THE EFFECT OF PHYSICAL ACTIVITY AND NUTRITION ON THE STRESS
MANAGEMENT, INTERPERSONAL RELATIONSHIPS, AND ALCOHOL
CONSUMPTION OF COLLEGE FRESHMEN

by

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ABSTRACT

SIMONE WILSON SALANDY. The effect of physical activity and nutrition, on the stress management, interpersonal relationships and alcohol consumption of college freshmen.(Under the direction of DR. MARY NIES)

Objective: The aim of this study was to assess the changes of health behaviors in college students as they transition through their freshman year. Methods: At a southern public university, the author surveyed 167 freshmen, ages 18 to 25, to examine the effects of physical activity and nutrition on stress management, interpersonal relationships and alcohol consumption in college freshmen. The participant's responses were assessed at two time points: baseline exposure and 3 month outcome and 3 month exposure and 6 month outcome. The Health-Promoting Lifestyle Profile (HPLP) II questionnaire and the Daily Drinking questionnaire (DDQ) examined the health behaviors and drinking consumption of college freshmen. Results: Students with moderate physical activity had nearly half the odds of better stress management as compared to students with higher physical activity. However, this result was not statistically significant; baseline exposure to 3 month outcome (OR= 0.49, 95% CI: 0.24, 1.01); 3 month exposure to 6 month outcome (OR= 0.52   95% CI: 0.25, 1.29). Students with moderate nutrition had nearly 1.5 times the odds of having poor interpersonal relationships as compared to students with high nutrition. This result was not statistically significant: baseline exposure to 3 month outcome (OR=1.49, 95% CI: 0.23, 2.34); 3 month exposure to 6 month outcome (OR=1.57, 95% CI: 0.89, 4.35). Discussion: Few studies have evaluated physical activity and nutrition and the health behaviors of stress management, interpersonal relationships

and alcohol consumption. This study can provide further understanding of health promotion behaviors in college students.

Keywords: Physical Activity, Nutrition, College Students and Health Promotion

DEDICATION

This dissertation is dedicated to my wonderful husband Ian

and my amazing daughter Chloe.

My life's greatest joys are you two.

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As I complete this dissertation, I would like to thank the numerous people who have supported me throughout this process.

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INTRODUCTION

The college experience brings many health challenges for incoming freshman students as they transition into a new environment (Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). The ability to engage in regular physical activity and maintain a balanced diet is often jeopardized by a new sense of independence to make lifestyle choices (Butler, Black, Blue, & Gretebeck, 2004). This is particularly concerning for college students who are disproportionately affected by the rising obesity epidemic (Kaur, 2003). Current research suggests that 35% of all college students are over-weight and will gain more weight as they matriculate through college (Kaur, 2003). Obese individuals have an increased risk for hypertension, type 2 diabetes, coronary heart disease, stroke, respiratory problems, and some cancers (Kaur, 2003). College students are at greater risk for developing these chronic conditions due to their lack of physical activity, poor diet and substantial weight gain. The young adult population is increasingly being diagnosed with type 2 diabetes; currently this age group shows the fastest growing rate of obesity (Seo, 2008). Diabetes is a preventable disease, diet and exercise, can reduce its development. Behavior modifications are necessary to prevent the occurrence of diabetes in vulnerable populations such as college students (Seo, 2008).

Physical inactivity in young adults remains a barrier to public health in college students. Sedentary behaviors, which include television (TV) viewing, computers, and sedentary socializing, are contributing to the growing physical inactivity in college students and the dramatic increase in chronic health conditions (Biddle, 2009). Consequently, these chronic conditions develop because most United States (US) college

students fail to meet the national physical activity recommendations of moderate to vigorous exercise (Biddle, 2009; Kaur, 2003). National physical activity guidelines recommend moderate-intensity cardiovascular exercise for 30 minutes 5 days a week and 20 minutes of vigorous-intensity exercise 3 or more days a week (American Heart Association, 2010). Currently, 19.4% of college students engage in the recommended amount of moderate intensity exercise, and 28.9% engage in the recommended amount of vigorous exercise (American College Health Association, 2010). Also, 1 out of every 10 US college students is obese, and 21% is overweight (National College Health Assessment, 2010). Sedentary behaviors such as television watching, frequent computer use, and social games are positively associated with physical inactivity in young adults(Biddle, 2009). College students are not immune to this physical inactivity problem; lack of physical activity among young adults suggests that there is a need for further investigation of specific sedentary behaviors that are contributing to weight gain in college students (Biddle, 2009).

Previous studies have found that overweight and obesity in adulthood have contributed to weight gain and health behavior patterns developed in college (Butler, Black, Blue, & Gretebeck, 2004). For college students, this is a critical health concern, as the greatest weight increase occurs during the ages of 18 and 19 years of age (Kaur, 2003). College students are at an increased risk for chronic conditions due to physical inactivity and poor nutrition (Butler, Black, Blue, & Gretebeck, 2004). The college setting is an important environment where health habits are developed and maintained for periods after college. The "freshmen fifteen", a phrase that refers to the 10-15 pound weight gain in college freshman during their first year, is very concerning for a

vulnerable population that already faces obesity issues (Lloyd-Richardson, 2008).

Freshmen college students experience many lifestyle changes that can affect their health

behaviors including changes in place of residence, dietary habits, physical activity and

increased alcohol consumption (Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). This

suggests that the transition from the home environment to college life is accompanied by

a substantial weight gained due to the development of poor health behaviors.

Heavy alcohol consumption is a major health concern on college campuses.

Currently 45% of students have reported engaging in heavy binge drinking, defined as at

least 5+ drinks in one setting for men and 4+ drinks in one sitting for women (Hingson,

Zha, & Weitzman, 2009). Heavy drinking is associated with many negative health

consequences, which include unintentional death, injury, and academic consequences.

Unintentional injuries have increased in 18 to 24 year olds from 4,809 in 1998 to 5,534 in

2005 (Hingson, 2010). Prior research suggests that students who engage in heavy

drinking have more academic, social, and health consequences as compared with other

students who do not consume alcohol as heavily (Wechsler et al. 2008).

There has been extensive research conducted to understand the predictors of binge

drinking in college students. Past research has found that binge drinking varies by race,

ethnicity, and gender (O'Mallery, 2002). Research has established that males drink more

heavily than females; Caucasian-American students drink the heaviest amounts of

alcohol, Hispanic Americans consume moderate amounts of alcohol, and African-

Americans students consume less alcohol than the two groups (O'Malley, 2002). Asian-

American students consume the lowest amount of alcohol compared to other racial

groups (O'Malley, 2002). Drinking motives for college students have also been

associated with social norms and affiliations, which include higher alcohol consumption in college athletes, as well as fraternity and sorority memberships (Baer, 2002). For freshman students the transition period from the home environment into college life is accompanied with an increase in alcohol consumption. National alcohol trends indicate that the average freshman college students drink an average of 5.26 drinks weekly, 7.39 drinks for men and 3.86 drinks for women (Core Institute, 2008). The increase in drinking by college freshmen has been associated with the pressures of adapting to a new physical and social environment (Schulenberg, 2002). Still, alcohol use remains a current health issue for college students and there is a need for targeted interventions to reduce alcohol use and promote healthy behaviors.

This research aims to contribute to future health services research by providing information for future studies that are investigating how health behaviors of college students change over time. This study specifically assessed the effect of physical activity and nutrition on the social relationships, stress, and alcohol consumption in college freshmen. This study will be useful for researchers who are trying to understand how these specific health behaviors are influenced during the first year of college. This study will increase the knowledge of the transition period of college students and of how nutrition and physical activity affect certain health behaviors. There is limited research examining these three specific health behaviors among college students.

The purpose of this study was to critically review and understand the associations that exist between physical activity and dietary behaviors in the college student population. There is a need for future research studies that focus on successful health interventions for college students that will address important issues of making healthy

food choices and encouraging daily exercise. (Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). This study may be useful because it aims to identify factors that could potentially contribute to health promotion and to the decrease of alcohol consumption in college freshmen. While previous research has evaluated college freshmen, there is a gap in scientific knowledge relevant to the health-promoting behaviors of college freshmen and factors associated with these behaviors.

TABLE OF CONTENTS

JOURNAL ARTICLE I

Physical Activity and College Students

Researchers have documented the benefits of regular physical activity for a healthy life. Regular physical activity reduces hypertension, heart disease, diabetes, and some cancers.[1] Engaging in regular physical activity improves psychosocial health and decreases stress.[2] This is particularly important for college freshman, who are at increased risk for developing unhealthy behaviors with the transition into a new environment. Common stressors that create unhealthy behaviors and physical inactivity for college students include chronic illnesses, academic load, social life, campus residence, and family events.[2] College students between the ages of 18 and 25 have the lowest amount of regular physical activity compared to other adults. On average they engage in less than the recommended daily 30 minutes of moderate to vigorous exercise.[3] One study that evaluated changes in the physical activity of female freshman found that in the transition from home to college, physical activity levels decreased.[4] This is alarming particularly because research has shown that students develop their health behaviors in college. These health behaviors then become well established and are extended for long periods after graduation.[5]

Freshmen college students who live on campus are often negatively affected by their new independence. They are left to make their own physical activity choices and their practice of regular exercise is circumvented by the distractions of college life. Physical activity is also affected by many other factors including race and ethnicity. Research has shown that race and ethnicity are highly correlated with physical activity intentions. One study of physical activity intentions of college students evaluated 238

African-American students and 197 Caucasian-American students.[6] This study found

that the African-American students exercised significantly less than their Caucasian-

American counter-parts.[6] The authors explained the lower physical activity level of

African-Americans as being attributed to the theory of planned behaviors which suggest

one's intentions control physical activity.[6-7]

Physical Activity & Stress Management of College Students

Stress directly affects health behaviors.[8] Stress occurs when persons view a

situation, demand, or challenge as exceeding their available coping resources.[8] College

students are vulnerable to several stress factors, including academic and social pressures

and a new environment. A recent study that assessed 145 college students found that

those with high levels of stress had poorer eating habits and were less physically active.[9]

This study also found that females and student athletes were more likely than males who

were not athletes to practice healthy behaviors, such as a regular daily exercise regimen.[9]

The authors explain that gender differences and stress have been well documented in

previous literature, and students with higher levels of stress perceive themselves as less

healthy and have lower self-esteem. All of this contributes to poorer health habits.[9]

Stress and physical activity have been well studied in adults and children.

However, for the college population there is still a need for research to understand the

relationship between stress and physical activity. One study that evaluated a diverse

sample of 841 students found that both males and females who engaged in regular

physical activity had lower levels of stress at all ages.[10] Another study that assessed 232

college students found that those who were physically active were less likely to be

stressed and also had better problem solving and coping skills.[11] Previous research has

shown that high stress levels in college are also associated with depression, anxiety, and less overall life satisfaction.[12] A study of 188 male and 193 female undergraduate students found that those who exercised frequently were less likely to be depressed and also exhibited higher self-esteem.[13]

Physical Activity and Interpersonal Relationships

Enhanced interpersonal relationships have been associated with healthier lifestyles. In particular, the risk of many chronic illnesses is much lower for individuals who have good interpersonal relationships and social support.[14] These individuals have better health behaviors.[14] The social environment and ability to maintain meaningful interactions with others are often correlated with leading healthly lifestyles.[14-15]

There is limited literature available on the association of interpersonal relationships and physical activity in college. Previous research has largely focused on social support and social connectedness and physical activity.[16] A recent study of 3,268 individuals found that health outcomes were affected by both interpersonal relationships and physical activity.[16] The authors hypothesized that an individual's health outcomes are intertwined with their stress levels and social environments. The study also found that individuals with lower levels of stress experienced stronger social connectedness and increased physical activity.[16]

Physical Activity and Alcohol Consumption of College

Alcohol consumption among college students is frequent; however, the misuse or abuse of alcohol can lead to many adverse health outcomes.[17] The high rate of alcohol consumption in college students has continued to increase and is now a critical public health concern.[17-19] In particular, binge drinking among college students is at an all-time
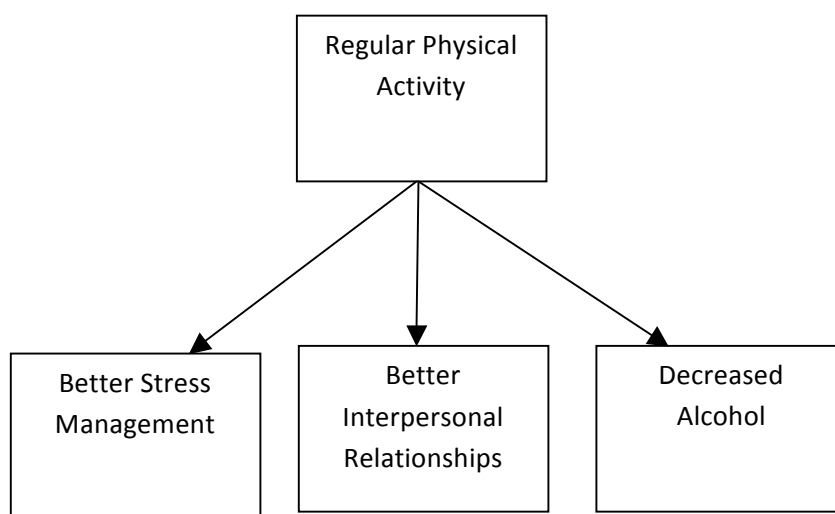
high: 66% of college students engage in alcohol use; 44% of these students binge drink

with binge drinking defined as a pattern of drinking alcohol that brings the blood alcohol

concentration to 0.08 or above.[20-22] Excessive alcohol use can result in many unintended

consequences, including academic failure, car accidents, injuries, pregnancies, and

suicide attempts.[23-24] The college environment is often more liberal than the home

environment and can foster many unhealthy lifestyle behaviors including a sedentary

lifestyle and a lack of physical activity.[25] Previous studies have focused largely on the

socioeconomic status of college students and their health status in relation to alcohol

use.[26] There is limited information on the role of college students' physical activity in

relation to their drinking.[27-28] The studies that have assessed the relationship of physical

activity to alcohol consumption in college students have found a positive relationship.

One study, which evaluated the drinking behaviors of undergraduate freshmen, found that

the students who exercised frequently consumed higher amounts of alcohol.[29] The authors

suggest that the positive association between physical activity and alcohol consumption

may have been due to students who are selecting environments and activities that are

compatible with substance use.[30]

Conceptual Model

The conceptual model that guided this study was the health promotion model

(HPM) developed by Pender.[30] The HPM defines health as a positive dynamic state, not

merely the absence of disease. Health promotion is directed at increasing an individual's

level of well-being. The HPM describes the multi-dimensional nature of people as they

interact within their environment in order to pursue health.[30] The model focuses on three

areas: individual characteristics and experiences, behavior specific cognitions as well as

behavioral outcomes. A modified model was used in the study to assess the relationship

individual health characteristics of physical activity and nutrition have on behavior

outcomes of freshmen. The HPM notes that each person has unique personal

characteristics and experiences that affect the person's subsequent actions. Health

promoting behavior is the desired behavioral outcome and the end-point in the HPM.

Health promoting behaviors should result in improved health, enhanced functional

ability, and a better quality of life. Past studies have used the HPM model to examine the

relationship of social support of family to increased physical activity in adolescents.[32]

Individual Behavior & Characteristics

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                    ┌─────────────────┐
                    │ Regular Physical│
                    │    Activity     │
                    └─────────────────┘
        ┌───────────────┐  ┌───────────────┐  ┌───────────────┐
        │ Better Stress │  │    Better     │  │   Decreased   │
        │  Management   │  │ Interpersonal │  │    Alcohol    │
        │               │  │ Relationships │  │               │
        └───────────────┘  └───────────────┘  └───────────────┘
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Behavior Outcomes

Figure 1.

The purpose of this study was to determine the degree to which college freshmen

engage in health promoting lifestyles, the ways in which college students' health

behaviors change over their first six months of college, and the demographic factors that

contribute to a health-promoting lifestyle. Specifically, this study assessed the effects of

physical activity on the participants' interpersonal relationships, stress management, and alcohol consumption. The literature supports the following hypotheses:

Hypothesis 1: College students who engage in regular physical activity will have lower levels of stress.

Hypothesis 2: College students who engage in regular physical activity will have better interpersonal relationships.

Hypothesis 3: College students who engage in regular physical activity will consume less alcohol.

METHODS

This study was a sub-study of an existing longitudinal study designed to prevent drinking in college students.[33] In the main study, a brief motivational intervention to prevent drinking was administered to college freshmen at baseline and follow-up at 3 and 6 months. As part of this longitudinal study, a sub-study was conducted by adding one measure, the Health Promotion Lifestyle Profile II (HPLP II)[34] measure, to determine the health promoting lifestyles of college freshman at baseline, 3 months, and 6 months. This paper reports the physical activity associations using the HPLP II measure in a subset of college students.

Procedures

Participants were freshmen from a public university in the Southeastern U.S. that participated in a healthy lifestyle survey that measured health behaviors and drinking patterns. Eligibility requirements included being a college freshman between the ages of 18 and 25, drinking alcohol within the past 90 days, and possessing the ability to read and speak English. This questionnaire included demographic information such as age, gender, race/ethnicity, education level, and place of residence. Students were recruited

from freshmen seminar classrooms and residence halls on campus. They were screened by telephone to determine their eligibility to participate in the study. Participation was voluntary. Institutional review board approval was obtained. Students signed an informed consent prior to completing the questionnaire. Participants received a $20 gift card to the university bookstore after completion of the baseline visit. Eligible students ($N = 167$) who agreed to be in the study were administered the (HPLP II) and Daily Drinking Questionnaire (DDQ)[35] questionnaires at baseline, 3 months, and 6 months. A subset of participant information from the main study on the prevention of drinking in college freshman (n=167) formed the database for this study. Data were collected from students who completed the HPLP II and the DDQ.

Instrumentation

The DDQ[35] measures drinking patterns, including quantity and frequency over a typical week. The DDQ was used to assess drinking patterns of a "typical week" occurring within the last month and the number of drinks consumed on a specific day. Alcohol consumption was calculated by averaging the number of drinks consumed per day during a week's period (Monday-Sunday). The DDQ has been tested and found to have a reasonable level of internal consistency, with Cronbach alphas of .66 and .75.[35]

The HPLP II [34] is a 52-item instrument that assesses individuals' endorsement of health-promotion behaviors. The HPLP II is a 4-point Likert scale ranging from "never" to "routinely". In this study, only three of the six subscales were used which included physical activity, interpersonal relationships, and stress management. The HPLP has a high internal consistency (alpha= 0.92). The alphas for the three subscales in this study are as follows: physical activity=.85, interpersonal relationships=.87, and stress

management=.79. [34] Mean scores range between 1.00 to 4.00 with means closer to 1.00 representing a lack of health promoting behaviors and 4.00 representing an optimal healthy lifestyle. [34]

Independent Variables

Physical activity is defined as any form of activity that gets the body moving and exercise that involves regimented moderate or vigorous physical activity.[3] Physical activity was computed using 8 items of the HPLP questionnaire, which assessed the frequency of moderate to vigorous exercise and whether the respondents followed a planned exercise regimen. The subscale on physical activity is scored by summing the values for each of the 8 items and dividing by the number of items. Mean scores range from 1.00 to 4.00. A score ≤2.5 represents moderate physical activity and a score >2.5 represent a person with high physical activity. These cut points for the physical activity measure were determined by the distribution of the data.

Dependent Variables

Stress management encompasses techniques intended to equip a person with effective coping mechanisms for dealing with stress from psychological, emotional, physiological, and physical changes.[36] Identifying the amount of stress and making the changes will result in successful stress management. Stress management was computed by using 8 items of the HPLP questionnaire, which assessed a participant's method of controlling stress, amount of sleep received, tiredness, and relaxation practices. The subscale stress management is scored by summing the values for each of the 8 items and dividing by the number of items. Mean scores range from 1.00 to 4.00. A score ≤2.5 represents moderate stress management, and a score >2.5 represents high stress

management. The cut points for stress management measure were determined by the distribution of the data.

Interpersonal relationships are association between two or more people that may range from fleeting to long-term[16] Interpersonal relationships involve the communication and sharing of thoughts and feelings through verbal and nonverbal messages.[16] Interpersonal relationships were assessed with 9 items of the HPLP questionnaire that assess a participant's ability to have meaningful and fulfilling relationships with others. The subscale of interpersonal relationships is scored by summing the values for each of the 9 items and dividing by the number of items. Mean scores range from 1.00 to 4.00. A score ≤3.25 represent moderate interpersonal relationships, and a score > 3.25 represent high interpersonal relationships. The cut points for interpersonal relationships were determined based on the distribution of the data.

The alcohol consumption of the participants were assessed by the mean number of drinks consumed per week. An average score between 7 and 14 drinks per week represents moderate alcohol consumption. An average score between 15 and 45 drinks per week represents high alcohol consumption.

STATISTICAL ANALYSIS

Participants' scores were entered into Microsoft Excel. Next, data were imported into SAS 9.2 statistical software. Percentages were computed for questions pertaining to age, gender, race, and place of residence. Percentages were also used to represent the areas of health behaviors (physical activity, interpersonal relations, and stress management) based on the participants' responses. Mean scores were used to assess three measures of health behaviors from the Health-Promoting Lifestyle Profile (HPLP

II) completed by the participants. The mean number of drinks consumed over a week was used to assess alcohol consumption. The participant's physical activity was assessed for its effect on the stress management, interpersonal relationships, alcohol consumption and was compared at two time points: baseline exposure and 3 month outcome and 3 month exposure and 6 month outcome.

Logistic Regression

Logistic regression analysis was performed to evaluate physical activity related to these 3 health behaviors. All analyses were performed using SAS, 9.2. Given the modest sample size, $p < 0.15$ was used for the backward elimination procedure to select variables for inclusion in the adjusted models.

RESULTS

Participant Characteristics

Students were between the ages of 18 and 20; 75% were 18; 24% were between 19 and 20. The students' race/ethnicity included 61% Caucasian American, 19% Black, and 19.1% Other. Other includes participants who identified themselves as Multi-racial, Asian, and Other. Place of Residence included Greek House 21.5%, Dormitory/Apartment, 68.2%, and with Parents 10.1%. Participant characteristics are shown in table 1.

The final model shows the relationship of physical activity and the three outcomes are shown in Tables 2 and 3 at the two time points: baseline to 3 months and 3 months to 6 months. In the final model, none of the demographic variables of age, race, gender, and place of residence were statistically significant at the 0.05 level. Though, the gender (OR) suggested that men had a lower likelihood than women to have better stress

management, higher interpersonal relationships and lower alcohol consumption. The results are shown in Tables 2 and 3.

Physical Activity and Stress Management

For both periods, there was no significant association between regular physical activity and stress management. Although, the odds ratio (OR) suggest a protective relationship between physical activity and stress management, 95% confidence intervals (CI) were not statistically significant; baseline to 3 months OR=0.49, 95% CI: 0.24,1.01 and 3 months to 6 months: OR= 0.52, 95% CI: 0.25,1.29.

Physical Activity and Interpersonal Relationships

For both periods assessed, there was no association between physical activity and interpersonal relationships. Although, the odds ratio (OR) suggest an association between physical activity and stress level, 95% confidence intervals (CI) were not statistically significant; baseline to 3 months OR= 0.85, 95% CI: 0.41,1.74 and OR= 0.61, 95% CI: 0.27,1.38 3 to 6 months.

Physical Activity and Alcohol Consumption

For both periods assessed, there was no association between physical activity level and alcohol consumption. Although, the odds ratios suggest a negative relationship between physical activity and alcohol consumption, 95% confidence (CI) and were not statistically significant: baseline to 3 months OR= 0.59, 95% CI: 0.23, 1.10 and 3 to 6 month OR= 0.57, 95% CI: 0.23, 1.41.

For all three models, a backwards elimination approach was used so that only those variables significant at the 0.15 level remained in the final model. The

demographic variables were not found to be confounders and the unadjusted results

remained. Results for the regression analyses are presented in Tables 2 and 3.

DISCUSSION

This research is unique in that there are limited studies that have collectively

researched these three health behaviors and their relationship to physical activity in

college students. This study found that no statistically significant relationships existed.

Studies based on larger samples, however, have found associations of healthier lifestyles

of students who consume less alcohol.[22,24] In particular, studies assessing interpersonal

relationships have found that physical activity is not only determined at the individual

level, but also is greatly affected by the social environment.[39] College students who

experience more social support are more physically active than other groups of

students.[15] The relationship of stress and college student health has been widely studied;

these studies show that students who exercise frequently exhibit lower levels of stress.[9]

Similarly, alcohol use in college students has been extensively studied; students who are

physically active are shown to consume less alcohol.[27] The benefits of regular physical

activity are widely known and have been shown to positively impact wellness by

reducing stress and creating better relationships in college students. Although none of the

results of this study was significant, most likely due to the modest sample size, larger

studies have documented the importance of health promotion in the first year. There is a

need for targeted health interventions that promote physical activity and assist college

students in making positive health decisions upon enrolling in college.

Limitations

Several limitations are acknowledged. The first limitation was the small sample size of 167 participants, which limited the statistical power and the ability to control for variables. The wide odds ratios indicate that the study was under-powered by sample size, and if a larger sample size were present, there could have been significant associations present. The second limitation was generalizability. The study sample was collected from a single southern university, which would limit the generalizability of this study to other college student populations. An additional limitation could be that the sample included students that drank alcohol within the last 90 days, thus, this sample is not be representative of all college students. The final limitation is that it is unknown if the intervention from the main study influenced the outcomes of the participants in this sub-study.

Study Significance and Implications for Future Research

This study does have important implications for future health services research studies. These findings can be helpful in understanding the health behaviors in college students. This study identifies specific mechanisms by which stress management, interpersonal relationships, and alcohol consumption may influence physical activity and increases the knowledge on the role of the social environment on the health behaviors of college students. Future research of a larger sample of college students may be needed to further understand the magnitude of the relationship between health behaviors and physical activity.

Conclusions

There is an urgent need for college students to adopt healthier lifestyle practices and maintain physical activity while in college. Future research on the health promotion needs of college students is extremely important in the development of successful health interventions and programs that can lead to lifelong wellness in college students.[39]

TABLES

Table 1. Participant Characteristics for the HPLP II and DDQ variables

Variable	N	%
Age		
18 Years	126	(75.4)
19-20 Years	41	(24.6)
Gender		
Male	66	(37.7)
Female	101	(62.2)
Race		
Caucasian	103	(61.67)
African- American	32	(19.16)
Other	32	(19.1)
Place of Residence		
Greek House	36	(21.55)
Dormitory/Apartment	114	(68.23)
With Parents	17	(10.17)
Stress Management		
Moderate(≤2.5)	69	(41.4)
High(>2.5)	97	(58.6)
Interpersonal relationships		
Moderate(≤3.25)	84	(50.9)

High(>3.25)	83 (49.1)
Alcohol Consumption	
Mod (7-14)drinks/week	70 (41.6)
High (15-45)drinks/week	97 (58.4)
Physical Activity	
Moderate(≤2.5)	82 (49.4)
High(>2.5)	85 (50.6)

Table 2. Final model of the (Baseline to 3 month) association on the effect of physical activity on the stress management, interpersonal relationships and alcohol consumption in college freshmen.

Baseline & 3 months	OR	95% CI
Stress Management		
Physical Activity		
Moderate ≤2.5	0.49	(0.24 1.01)
High >2.5	1.00	Referent
Age		
18 years	1.00	Referent
19-20 years	0.43	(0.28 1.13)
Gender		
Male	0.67	(0.32 1.37)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.58	(0.24 1.42)
Other	0.66	(0.36 2.70)
Place of Residence		
Greek House	0.24	(0.19 1.51)
Dormitory/Apartment house	1.00	Referent
With Parents	0.91	(0.31 2.67)

Table 2. Final model of baseline to 3 month continued.

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Interpersonal Relationships

Physical Activity

Moderate ≤ 2.5	0.85	(0.41 1.74)
High >2.5	1.00	Referent

Age

18 years	1.00	Referent
19-20 years	0.87	(0.40 1.89)

Gender

Male	0.67	(0.36 2.65)
Female	1.00	Referent

Race

Caucasian	1.00	Referent
African-American	0.36	(0.22 3.31)
Other	0.60	(0.41 4.12)

Place of Residence

Greek House	0.82	(0.28 1.38)
Dormitory/Apartment house	1.00	Referent
With Parents	0.74	(0.46 2.77)

Alcohol Consumption

Physical Activity

Moderate ≤2.5	0.59	(0.23 1.10)
High >2.5	1.00	Referent

Table 2. Final model of the baseline to 3 month continued.

Age		
18 years	1.00	Referent
19-20 years	0.24	(0.35 2.11)
Gender		
Male	0.92	(0.42 2.02)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.44	(0.21 4.03)
Other	0.26	(0.18 3.26)
Place of Residence		
Greek House	0.61	(0.32 3.31)
Dormitory/Apartment house	1.00	Referent
With Parents	0.94	(0.45 3.64)

*There were no confounders retained in the final model.
 Note: OR= Odds Ratio; CI =confidence interval

Table 3. Final model of the (3 to 6 month) association on the effect of physical activity on the stress management, interpersonal relationships and alcohol consumption in college freshmen.

3 & 6 months	OR	95% CI
Stress Management		
Physical Activity		
Moderate ≤2.5	0.52	(0.25 1.29)
High >2.5	1.00	Referent
Age		
18 years	1.00	Referent
19-20 years	0.70	(0.26 1.88)
Gender		
Male	0.43	(0.18 1.02)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.61	(0.26 4.26)
Other	0.82	(0.23 1.94)
Place of Residence		
Greek House	0.62	(0.51 5.05)
Dormitory/Apartment house	1.00	Referent
With Parents	0.95	(0.42 4.07)

Table 3. Final model 3 and 6 months continued.

Interpersonal Relationships		
Physical Activity		
Moderate ≤ 2.5	0.61	(0.27 1.38)
High >2.5	1.00	Referent
Age		
18 years	1.00	Referent
19-20 years	0.36	(0.20 5.04)
Gender		
Male	0.92	(0.83 4.47)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.64	(0.27 2.69)
Other	0.89	(0.51 6.93)
Place of Residence		
Greek House	0.22	(0.03 1.38)
Dormitory/Apartment house	1.00	Referent
With Parents	0.39	(0.19 2.31)
Alcohol Consumption		
Physical Activity		
Moderate ≤2.5	0.57	(0.23 1.41)
High >2.5	1.00	Referent

Table 3. Final model of 3 and 6 month continued.

Age		
18 years	1.00	Referent
19-20 years	0.48	(0.25 3.22)
Gender		
Male	0.29	(0.11 0.73)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.83	(0.27 2.47)
Other	0.35	(0.10 6.01)
Place of Residence		
Greek House	0.69	(0.15 1.33)
Dormitory/Apartment house	1.00	Referent
With Parents	0.98	(0.29 4.13)

*There were no confounders were retained in the final model.
  Note: OR= Odds Ratio; CI =confidence interval

JOURNAL ARTICLE II

Nutrition Among College Students

  The transition period of leaving home and entering college is for many students a time of independence and freedom to make their own choices (Hudd, et al. 2000). This period is of great importance because health behaviors established in college are usually maintained for long periods after graduation. During this period of new independence, students often make poor health decisions such as eating junk food. The United States Department of Health and Human Services (2005) diet recommendations include 2 ½-3 cups of fruits and vegetables per day and 3 cups of whole grain and low-fat milk products. Few young adults between the ages of 18 and 25, however, follow these diet recommendations. The transition into college marks a time of weight gain; freshman typically are gaining between 5 and 15 pounds during their freshman year.

  Authors who have assessed nutrition in college freshman have attributed this weight gain to wrong food choices and large portions (Monteiro, Jeremic, & Budden, 2008). The spike in weight also has been attributed to lack of knowledge regarding food choices as well as the misreading of label information when purchasing an item for the first time (Kolodinsky, 2008). Making health conscious food choices is particularly challenging when prior to college the majority of the meal planning was done by parents (Muta, 2008). The weight gain by college freshman is a clear public health concern. Several studies have assessed differences in nutrition and food choices by race and ethnicity and have found that minority women are less likely than other groups to make

healthy food choices as well as suffer from higher rates of obesity and chronic disease (Blanchard, 2008).

Nutrition and Stress Management of College Students

Several studies have assessed the diet quality of college students and found that students consume less than the recommended amount of fruits and vegetables needed for a healthy diet (Centers of Disease Control and Prevention, 2011). Research also indicates that stress can be detrimental to college students' academic performance as well as their overall health and nutrition (Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). Unusan (2006) evaluated a small sample of 90 college students using a fruit and vegetable questionnaire and a stress and coping questionnaire. Unusan found that students' diets were heavily affected by the degree of their stress.

Other studies have evaluated nutrition and stress by gender and found that in women there is more unhealthy eating during periods of high stress. A longitudinal study of 71 college women conducted by Roberts (2008) found that periods of chronic stress were correlated with changes in food choice and increased energy consumption that resulted in weight gain. A study by Economos, Hildebrant, and Hyatt (2008) assessed the relationship of stress with diet and weight change in a sample of 396 freshmen. This study found that weight increased more than 5 pounds in men and women due to perceived stress. Environmental stressors such as junk food accessibility and "all you can eat" dining halls have been shown to contribute to obesity in college students (Economos, Hildebrant, & Hyatt, 2008).

Nutrition and Interpersonal Relationships of College Students

Recent literature has verified the strong impact of the social environment on eating habits, though much of that literature has involved children and adolescents (Gruber, 2008). Less research has been conducted on the association of interpersonal relationships with a young adult's diet and health (Gruber, 2008). The social environment is a fundamental aspect of an individual's health and well-being (Cohen, 2004). However, the social environment influences norms, which can adversely affect certain health behaviors. Social interactions and interpersonal relationships are important parts of the social environment for college students, and they can have a profound impact on the health behaviors of these students (Cohen, 2004). Students who are socially connected and have better social support from family and friends tend to have healthier diets and overall better nutrition. Other studies, which have assessed the association of social relationships with health status, have shown a positive relationship that exists between an individual's well-being and their interpersonal relationships (Canevello, 2010).

Nutrition and Alcohol Consumption of College Students

Excessive alcohol consumption has become a widespread problem on many college campuses (Wechsler et al., 2003; Von et al., 2004). This is a particular issue for entering college students because they are vulnerable to the changes and greater freedoms that accompany the transition into college (Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). College students are often challenged by their new environment and make choices that can greatly affect their health. Such decisions for college students include frequent alcohol consumption and an inadequate diet. Currently college students between the ages of 18 and 25 eat less than the recommended daily amounts of fruits and vegetables (CDC,

2010). Several studies have evaluated the extent to which college students restrict

calories when they are going to consume high amounts of alcohol. An example is a recent

study that assessed college drinking behaviors. This study found that among 4,271

students, 67% reported past-month drinking and 1,106 (39%) reported restricting food,

fat, or calories on days they were planning to drink alcohol (Giles, 2009). Additional

studies indicate that female college students are more likely to restrict their calories thus

affecting diet quality because of a need to be thinner (Giles, 2009). Poor eating habits has

been associated both with consuming less calories and with consuming high amounts of

alcohol, which creates an imbalanced diet and long-term health problems in college

students (Giles, 2009).

Conceptual Model

The conceptual model that guided this study was the health promotion model (HPM)

developed by Nola J. Pender. The HPM describes the multi-dimensional nature of people

as they interact within their environment in order to pursue health (Pender,1982). The

model focuses on individual characteristics and experiences, as well as behavioral

outcomes. A modified version was used in the study.
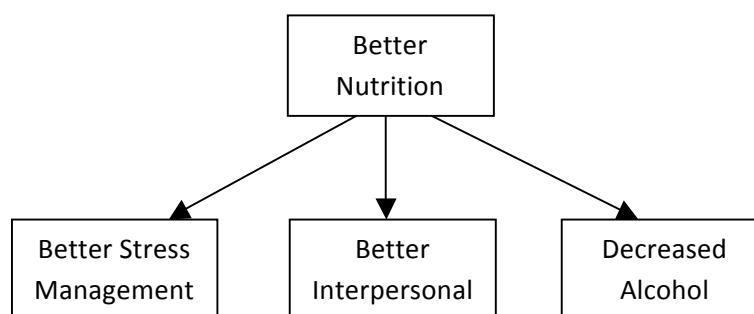

Figure 1.   *Individual Behavior Characteristics & Behavior Outcomes*

METHODS

This study examined college freshmen's nutrition and diet during their first six months of college. Specifically, the study assessed the associations of nutrition effects on health promotion behaviors in college freshman with (1) interpersonal relationships, (2) stress management, (3) and alcohol use. The literature supports the following hypotheses:

Hypothesis 1: College students who eat healthy diets will have lower levels of stress.

Hypothesis 2: College students who eat healthy diets will have better interpersonal relationships.

Hypothesis 3: College students who eat healthy diets will consume less alcohol.

Study Design

This study included a sub-study of an existing longitudinal study of an intervention that seeks to prevent drinking in college students at a southern public university. The brief motivational interviewing was provided by graduate student peers who were trained to use harm reduction techniques when conducting the intervention (Kazemi, Sun, Nies, Dmochowski, Walford, 2011). The main study participants were college freshmen who received assessments at baseline, 3-months, and 6 months post intervention. As part of the ongoing longitudinal study, this sub-study was conducted adding one measure, the Health Promotion Life-style Profile II (HPLP II), to evaluate the health promoting lifestyle of college freshman at baseline, 3 months, and 6 months. This paper reports on the relationships found using the HPLP measure for a subset of college students.

Participants and Recruitment

Participants were recruited from freshmen classrooms and residence halls on campus. Eligibility criteria included enrolled as a freshman, between ages of 18 and 25, drank alcohol within the previous 90 days, and the ability to read and speak English. Participant eligibility was determined through phone screens. Institutional Review Board approval was obtained for the study. Students were provided with informed consent forms prior to completing the questionnaires. As an incentive, the participants received a $20 gift card to the university bookstore after completion of the baseline visit. Eligible students ($N = 167$) who agreed to be in the study were administered the HPLP II at baseline, at 3 months, and at 6 months. There were 148 participants at 3 months and 125 participants at 6 month conclusion of the study. Demographic information on age, gender, race/ethnicity, and place of residence were collected from the participants.

Instrumentation

The Daily Drinking Questionnaire (DDQ) is a commonly used self-report measure that provides information about quantity and frequency of alcohol consumption. The (DDQ) was used to assess drinking patterns of a "typical week" occurring within the last month and the number of drinks that are consumed on a specific day. Alcohol consumption was calculated by averaging the number of drinks consumed per day during a week's period (Monday-Sunday). The DDQ has been tested and found to have internal consistency of .66 and .75 (Collins, Parks & Marlatt, 1985).

The HPLP II is a 52-item instrument that assesses individuals' health promotion behaviors for living and wellness(Walker, Sechrist, & Pender, 1987). The HPLP II uses a 4-point Likert scale ranging from "never" to "routinely" to measure behaviors that can be

classified along six dimensions. In this study, only three of the six subscales were used: nutrition, interpersonal relationships and stress management.

Dependent Variables

Stress management involves controlling and reducing the tension that occurs in stressful situations by making emotional, physiological and physical changes (Hudd, 2000; Nuygen, 2006). Successful stress management involves identifying the amount of stress and making changes. Stress management was computed by using 8 items of the HPLP questionnaire, which assessed participant's methods of controlling stress, the amount of sleep received, tiredness, and relaxation practices. The subscale on stress management was scored by summing the values for the 8 items and dividing by the number of items. A mean score will range between 1.00 and 4.00. A score ≤2.5 represents moderate stress management and a score greater than >2.5 represents high stress management ability. The cut points for the stress management measure were determined by the distribution of the data.

Interpersonal relationships entail the use of communication to achieve a sense of intimacy and closeness within meaningful interactions rather than casual relationships with others (Canevello & Crocker, 2010). Communication involves sharing thoughts and feelings through verbal and nonverbal messages. Interpersonal relationships were computed with 9 items of the HPLP questionnaire, which evaluated the participant's ability to have meaningful and fulfilling relationships with others. The subscale for interpersonal relationships was scored by summing the values for each of the 9 items and dividing by the number of items. Mean scores range between 1.00 and 4.00. A score of ≤3.25 represents moderate interpersonal relationships and a score > 3.25 reflect high

interpersonal relationships. The cut points for the interpersonal relationship measure were determined by the distribution of the data.

Alcohol consumption was evaluated by assessing the mean number of drinks per week. An average score between 7 and 14 drinks per week represents moderate alcohol consumption. An average score between 15 and 45 drinks per week represents high alcohol consumption. The cut points for alcohol consumption were not based on the literature; these cut points was determined by the distribution of the data.

Independent Variables

Nutrition involves making well-balanced food choices and choosing to consume food that will promote sustenance, health, and wellness. Nutrition also includes choosing a diet consistent with the guidelines provided by the Food Guide Pyramid (USDA, 2010). Nutrition was computed using 9 items on the participant's daily diet and food choices. The subscale on nutrition was scored by summing the values for the 9 items and dividing by the number of items. Mean scores range was between 1.00 and 4.00. A score ≤2.35 represents moderate nutrition, and a score >2.35 represent a person with high nutrition. The cut points for nutrition were determined by the distribution of the data.

RESULTS

Participant Demographics

Students were between the ages of 18 and 20; 75% were 18 years old; 24% were between 19 and 20. Of the students' race/ethnicity, 62% were Caucasian American, 19% Black, and 19% Other. Other includes participants who identified themselves as Multi-racial, Asian, and Other. Place of residence included 21.5% Greek house, 68.2%

dormitory/apartment, and 10.1% with parents. Participant characteristics are shown in Table 1.

The final models shows the relationship of nutrition and the three outcomes are shown in Tables 2 and 3. The relationship was assessed at the two time points: baseline to 3 months and 3 months to 6 months. The final model found that all of the demographic variables of age, race, gender and place of residence was not statistically significant at the 0.05 level. Although, not significant the results suggested that the female participants had higher stress management as compared to their male counterparts with higher interpersonal relationships.

The final model results are shown below and in Tables 2 and 3.

Nutrition and Stress Management

For both periods, there was no significant association between nutrition and stress management. Although, the odds ratio (OR) suggest a possible association between nutrition and stress management, 95% confidence intervals (CI) were not statistically significant: baseline to 3 months: OR=0.54, 95% CI: 0.25,1.10 and 3 months to 6 months OR=0.78, 95% CI: 0.31, 6.76.

Nutrition and Interpersonal Relationships

For both periods assessed, there was no statistically significant association between nutrition and interpersonal relationships. The odds ratio (OR) suggest an association between nutrition and interpersonal relationships, 95% confidence intervals (CI) were not statistically significant; baseline to 3 months OR=1.49, 95% CI: 0.23, 2.34 and 3 to 6 months OR= 1.57, 95% CI: 0.89, 4.35.

Nutrition and Alcohol Consumption

For both periods assessed, there was no association between nutrition and alcohol consumption. Although, the odds ratio does suggest a negative relationship between nutrition and alcohol consumption, the 95% confidence intervals (CI) were not statistically significant; baseline to 3 months OR= 0.64, 95% CI: 0.29, 1.40 and 3 to 6 months OR= 0.59, 95% CI: 0.42, 2.43.

For all three models, a backwards elimination approach was incorporated including each predictor variable and all possible confounders in the equation until the most predictive variables remained at the 0.15 significance level. Results for the regression analyses are presented in Tables 2 and 3.

DISCUSSION

Reducing the risk for chronic disease associated with diet and weight gain is a prominent goal of the American College association's *Healthy Campus 2010*. Nutrition education on college campuses has become increasingly important as students who transition into the college environment face many diet challenges, which often become established health behaviors (Kicklighter, 2010). This was an exploratory research study to further investigate the type of associations that may exist for nutrition and interpersonal relationships, stress management, and alcohol consumption in college students. Interpersonal relationships were found to be positively associated with nutrition behaviors of college students, which is consistent with the current literature. Interpersonal relationships and college students have been studied for the degree to which the social environment influences one's overall health. Gruber (2008) evaluated a sample of 410 male and female undergraduate students to assess the degree to which their peers and

personal relationships affected their diet quality and nutrition intentions. The study concluded that peers and social relationships do encourage diet quality in both male and female college students. Just as hypothesized in this study, prior research has concluded that students who are socially connected have better nutrition (Uchino, 2004).

Study Significance and Implications for Future Research

In future studies that evaluate these specific lifestyle behaviors, a larger sample size of students would provide more statistical power to determine if there are associations for these health behaviors. Although, this study had no significant findings, this study could be a stepping-stone for future researchers to study these types of associations in college students. Few studies have evaluated these behaviors together in college students, and this study can provide further understanding of health promotion behaviors in college students.

Limitations

Several limitations should be noted when discussing the results of this study. The first major limitation of this study concerns the small sample size; 167 students participated in the study. The second limitation was generalizability of the study. Generalizability was limited by the sample, which was drawn from a single southern university. It is not known how well the findings generalize to students in other schools. An additional limitation could be that the sample included students that drank alcohol within the last 90 days, thus, this sample is not be representative of all college students. The final limitation is that it is unknown if the intervention from the main study influenced the outcomes of the participants in this sub-study.

Conclusions

      The purpose of this study was to gain new insight on the nutrition and dietary implications associated with being a new college freshman. For freshmen the new changes in lifestyle can have an adverse impact on dietary and nutrition quality. Research has found that students' diets are heavily influenced by their physical and social environments while attending college (Kicklighter, 2010). Thus, the importance of having a healthy diet has been well-documented in terms of maintaining successful interpersonal relationships. As health interventions are created and targeted for college students, it is important that health promotion research identify the needs of college students so that healthier behaviors can be maintained for a lifetime (Fisher & Nies, 1996).

TABLES

Table 1. Participant Characteristics for HPLP II and DDQ   variables

Variable	N	%
Age		
18 Years	126	(75.4)
19-20 Years	41	(24.6)
Gender		
Male	66	(37.7)
Female	101	(62.2)
Race		
Caucasian	103	(61.67)
African- American	32	(19.16)
Other	32	(19.1)
Place of Residence		
Greek House	36	(21.55)
Dormitory/Apartment	114	(68.23)
With Parents	17	(10.17)
Stress Management		
Moderate($\leq$2.5)	69	(41.4)
High($>$2.5)	97	(58.6)
Interpersonal relationships		
Moderate $\leq$3.25)	84	(50.9)
High($>$3.25)	83	(49.1)

Alcohol Consumption

    Mod (7-14)drinks/week   70 (41.6)

    High (15-45)drinks/week   97 (58.4)

Nutrition

    Moderate (≤2.35)   82 (49.3)

    High(>2.35)   85 (50.7)

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Table 2. Final model of baseline to 3 month association on the effect of nutrition on the stress management, interpersonal relationships and alcohol consumption in college freshmen.

Baseline & 3 months	OR	95% CI
Stress Management		
Nutrition		
Moderate (≤2.35)	0.54	(0.25 1.10)
High (>2.35)	1.00	Referent
Age		
18 years	1.00	Referent
19-20 years	0.76	(0.38 9.79)
Gender		
Male	0.57	(0.27 1.18)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.59	(0.24 1.42)
Other	0.83	(0.33 3.67)
Place of Residence		
Greek House	0.25	(0.03 1.39)
Dormitory/Apartment house	1.00	Referent
With Parents	0.82	(0.28 2.45)

Table 2. Final model of baseline & 3 months continued.

__Interpersonal Relationships__

Nutrition

Moderate (≤2.35)	1.49	(0.23 2.34)
High (>2.35)	1.00	Referent

Age

18 years	1.00	Referent
19-20 years	0.81	(0.40 4.94)

Gender

Male	0.68	(0.81 3.58)
Female	1.00	Referent

Race

Caucasian	1.00	Referent
African-American	0.37	(0.15 2.93)
Other	0.60	(0.41 4.12)

Place of Residence

Greek House	0.74	(0.25 2.21)
Dormitory/Apartment house	1.00	Referent
With Parents	0.71	(0.62 9.76)

__Alcohol Consumption__

Nutrition

Moderate (≤2.35)	0.64	(0.29 1.40)
High (>2.35)	1.00	Referent

Table 2. Final model of baseline & 3 months continued.

Age		
18 years	1.00	Referent
19-20 years	0.20	(0.18 4.21)
Gender		
Male	0.80	(0.36 1.76)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.45	(0.32 4.29)
Other	0.83	(0.27 3.38)
Place of Residence		
Greek House	0.13	(0.03 1.63)
Dormitory/Apartment house	1.00	Referent
With Parents	0.95	(0.21 5.02)

*There were no confounders retained in the final model.
  Note: OR = odds ratio; CI = confidence

Table 3. Final model (3 to 6 month) association on the effect of nutrition on the stress management, interpersonal relationships and alcohol consumption of college freshmen.

3 & 6 months	OR	95% CI
Stress Management		
Nutrition		
Moderate (≤2.35)	0.98	(0.31 6.76)
High (>2.35)	1.00	Referent
Age		
18 years	1.00	Referent
19-20 years	0.24	(0.02 2.37)
Gender		
Male	0.39	(0.16 0.97)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.59	(0.21 1.64)
Other	0.61	(0.32 4.17)
Place of Residence		
Greek House	0.43	(0.31 4.53)
Dormitory/Apartment house	1.00	Referent
With Parents	0.77	(0.09 6.11)
Interpersonal Relationships		
Nutrition		
Moderate (≤2.35)	1.57	(0.89 4.35)
High (>2.35)	1.00	Referent

Table 3. Final model of 3 & 6 month continued.

_____

Age

18 years	1.00	Referent
19-20 years	0.67	(0.12 2.80)

Gender

Male	0.89	(0.56 4.40)
Female	1.00	Referent

Race

Caucasian	1.00	Referent
African-American	0.41	(0.33 2.48)
Other	0.23	(0.19 3.23)

Place of Residence

Greek House	0.48	(0.37 4.65)
Dormitory/Apartment house	1.00	Referent
With Parents	0.86	(0.14 6.29)

Alcohol Consumption

Nutrition

Moderate (≤2.35)	0.59	(0.42 2.43)
High (>2.35)	1.00	Referent

Age

18 years	1.00	Referent
19-20 years	0.46	(0.36 4.97)

Table 3. Final model of 3 & 6 months continued.

	OR	CI
Gender		
Male	0.30	(0.24 0.75)
Female	1.00	Referent
Race		
Caucasian	1.00	Referent
African-American	0.83	(0.28 2.47)
Other	0.72	(0.34 6.80)
Place of Residence		
Greek House	0.16	(0.02 2.65)
Dormitory/Apartment house	1.00	Referent
With Parents	0.42	(0.13 3.64)

*There were no confounders retained in the final model.
Note: OR = odds ratio; CI = confidence

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JOURNAL ARTICLE I

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