Longer Life Foundation – Final Report
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Project Title: "Influence of Exercise and Dietary Patterns on Weight Gain Throughout College"

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Abstract

Physical activity and dietary behaviors adopted during college may influence the development of overweight and obesity in adulthood. The purpose of this study was to assess changes in weight status, exercise and dietary behaviors from the beginning of freshman year to the end of senior year of college in a group of undergraduate students at a medium sized private university. Students were recruited at the beginning of freshmen year to undergo assessments of height, weight, body composition, and self-reported physical activity and dietary behaviors. Students were re-assessed at the end of sophomore and senior years. Participants included 204 students (138 females, 66 males). Body weight increased from 59.4±1.0 to 61.1±1.0 kg in females and from 72.0±1.4 to 76.1±1.6 kg in males by the end of senior year; height also increased. The majority of weight change occurred during the first two years of college, with little change after that. BMI increased from 22.4±0.3 kg/m2 at the beginning of freshman year to 23.1±0.3 kg/m2 at the end of senior year. Importantly, self-reported exercise and dietary patterns did not meet recommended levels upon entrance into college, and did not change during the four years of college. There were no relationships between change in body weight and participation in organized sports, recent exercise or dietary patterns, or living situation. Although health behaviors did not worsen and weight gains were modest during the four years of college, it remains a concern that many students did not meet contemporary exercise and nutrition recommendations. Such behavioral patterns may have detrimental long-term health implications.

Introduction

An epidemic of overweight and obesity is evident among all age groups, including children and adolescents.[1] According to the 2002 report of the National Health and Nutrition Examination Survey,[2] 64.5% of American adults are overweight, the highest prevalence ever observed. Sedentary lifestyles and excess calorie intake contribute to overweight and obesity, and the period between adolescence and early adulthood is accompanied by lifestyle changes that predispose young adults to become less physically active.[3-7] The greatest deterioration in physical activity has been observed between the ages of 15 and 18 years, with a continuous decline being common between 18 and 29 years of age.[3]

Weight gain during the first year of college has been described as a problem for many students, but there is little evidence to support or refute these anecdotal reports. Recent studies have shown that college students' behavioral patterns may put them at risk for overweight during adulthood. Failure to meet recommended guidelines for healthy eating[10-13] and physical activity[10,11,14-16] appears to be characteristic of many college students. Although mean BMI ranges in college students have been reported by several investigators to be in low risk categories,[17,18] some studies have concluded that as many as 35% of undergraduate students may be overweight.[19] In view of the current epidemic of obesity – which is now a world-wide and global phenomenon[20] – studies are needed to identify behavioral patterns that can prevent the serious health impact of physical inactivity and unhealthful eating patterns. The college environment may be an ideal environment in which to prepare young adults to assume responsibility for lifestyle behaviors that will enhance health in later adulthood.

Methods

Assessments were conducted upon enrollment in the freshman year, and again at the end of sophomore and senior years. Assessments included measurements of height, weight, body composition, and self-reported physical activity and dietary behaviors using five questionnaires.

Height was measured with a portable stadiometer to the nearest 0.1 cm, and body weight was measured on a balance scale to the nearest 0.1 kg. These measurements were performed without shoes, hats, outer garments or heavy belts, and with pockets emptied. Body mass index (BMI) was calculated by dividing body weight in kilograms by height in meters squared (kg/m^2). Body composition was assessed using bioelectrical impedance analysis (BIA). Fat-free mass, fat mass, and percentage body fat were calculated from biological resistance and reactance using a computer algorithm provided by the manufacturer (RJL Systems, Clinton Township, MI).

Questionnaires included demographics, health history, and EAT-26 to obtain descriptive information and to identify students at risk for disordered eating. Demographic information for all freshman students entering Washington University was obtained to determine whether our sample was representative of this college campus. Exercise and dietary questionnaires were based upon the transtheoretical model of behavior change, which distinguishes stages of readiness to engage in a particular behavior (e.g. precontemplation, contemplation, preparation, action and maintenance).[21-24]

The exercise questionnaire assessed self-reported participation in aerobic, strengthening, and stretching exercises, with definitions based upon the American College of Sports Medicine guidelines.[8] The dietary questionnaire was used to assess whether students were: 1) meeting the guidelines established by the 5-A-Day campaign[9] to eat at least 5 fruits/vegetables daily; 2) limiting fried food intake to twice during the previous week; 3) limiting intake of high-fat fast foods to twice during the previous

week; 4) consuming 64 ounces of non-caffeinated, non-alcoholic beverages daily; and 5) readiness to adopt these behaviors.

Statistical analyses included simple descriptive statistics to provide basic information about the overall characteristics of the sample. In addition, differences between men and women were examined using either two-sample t-tests (for continuous outcome measures such as BMI) or chi-square tests (for categorical outcome measures such as exercise status). Changes in outcome measures from the beginning of freshmen year to the end of senior year were evaluated using paired samples t-tests (for continuous variables) and McNemar's change test (for categorical variables). Significance was accepted at an alpha of 0.05.

Results

Two hundred four students completed assessments at the beginning of freshman year and the end of senior year. Ninety-seven students were from the freshmen class enrolled in 1999, and 107 were from the freshmen class enrolled in 2000. Because the characteristics of the 2 cohorts were similar, their data were combined in all analyses. The gender and racial/ethnic distribution was 68% female, 32% male, 75% Caucasian, 11% Asian, 6% African American, 3% Hispanic, and 5% of other or unknown background. Mean age was 18.1±0.2 years. One hundred thirty one of these 204 students also completed assessments at the end of sophomore year. At the beginning of freshman year, the majority of students (72%) were classified as normal weight using the adult BMI criteria.

From the beginning of freshman year to the end of senior year, body weight increased from 59.4±1.0 to 61.1±1.0 kg in females, and from 72.0±1.4 to 76.1±1.6 kg in males. By the end of senior year, there was an increase in the number of students classified as overweight. The majority of weight change occurred during the first two years of college, with little change after that. BMI increased from 22.4±0.3 kg/m^2 at the beginning of freshman year to 23.1±0.3 kg/m^2 at the end of senior year, with a BMI range of 17.2-46.2 kg/m^2 during the latter assessment.

Importantly, self-reported exercise and dietary patterns did not improve or worsen during the four years of college. BMI during senior year was inversely related to fried food consumption ($r=-0.185$, $p=0.008$), but there were no relationships between change in body weight and participation in organized sports, recent exercise or dietary patterns, or living situation (i.e. dormitory, apartment, etc.). The exercise and dietary patterns of these college students did not meet recommended levels upon entrance into college, and do not appear to improve or worsen during their four years of college life.

Discussion

This is one of only a few studies to provide measured, longitudinal data on college students from the beginning of freshman year to the end of senior year. Based on measurements taken on a sub-set of subjects after the first year of college, our data does

not support the commonly held belief of the “freshman 15”, but rather suggests that weight gain is highly variable between individuals, with only a modest increase in BMI during college, on average. However, our results indicate that exercise and dietary patterns of college students, during freshman, sophomore and senior years, do not meet recommended guidelines for many of these students. The long-term implications of health behaviors during college are unclear, but there is an abundance of evidence that a sedentary lifestyle and adverse dietary patterns contribute to a variety of disease risk factors.

The institutional culture in which studies of health and health behaviors are done may have a significant impact on individual behavior. Proposal of strategies to encourage college students to pursue more healthful eating and exercise patterns can emanate from evidence about current patterns. Understanding what can motivate change in a group who will imminently enter adulthood may help to reduce the incidence of physical inactivity, overweight and obesity in our society.

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