agency.

Data Analysis

Cronbach α scores were used to determine internal reliability of the questionnaires. Stepwise regression analysis was used to explain the variability in total post-test scores accounted for by variables of each construct as well as total pre-test scores. Paired t-tests were performed for the pre- and post-scores to evaluate changes in behavior, self-efficacy, and outcome expectations over the eight weeks. Significance was set at $P \leq 0.05$ (SPSS, version 16.0, SPSS Inc., Chicago, IL, 2008).

Results and Discussion

All PEs approved the lecture-discussion format of the class and had positive attitudes toward teaching with the faculty and graduate students as a team. Five of the PEs agreed that the training activities and discussions were purposeful and only one PE disagreed. According to one of the PEs, "I liked doing the discussion activities and the group really liked having someone their age lead." Four PEs stated the need for additional content specific training, public speaking, and teaching practice. The training manual did not have any nutrition and exercise related training since the investigators assumed that the content was basic enough for senior level students to be comfortable teaching. Responses from the PEs indicated that future training models should devote more time for content specific training. Perhaps a competitive PE application process could have selected for students with previous teaching experience. Given the time limitations of this study it was not possible to have a competitive application process for PEs. However, the training methods used in this study provide a basic and novel program specific to nutrition and exercise peer education in the undergraduate setting.

The UFTP questionnaire assessed the academic background and level of the students. Additional questions asked the students what their overall impression of the class was. Thirty-one students answered the question regarding classification and area of study. The class consisted of 12 juniors (39%), 10 (32%) freshmen, six (19%) seniors, and three (10%) sophomores. Seventeen (52%) of the students were from other majors, nine (25%) were from the area of food science and human nutrition, and five (14%) of the students belonged to communication/education disciplines. Over 90% of the students indicated they formed a deeper understanding of class content and 89% said they were more engaged in the learning process as a result of having an appointed PE. However, the investigators only collected this information at the conclusion of the eight-week class. Future interventions should assess the impressions of students at the beginning as well. It is also recommended that better instrumentation specific to assessment of teaching should be used to collect important feedback for improvement in the teaching methods. To meet the goals of this short pilot study, the investigators focused on the impact of this novel teaching methodology on nutrition and exercise outcomes.

At the conclusion of the class, 39 students returned the post-surveys for Exercise Self-Efficacy, Nutrition Self-Efficacy, Outcome Expectations for Exercise, and Outcome Expectations for Fruits and Vegetables, Outcome Expectations for Low-Fat foods, Leisure Time Exercise, and the Rapid Eating Assessment for Patients. Cronbach α test scores indicated a high reliability for the Exercise Self-Efficacy ($\alpha=0.98$), Nutrition Self-Efficacy ($\alpha=0.85$), and the Outcome Expectations for Exercise ($\alpha=0.84$) questionnaires. Reliability scores for the Outcome Expectations for Fruits & Vegetables ($\alpha=0.31$), Outcome Expectations for Low-Fat foods ($\alpha=0.0.48$), and Leisure Time Exercise ($\alpha=0.40$) were low, indicating inappropriate grouping of items in these questionnaires, poor item selection for the target group, or too few questions per construct. Since these questionnaires had lower Cronbach α scores, pre- and post-test changes in scores were assessed on an item-to-item basis rather than as a grouped variable.

The significant changes in pre- and post-test scores are summarized in Table 3. There were no significant changes in pre-test and post-test Exercise Self-Efficacy and Outcome Expectations for Exercise and therefore are not listed in the table. However, the Leisure Time Exercise Questionnaire asked students to report the number of times they engage in exercise for more than 15 minutes during a seven-day period. Mean strenuous exercise significantly improved from 2.95 ± 2.07 to 3.95 ± 2.77 ($P=0.003$). Mean number of times moderate exercise was performed increased from 3.00 ± 2.26 to 4.35 ± 2.33 ($P=0.032$).

The Nutrition Self-Efficacy questionnaire asked participants to respond to questions relating to self-

efficacy in nutrition, with 20 questions separated into the categories/factors of negative emotions, availability, social pressure, physical discomfort, and positive activities (Clark et al., 1991). Results of the paired-t test on mean scores for the factors are summarized in Table 4. There was a significant increase in the self-efficacy scores related to resisting eating when faced with negative emotions and resisting eating under social pressure. The mean scores of the remaining three categories increased, however, the changes were not significant. Analysis of specific items in the Nutrition Self-Efficacy questionnaire showed significant increases in the mean scores associated with resisting eating when students had to say no to others when physically run down and during depression.

Although none of the items on the Exercise Self-Efficacy and Outcome Expectations for Exercise questionnaires showed a significant change, the pre-test responses on these surveys were high and already reflected the desired response. The items that showed significant changes pre- and post-intervention are listed in Table 3. These items related to self-efficacy and outcome expectations for nutrition (Weight-Efficacy Lifestyle, Outcome Expectations for Nutrition Fruits/Vegetables and for Low-Fat Foods,). Other items that changed significantly related to nutritional and exercise behaviors (Rapid Eating Assessment for Patients and Godin Leisure-Time Exercise).

Although peer education has been used previously to improve intake of fruits and vegetables (Buller

Table 3. Paired T-test for Pre/post Scores for Nutrition and Exercise for Healthy Living Class

Questionnaire	Item	n	Mean ± SD	T	P
REAP Scale 1=Usually 2=Sometimes 3=Rarely	Less than 2-3 servings of fruits/day	39	1.82 ± 0.75(Pre) 2.05 ± 0.60(Post)	-2.16	0.037
	Regular salad dressing	39	2.18 ± 0.79 2.56 ± 0.64	-2.90	0.002
	Watch more than 2 hrs of TV/ day	38	2.13 ± 0.70 2.34 ± 0.62	-2.08	0.040
WEL Scale 0=Not confident 4=Moderately confident 9=Very confident	I can resist eating when I have to say "no" to others	38	5.95 ± 2.30 6.74 ± 2.76	-2.32	0.026
	I can resist eating when I feel physically run down	39	5.21 ± 2.76 5.87 ± 2.43	-2.36	0.024
	I can resist eating when I am depressed (or down)	37	4.81 ± 2.42 6.00 ± 2.45	-2.91	0.006
OENLF Scale 1=Strongly agree 2= Agree 3= Unsure 4=Disagree 5=Strongly disagree	If I ate foods low in fat every day I would have more energy	39	2.15 ± 1.16 1.74 ± 0.82	2.731	0.010
	If I ate foods low in fat every day I would have a desirable weight	38	2.03 ± 1.05 1.71 ± 0.87	2.154	0.038
	If I ate foods low in fat every day I would not enjoy eating	39	3.15 ± 1.16 3.64 ± 1.20	-3.14	0.003
	If I ate foods low in fat every day my family would not enjoy eating	39	4.81 ± 2.42 6.00 ± 2.45	-2.81	0.008
OENFV Scale 1=Strongly agree 2= Agree 3= Unsure 4=Disagree 5=Strongly disagree	If I ate 5 servings of fruits & vegetables every day I would have more energy	39	1.90 ± 0.82 1.56 ± 0.60	2.18	0.036
	If I ate 5 servings of fruits & vegetables every day I would not enjoy eating	38	3.61 ± 1.26 4.08 ± 0.94	-2.83	0.008
	If I ate 5 servings of fruits & vegetables every day I would be less likely to get cancer	39	1.87 ± 0.77 1.62 ± 0.59	2.24	0.031
	If I ate 5 servings of fruits & vegetables every day I would be a good example to others	39	1.56 ± 0.64 1.33 ± 0.58	2.69	0.011
LTEQ Self-reported Physical Activity	Moderate exercise/week	37	3.00 ± 2.26 4.35 ± 2.33	-2.22	0.032
	Strenuous exercise/week	37	2.95 ± 2.07 3.95 ± 2.77	-3.20	0.003

Significant at *P= 0.05*
REAP= Rapid Eating Assessment for Patients
WEL= Weight Efficacy Lifestyle Questionnaire
OENLF= Outcome Expectations for Nutrition (Low-Fat)
OENFV= Outcome Expectations for Nutrition (Fruits & Vegetables)
LTEQ = Godin Leisure-Time Exercise Questionnaire
SD= Standard deviation

Table 4. Paired T-test for Pre/post Total Scores in Weight Efficacy Lifestyle Factors/Categories

Factor	Questions/Items	N	Mean ± SD	T	P
Negative Emotions	I can resist eating when I am anxious/ nervous. I can resist eating when I am depressed/ down. I can resist eating when I am angry/ irritable. I can resist eating when I have experienced failure.	36	23.14 ± 7.46 (Pre) 25.36 ± 7.72 (Post)	-2.70	0.011*
Availability	I can control my eating on weekends. I can resist eating when there are many different kinds of food available. I can resist eating even at a party. I can resist eating even when high-calorie foods are available.	37	20.89 ± 7.54 25.36 ± 8.49	-1.75	0.089
Social Pressure	I can resist eating even when I have to say "no" to others. I can resist eating even when I feel it's impolite to refuse a second helping. I can resist eating even when others are pressuring me to eat. I can resist eating even when I think others will be upset if I don't eat.	38	22.73 ± 7.80 24.52 ± 8.46	-2.13	0.040*
Physical Discomfort	I can resist eating when I feel physically run down. I can resist eating even when I have a headache. I can resist eating when I am in pain. I can resist eating when I feel uncomfortable.	39	26.70 ± 7.19 27.51 ± 7.28	-1.08	0.285
Positive Activities	I can resist eating when I am watching TV. I can resist eating when I am reading. I can resist eating just before going to bed. 1 can resist eating when 1 am happy.	39	26.43 ± 7.06 27.40 ± 7.04	-1.31	0.198

* Significant at *P= 0.05*

et al., 1999), outcomes related to breast feeding (Boyd and Windsor, 2003), and improvement in class performance (Sé et al., 2008), the role of the PE seems to have been limited to the implementation phase of interventions. However, one of the major goals of this study was to incorporate PE participation in not only the implementation, but also the curriculum development phase. Feedback from PEs regarding course content, during their training, was considered in revisions made by faculty and graduate assistants. This was done with the intention to increase PE ownership of the lecture and discussion content of the course, and also to allow adoption of key issues important to the target population.

Significant improvement in self-reported weekly strenuous and moderate physical activity in eight weeks was found in the present study as compared to a previous trial in college students (D'Alanzo, 2004) which consisted of two 16-week sessions over two semesters. However, our study was unable to show changes in self-efficacy for exercise behaviors due to the short intervention period and high pre-intervention self-efficacy. This is interesting because the self-reported physical activity improved but the students' overall efficacy for exercise did not change.

One of the major premises of this study was the use of nutrition knowledge as a necessary platform for supporting changes in behavior. This was evident in examining the Rapid Eating Assessment for Patients results which showed improved fruit intake, reduced regular salad dressing, and a reduction in time spent watching television. All these issues except time spent watching television were emphasized in our class content. Nutrition Self-Efficacy scores showed improvement in conditions related to peer pressure and negative emotions. Other studies (Matvienko et al., 2001; Abood et al., 2004) have shown behavioral changes using undergraduate class-based initiatives as well. These positive results reported here could possibly be attributed to the PE-faculty teaching partnership structure of the intervention or the short time period of the study.

Other studies have also used the self-efficacy component of the Social Cognitive Theory to induce behavior changes. One such intervention (Abood et al., 2004) in college female athletes used a self-efficacy-based approach to improve nutrition knowledge and confidence in the ability to make healthful choices. Our study, using PEs, improved self-efficacy associated with resisting eating when students had to say no to others, when physically run down, during depression, and making healthful dietary choices during periods of stress and under pressure from others. In addition, we demonstrated positive and significant increase in mean scores on categories/factors relating to resisting eating when faced with negative emotions and social pressure.

Our results demonstrate some changes in nutritional self-efficacy, outcome expectancies, and behavior within an eight-week period. Although a short-term intervention, the most significant change was the improvement in nutrition expectancies associated with intake of fruits and vegetables and low fat foods. Other significant findings included nutrition self-efficacy associated with resisting eating during depression and under pressure from others. Finally, we saw changes in self-reported strenuous and moderate physical activity per week. Grounding the project in Social Cognitive Theory and using the construct of self-efficacy showed significant impact on self-reported nutrition intake and physical activity.

Regression models generated from the data showed that the variance in post-test Nutrition Self-Efficacy, Self-Efficacy for Exercise, and nutrition behavior (Rapid Eating Assessment for Patients) was largely explained by the pre-test scores in those variables at the beginning of the program (79%, 81%, and 80% respectively). This suggests that self-efficacy and outcome expectations at the conclusion of the study were influenced most by the values for those variables at the beginning of the study. However, some physical activity-related constructs were included in the Rapid Eating Assessment for Patients, and fruit and vegetable-related eating as well as physical activity were included in the Outcome Expectations for Low-Fat models. This suggests that healthy behaviors may sometimes, but not always, reinforce one another.

Limitations

One of the major limitations of the study was the lack of a control group (Cluskey and Grobe, 2009). To remain within the limits of the grant in terms of time and money, a pilot study was designed without a control group, using a pre/post-test assessment of impact. Another limitation was the absence of a post-post evaluation which would have determined how long the changes were maintained after the intervention. The sample in the study was a convenience sample and not ethnically diverse since the recruitment was carried out in the departments of food science, human nutrition, and kinesiology. Marketing the course to students in these fields makes it difficult to generalize the results of the study to the general student population. As with many education interventions, our study also relied on self-reported nutrition and exercise behavior.

Summary

While peer education has been previously used in health-based initiatives, one of the novel achievements of our study was the utilization of PEs in course development, implementation, and evaluation. This comprehensive approach ensured that our class content remained appropriate for the college student target audience. The discussion and lecture format of the class also allowed PEs the opportunity to reinforce basic nutrition and exercise concepts taught by faculty through an activity-based learning style.

Sustainability of a PE driven initiative would rely heavily on the adequate training of PEs and interest among college students. Our study provided a basic PE training model that could be improved in the areas of teaching practice and content specific training. The overwhelming response from students demonstrated interest for topics addressing obesity in college setting.

Impact evaluation showed some significant improvements in nutrition self-efficacy, outcome expectations, and behavior. There was also a significant increase in self-reported moderate and strenuous weekly physical activity over the eight-week intervention period.

Young adulthood can serve as a critical time for establishing health behaviors and the college environment is an optimal venue for an obesity prevention effort. These positive outcomes related to nutrition and physical activity highlight the importance of using the constructs of self-efficacy and outcome expectations as a framework for future studies that tackle the obesity epidemic in the college-aged population.

Literature Cited

Abood, D. A., D. Black, R. Birnbaum. 2004. Nutrition education intervention for college female athletes. Journal of Nutrition Education and Behavior 36(3): 135-139.

Abrams, D.B. and M.J. Follick. 1983. Behavioral weight-loss intervention at the worksite: Feasibility and maintenance. Journal of Consulting and Clinical Psychology 51:226-233.

Amstutz, M., K. Wimbush, and D. Snyder. 2010. Effectiveness and student demographics of peer-led study groups in undergraduate animal science courses. NACTA Journal 54(1): 76-81.

Bandura, A. 1997. Self-efficacy: The exercise of control. New York, NY: W.H. Freeman.

Baranowski, T., M. Davis, K. Resnicow, J. Baranowski, C. Doyle, L.S. Lin, M. Smith, and D.T. Wang. 2000. Gimme 5 fruit, juice, and vegetables for fun and health: Outcome evaluation. Health Education Behavior 27(1): 96-111.

Boyd, N.R. and R.A. Windsor. 2003. A formative evaluation in maternal and child health practice: The partners for life nutrition education program for pregnant women. Maternal and Child Health Journal 7(2): 137-143.

Buller, D.B., C. Morrill, D. Taren, M. Aickin, L. Sennott-Miller, M.K. Buller, L. Larkey, C. Alatorre, and T.M. Wentzel. 1999. Randomized trial testing the effect of peer education at increasing fruit and vegetable intake. Journal of the National Cancer Institute 91(17): 1491-1500.

Center for Disease Control and Prevention. 1997. Update: Prevalence of overweight among children, adolescents, and adults- United States, 1998-1994. MMWR Morb Mortal Rep 46: 199-202.

Clark, M.M., D.B. Abrams, R.S. Niaura, C.A. Eaton, and J.S. Rossi. 1991. Self-efficacy in weight management. Journal of Consulting and Clinical Psychology 59(5): 739-744.

Cluskey, M. and D. Grobe. 2009. College weight gain and behavior transitions: Male and female differences. Journal of the American Dietetic Association 109(2): 325-329.

Cornwall, A. and R. Jewkes. 1995. What is participatory research? Social Science Medicine. Part D, Medical Geography 41(12): 1667-1676.

D'Alonzo, K.T. 2004. Outcomes of a program to enhance exercise self-efficacy and improve fitness in black and Hispanic college-age women. Research in Nursing Health 27(5): 357-369.

Dishman, R.K., R.W. Motl, R. Saunders, G. Felton, D.S. Ward, M. Dowda, and R.R. Pate. 2004. Self-efficacy partially mediates the effect of a school-based physical-activity intervention among adolescent girls. Preventive Medicine 38(5): 628-636.

Fisher, J.D. W.A. Fisher, S.J. Misovich, D.L. Kimble, L. Diane, and T.E. Malloy. 1996. Changing AIDS risk behavior: Effects of an intervention emphasizing AIDS risk reduction information, motivation, and behavioral skills in a college student population. Health Psychology 15(2): 114-123.

Ellis, W.W. 1993. Bonding with freshman. NACTA Journal 37(1): 14-15.

Gans, K.M., E. Ross, C.W. Barner, J. Wylie-Rosett, J. McMurray, and C. Eaton. 2003. REAP and WAVE: New tools to rapidly assess/discuss nutrition with patients. Journal of Nutrition 133(2): 556s-562s.

Godin, G. and R.J. Shephard. 1985. A simple method to assess exercise behavior in the community. Canadian Journal of Applied Sport Sciences 10(3): 141-146.

Gordon-Larsen, P., L.S. Adair, M.C. Nelson, and B.M. Popkin. 2004. Five-year obesity incidence in the transition period between adolescence and adulthood: The national longitudinal study of adolescent health. American Journal of Clinical Nutrition 80(3): 569-575.

Guo, S.S., C. Huang, L.M. Maynard, E. Demerath, B. Towne, W.C. Chumlea, and R.M. Siervogel. 2000. Body mass index during childhood, adolescence and young adulthood in relation to adult overweight and adiposity: The Fels longitudinal study. International Journal of Obesity 24(12): 1628-1635.

Holm-Denoma, J.M., T.E. Joiner, K.D. Vohs, and T.F. Heatherton. 2008. The "Freshman fifteen" (the "Freshman five" actually): Predictors and possible explanations. Health Psychology 27(1 Suppl): S3-S9.

Khan, N., C. Nasti, E.M. Evans, and K. Chapman-Novakofski. 2009. Peer education, exercising, and eating right (PEER): Training of peers in an undergraduate faculty teaching partnership.

Journal of Nutrition Education and Behavior 41(1): 68-70.

Levitsky, D.A., C.A. Halbmaier, and G. Mrdjenovic. 2004. The freshman weight gain: A model for the study of the epidemic of obesity. International Journal of Obesity 28(11): 1435-1442.

Lowry, R., D.A. Galuska, J.E. Fulton, H. Wechsler, L. Kann, and J.L. Collins. 2000. Physical activity, food choice, and weight management goals and practices among U.S. college students. American Journal of Preventive Medicine 18(1): 18-27.

Matvienko, O., D.S. Lewis, and E. Schafer. 2001. A college nutrition science course as an intervention to prevent weight gain in female college freshmen. Journal of Nutrition Education 33(2): 95-101.

McAuley, E. 1993. Self-efficacy and the maintenance of exercise participation in older adults. Journal of Behavioral Medicine 16(1): 103-113.

Mokdad, A.H., M.K. Serdula, W.H. Dietz, B.A. Bowman, J.S. Marks, and J.P. Koplan. 1999. The spread of the obesity epidemic in the United States, 1991-1998. Journal of American Medical Association 282 (16): 1519-1522.

National Institutes of Health, National Heart, Lung, and Blood Institute. 1998. Obesity research. Bethesda, MD 6(2): 51S-209S.

NHLBI Obesity Education Initiative Expert Panel. Clinical guidelines on identification, evaluation, and treatment of overweight and obesity in adults: The Evidence Report.

Racette, S.B., S.S. Deusinger, M.J. Strube, G.R. Highstein, and R.H. Deusinger. 2005. Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. Journal of American College Health 53(6): 245-251.

Sé, A.B., R.M. Passos, A.H. Ono, and M. Hermes-Lima. 2008. The use of multiple tools for teaching medical biochemistry. Advances in Psychology Education 32: 38-46.

Steinhardt, M. and R.K. Dishman. 1989. Reliability and validity of expected outcomes and barriers for habitual physical activity. Journal of Occupational Medicine 31: 536-546.

Tussing L. and K. Chapman-Novakofski. 2005. Osteoporosis prevention education: Behavior theories and calcium intake. Journal of American Dietetic Association 105(1): 92-97.

United Nations Interagency Group on Young People's Health, Development and Protection in Europe and Central Asia, Sub-Committee on Peer Education. Peer Education: Training of Trainers Manual. 2003. http://www.aidsmark.org/ipc_en/pdf/sm/tm/Peer%20Education%20Training%20of%20Trainers%20Manual.pdf . Accessed July 8, 2008.

Wechsler, H., K. Kelley, M. Seibring, M. Kuo, and N.A. Rigotti. 2001. College smoking policies and smoking cessation programs: Results of a survey of college health center directors. Journal of American College Health 49(5): 205-212.

White, S. Y.S. Park, T. Israel, and E.D. Cordero. 2009. Longitudinal evaluation of peer health education on a college campus: Impact on health behaviors. Journal of American College Health 57(5): 497-506.