

Original Research Article

Changes in Fruit, Vegetable, and Fiber Intake among College Students: Effect of an Introductory Nutrition Course Intervention

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ABSTRACT

This quasi-experimental study used a pre-test and post-test design approach to determine the affect a 10-week introductory nutrition course had on dietary fruit, vegetable, and fiber intake of students who completed the course. Dietary behavior change interventions are needed among college students, as this is a period of excess weight gain and poor dietary behaviors. While weight gain and poor eating habits and behaviors have been identified as common undertakings by college students, little is known about the effectiveness of dietary intake change among college students after the completion of an introductory nutrition course. Furthermore, there is not any existing literature to indicate if the completion of a short-term, 10-week dietary behavior change course can change students' dietary intake.

Dietary behavior change interventions rooted in Social Cognitive Theory have been shown to have one of the greatest impacts on changing dietary behaviors among college students. The 10-week introductory nutrition course in this study included a dietary behavior change intervention that was rooted in Social Cognitive Theory, making it desirable to elicit dietary behavior change. It was the researchers hope that the results of this study would highlight the importance of making an introductory nutrition course with a dietary behavior change intervention, modeled after the Social Cognitive Theory, a mandatory component of the undergraduate college curriculum in order to improve college students' dietary intake.

Key Words: Nutrition, college students, dietary behavior change, fruit, vegetables, fiber

INTRODUCTION

College is a time when students engage in behaviors that decrease the likelihood of optimal health and increase the likelihood of overweight and obesity.^[1] The percentage of college students classified as overweight or obese increased from 29 percent in 2000 to 32.5 percent in 2009.^[2] Furthermore, nearly 5.5 million Americans are now obese by the time they reach their early 30's and the prevalence of becoming obese increases twofold as individuals move from their 20's to their 30's.^[3] The reality is that over one-third of students in college today are obese.^[2]

Predictors of weight gain in college students include changes in lifestyle, with diet being one of the major contributors.^[4] Only one in three college students consume a diet consistent with national recommendations. Eating patterns most notably seen in college students include low intakes of fruits, vegetables, and dietary fiber, and high intakes of fast food, sugar-sweetened beverages, and alcohol.^[1] The CDC reports that nine out of ten college students eat fewer than the recommended five servings of fruits and vegetables per day.^[5] In fact, the average college student consumes 1 serving of fruit, 1.5 servings of

vegetables, 0.5 servings of low-fat dairy, and 1 / 4 servings of whole-grains on a daily basis. [6] The Dietary Reference Intakes recommend that adults consume at least 25 grams of fiber each day. [7] However, the nutritional status of college students is far less than optimal and only one in three college students consume a diet that meets national recommendations across a variety of food groups. [5] Research has also shown that dietary intake lacking in fiber, vitamins, and minerals is a major contributor to the world's most widespread and debilitating nutritional disorders and outcomes, including chronic diseases, weight gain, and increased health care costs. [6,8]

Obesity has been increasing in the U.S. population over the past several decades, and as a direct result of this increase, overall morbidity and mortality have been increasing as well. [9] Certain subsets of the population are at greater risk than others of experiencing overweight or obesity. College students are one of these subsets. College students are gaining weight at a six-time greater rate than the general population. [1] 2009-2010 data from the National Health and Nutrition Examination Survey (NHANES) and the National Health Interview Survey (NHIS) published by the Centers for Disease Control (CDC) reports that 68.8 percent of adults aged 20 and older are overweight or obese. [10] Of this 68.8 percent, 35.1 percent are obese. [5] Furthermore, nearly 5.5 million Americans are now obese by the time they reach their early 30's and the prevalence of becoming obese increases twofold as individuals move from their 20's to their 30's. [3] The reality is that over one-third of students in college today are obese and less than one-third of the United States population is able to maintain a normal weight.

During the past two decades, a significant increase in type 2 diabetes, hypertension, and dyslipidemia has occurred among individuals in their teens and twenties. [5] This paints a glum picture of the health of the country's young people. Carrying around extra weight is especially

concerning when examining college students because chances are these young adults will carry this extra weight past young adulthood which will affect their future health and the health of their future families. [8]

The purpose of this quasi-experimental study was to evaluate the effects of a 10-week introductory nutrition course intervention on changing fiber, fruit, and vegetable intake among college students. Previous studies showed that wellness courses may help to improve the health and wellness patterns of college students by motivating them to engage in a healthy lifestyle. [11] Studies have shown that larger dietary intake effect sizes have been associated with interventions longer than six weeks, but less than sixteen weeks. [12] The problem is, when compared to children and the elderly, nutrition education interventions for college students are far underrepresented in the literature. [13] In fact, there are no effective health promotion programs in place for young adults. [3] As such, it is important to develop prevention programs for college students, an underrepresented population in the dietary behavior change literature. [12] Reviewing the effectiveness of various nutrition interventions for college students in the literature is necessary for future studies on this underrepresented population.

MATERIALS AND METHODS

This study was approved by the Drexel University Institutional Review Board and the West Chester University Institutional Review Board. This quasi-experimental, pre-test and post-test design study focused on college students in two separate sections of a 10-week introductory nutrition course which employed a dietary behavior change intervention based on the Social Cognitive Theory. The study utilized a convenience sample. Participants enrolled themselves in one of two introductory nutrition course sections, according to personal preference regarding class meeting time. At that point in time, students were not

aware that the course sections were being used as part of a research study. As such, because students self-enrolled into both course sections, the researcher did not control randomization. Both course sections were labeled as the same course title and number and had a maximum capacity of forty-five students per course. The courses were offered without the stipulation of prerequisites to enroll in the course and were not limited to any particular college majors. All participants in the study were students at the university who chose to enroll in the courses by their own doing. The study was carried out at a public university located in the southwestern suburbs of Philadelphia from January to April, 2016. Participants were 70 male and female college students ranging in age from 18 to 29 years of age.

Throughout the course of the study, the researcher collected demographic surveys at week 1 of the course, pre- and post-study 3-day average dietary intake reports at weeks 2 and 10 of the course, respectively, and weekly goal sheets in weeks 2 through 10 of the course from all consented study participants in each of the two course study section. The purpose of the collected quantitative data was to address whether the 10-week introductory nutrition class with a dietary goal setting intervention had an impact on the dietary fiber, fruit, and vegetable intake of participants.

The 3-day average intake reports were completed by participants using a software program called Diet Analysis Plus, 10th edition. Diet Analysis Plus is a student-friendly software program owned by Cengage Learning for instructional purposes in higher education. The program allows students to track their diet and physical activity, using Diet Analysis Plus' searchable database of over 20,000 foods and beverages. ^[14] Only the dietary component of the program was used in the study. The physical activity component of the program was excluded.

This study was interested in analyzing students' fruit, vegetable, and

fiber intake both pre-study and post-study, due to suboptimal intake levels of these dietary components among college students. For purposes of this study, students were instructed to select three days (two weekdays and one weekend day for a more accurate representation of typical diet) to log into the Diet Analysis Plus software program, at two time points (pre-study at week 2 of the course and post-study at week 10 of the course). Through the Diet Analysis Plus software program, they were then instructed to generate a three-day average report both pre-study and post-study. These reports were collected by the researcher at the end of week 2 in the course (to represent a 3-day average of dietary intake logged in the second week of the course, or pre-study) and then again at week 10 in the course (to represent a second 3-day average of dietary intake logged in the last week of the study, or post-study). Study variables of interest that were obtained from the 3-day average intake reports included average intake of fruits, vegetables, and fiber. Fruits and vegetables were reported in "cups" and fiber was reported in "grams." As previously stated, 3-day average intake reports were collected at two time points in the course – week 2 and week 10, representing pre-study and post-study snapshots. When logging at each of the two time points in the study, students were instructed to choose two weekdays and one weekend day to log into the software analysis program. Two weekdays and one weekend day were chosen because this represented an average of an individual's typical eating patterns and habits, which tend to differ between a week day versus a day on the weekend. The 3-day average reports generated by study participants at week 2 and again at week 10 in the course served as the pre-study and post-study data collection measures of dietary fiber, fruit, and vegetable intake of participants analyzed by the researcher. All study variables of interest were analyzed using the statistical software program, Statistical Package for the Social Sciences (SPSS), version 22, which can perform

statistical tests based on data entered into the program and can generate reports based on specific characteristics of interest. Paired t-tests were run in SPSS in order to generate pre-study to post-study results and findings for each of the three study variables of interest: dietary fiber intake (grams), dietary fruit intake (cups), and dietary vegetable intake (cups). Results with a p-value less than .5 indicated statistical significance.

RESULTS

Subjects

Of the possible 90 students enrolled across the two Nutrition & Dietetics 303 (NTD 303) study courses, 70 students consented to participate in the study and completed the quantitative study materials. The average age of the seventy participants in the study was 19.89 years, 30% of the study population was male and 70% of the study population was female, students of white race accounted for 83% of the study population, over three quarters of the study population were either freshman or sophomore level in undergraduate studies, and over 90% of participants were either science or nutrition majors. Further, 64% of participants had never previously taken a nutrition course and almost 93% of participants took the course as a requirement for their respective major. Demographics can be found in Table 1.

Study Results

Paired t-tests were performed using SPSS, version 22.0 statistical software, to

measure the effect the course intervention had on participants' fruit, vegetable, and fiber intake from pre-study to post-study. Paired t-test changes in fiber, fruit, and vegetable intake can be found in Table 2. Participants' fiber intake from pre-study to post-study increased significantly, from 18.14 grams pre-study to 21.04 grams post-study, $p = .016$ (Table 2). Participants' fruit intake (cups of fruit) increased from pre-study to post-study, but not significantly. On average, participants' fruit intake increased from .926 cups to 1.16 cups, $p = .141$ (Table 2). Participants' vegetable intake (cups of vegetables) also increased from pre-study to post-study, but not significantly. On average, participants' vegetable intake increased from 1.41 cups to 1.56 cups, $p = .300$ (Table 2).

Variable	Finding
Age	Mean: 19.89 years Range: 18-29 years
Gender	70% Female 30% Male
Race	82.86% White 11.43% African American <6% Hispanic, Asian, Other
Undergraduate Class Standing	52.86% Sophomore 25.71% Freshman 11.43% Junior 7.14% Senior 2.86% Other
Major	68.57% Science 28.57% Nutrition 2.86% Other
Previously Taken Nutrition Course	64.29% No 35.71% Yes
Course Major Requirement	92.86% Yes 7.14% No

Variable	Mean (pre-study)	Mean (post-study)	p-value
Fiber (grams)	18.1446	21.0361	.016
Fruit (cups)	.9257	1.1571	.141
Vegetables (cups)	1.4114	1.5571	.300

DISCUSSION

This study shows that a 10-week introductory nutrition course with a dietary goal setting intervention led to an increase in participants' dietary fiber intake (grams) from pre-study to post-study. The result of the paired t-test for this study variable was

significant. The same cannot be said for vegetable and fruit intake. Paired t-tests showed that there was not a significant change from pre-study to post-study in neither fruit nor vegetable intake as a result of a 10-week introductory nutrition course with a dietary goal setting intervention. The

literature indicates that the diets of college students are low in fruit, vegetable, and fiber intake. [5] As such, nutrition education outreach efforts must be made to the college student population in order to increase fruit, vegetable, and fiber intake to enhance long-term health and wellbeing well into adulthood.

In regards to dietary fiber, The Dietary Reference Intakes recommend that adults consume at least 25 grams of fiber each day. [8] Results from this study showed after the 10-week introductory nutrition course with dietary goal setting intervention, college students came close to meeting daily fiber recommendations. As such, a 10-week introductory nutrition course with a dietary behavior change intervention can significantly improve fiber intake among college students, which is lacking among this population.

The Centers for Disease Control (CDC) reports that nine out of ten college students eat fewer than the recommended five servings of fruits and vegetables per day. [5] In fact, the average college student consumes 1 serving of fruit, and 1.5 servings of vegetables on a daily basis. [6] Unfortunately, the results from this study aligned with CDC data in that the average vegetable consumption of participants was around 1.5 servings per day and the average fruit consumption of participants was around 1 serving per day. This intake of fruits and vegetables is certainly sub-optimal for this population. More research is needed to better understand the methods to best increase fruit and vegetable intake among college students.

The results from this study demonstrate value in recommending that an introductory nutrition course be integrated as a required component in the undergraduate general education curriculum at the university where this study took place in order to set college students up for lifelong health and well being. Colleges and universities across the country may also find the results of this study alarming and may recognize the urgency and lifelong student

health benefit in mandating an introductory nutrition course into the standard college curriculum.

CONCLUSION

The findings support the impact a short, 10-week introductory nutrition course has on increasing the dietary fiber intake of college students. This study demonstrated the favorable effects of incorporating an introductory nutrition course as part of a multi-prong approach to promoting lifelong dietary wellbeing among college students. As such, the incorporation of an introductory nutrition course into the undergraduate general education curriculum should be a top priority for universities across the country in order to promote and support lifelong wellness among their young adult college populations.

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