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The Effects of Residence on the Eating and Exercise Habits of College Freshmen in US

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Abstract

College freshmen usually face much stress and drastic environmental changes. These may influence health-related habits of college students. The purpose of this study was to compare and investigate the effect of residence on the levels of physical activity, diet patterns, and health-related habits between college freshmen who live on and off-campus. College freshmen (N = 71) participated in this study. Body weight, height, and body mass index (BMI) were measured. The level of physical activity was monitored and dietary patterns were analysed. Exercise, smoking, and drinking habits were surveyed. Physical activity was significantly higher for students living on-campus than for students living off-campus for both male and female. Calorie intake, monosaturated fat intake, and the frequency of alcoholic consumption were significantly higher for females living on-campus, while consumption of vitamins C and E were significantly lower for females living on-campus compared to their off-campus counterparts. We concluded that physical activity can be affected by where they live for both genders. Drinking habits and dietary patterns can be affected by their residence, especially for female students. Therefore, where college students live can be an important factor in impacting their health-related lifestyle

Key words: Physical Activity, Health Behaviour, Campus Living, Freshmen

Introduction

Regarding transitions from high school to college, freshmen face many types of stress and drastic environmental changes. Various environmental and social factors affect college students and cause them to act in some specific manners, especially when it comes to physical activities, drinking alcohol and food choices (Hoffman et al., 2006; Rozin et al., 2003). In this period, previous positive health behaviours such as a healthy diet and regular exercise during high school appear to decline, and negative health behaviours such as alcohol consumption and smoking appear to incline (Jung et al., 2008). These influences could impact health-related behaviours and have lasting effects on body weight.

The first year of college is often associated with weight gain referred to as “freshman 15” in reference to the fifteen pounds that female college freshman allegedly gain during their first year of higher education (Economos et al., 2008; Hoffman et al., 2006).

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Reasons for the weight gain in young adults may be due to specific characteristics of this age group, including important environmental and behavioural changes that influence lifestyle, eating and exercise habits (Crombie et al., 2009). Also, the causes of the weight gain range from the many stresses and changes in entering behaviour, to excessive consumption of alcohol (Economos et al., 2008; Hoffman et al., 2006). Although, some studies do not support the increase by fifteen pounds, the weight gain in this transitional period obviously occurs (Graham & Jones, 2002; Holm-Denoma et al., 2008; Mihalopoulos et al., 2008; Morrow et al., 2006).

Studying freshman health behaviour such as food choice, meal plan status, intake of alcoholic beverage, and physical activity level, can help identify the causes of the weight gain in this period (Levitsky et al., 2004). Dietary intakes and physical activities are the most important factors to control the body weight. Dietary behaviours and food choices are determined by an interaction of various divergent factors, including availability and convenience, price of food, culture, and environmental situations (Brunt & Rhee, 2008). In the aspect of diet in college freshman, many universities recommend freshmen to live on-campus and to purchase meal plans (Kasparek et al., 2008). However, female freshmen who lived on-campus and had mandatory meal plans gained weight 34 times faster than their non-collegiate peers due to unlimited amount of food choices and increased portion sizes (Rolls et al., 2002). These results implicate that where students live can affect their dietary pattern and finally connected to their weight gain.

Physical activity is another major factor in weight control. On-campus life can provide a transportation walking behaviours. The average student on a traditional university campus walks 9,000-11,000 steps per day, a value considered sufficiently active (Behrenes & Dinger, 2003; Behrens & Dinger, 2005; Welsh et al., 2002). Moreover, there is a great possibility that exercise facilities on college campuses influence students' physical activity level (Brevard & Ricketts, 1996). Therefore, residence of the college student might impact their daily activities and accessibility to the exercise facilities.

A study of freshman dorm residents adds a new perspective to this phenomenon. Living arrangements and physical environment both largely influence lifestyle factors and health behaviours such as food choices, nutrient content of the diet, and physical activity habits (Brevard & Ricketts, 1996; Moczulski et al., 2007). To our knowledge, there are few studies focused on the effects of residency (on-campus, off-campus living) on physical activity, diet patterns and health-related habits. Also, most of these studies were performed on all levels of college students and not on freshmen specifically. Furthermore, patterns such as exercise and dietary patterns were factored separately and not in cohesion reflective of a college freshman student. Therefore, it remains unclear whether or not the residence status could influence college freshmen. We hypothesized that residency of college freshmen makes differences in physical activity, dietary pattern, and health related habits.

We believe that environmental factors including type of residence, play a major role in developing health-related habits of college students, especially on freshman. Therefore, the purpose of this study was to compare and investigate the effect of residence on the levels of physical activity, diet patterns, and health-related habits between college freshmen who live on and off-campus.

Methods

Participants

Researchers of this study visited several freshmen level core classes to inform and provide a complete description of the study and recruited participants. The majority of students at the University are Hispanic. There are 11.5% students living on campus (data

obtained from University's demographic figure). Seventy one university freshmen (22 males and 49 females) participated in the study. Based on the status of residence, the participants were divided into either an on-campus group (n = 31) or an off-campus group (n = 40). Participants completed a lifestyle survey questionnaire and performed the measurements of body weight, body mass index (BMI). Level of physical activity was monitored using a pedometer (Omron HJ-150 Hip Pedometer) for seven days. Personal daily logs, recording sheet for food consumption, were given and asked to record food consumption for seven days. All procedures of this study were approved by the Institutional Review Board for Human Subjects of Texas A&M International University and each participant gave informed written consents.

Methodology

All seventy one participants underwent measurements of body weight and height, body mass index (BMI). Body weight and height were assessed with a mechanical scale and height rod (Health O meter Professional, McCook, IL), while participants wore light clothes and no shoes. The following formula was used to determine BMI: Weight (kg)/ Height (m)* Height (m).

Physical activity can be evaluated by using direct or indirect methods, indirect methods are surrogate markers of physical activity and direct methods reflect actual movement and/or energy expenditure (Ainsworth, 2000). Pedometers can be used to directly measure ambulatory physical activity. Pedometers are relatively inexpensive and allow for objective and reliable measurement of ambulatory physical activity (Bassett, 2000). Participants were provided with a physical activity log and a pedometer (Omron Healthcare, Inc., Lake Forest, IL) and instructed to wear the pedometer all day (morning to right before bed time). The participants were informed that the pedometer screen look as if it is off, but continue to record the number of steps throughout the day, and that to activate the screen, they should simply give it a shake. At the end of the day, participants were instructed to remove the pedometer and record the number of steps taken for that day on their provided activity log. This procedure was followed for all seven days.

Personal daily logs (recording sheets for food consumption) were developed based on previous researches (Lee, Kaster, & Misra, 2012) and given to the subjects. The subjects were asked to record their food consumption for seven days. Dietary pattern (total caloric intake, % calories from fat, and sodium, potassium, sugar, calcium, and vitamin intake) was assessed by the researcher based on the daily log using computer software (Diet Power, Inc., Danbury, CT).

Statistics

All data were analysed using SPSS 20.0 (SPSS Inc., Chicago, IL). All data were expressed as means standard deviations to describe the distribution of continuous variables. The differences between on and off-campus groups were identified with an independent t test by gender. A level of significance was set $P < .05$ for all comparisons.

Results

Characteristics of participants

The seventy one subjects who participated in this study included 22 males (31%), (9 on-campus vs. 13 off-campus), and 49 females (69%), (22 on-campus vs. 27 off-campus). The descriptive characteristics of participants were as shown in Table 1. There are no significant differences between on and off-campus residence in body weight, height, and BMI. In the same way, each group was separated by their gender; there are no significant differences. However, there are statistically significant differences in physical activities

Table 1. *Characteristics of Participants of the Study by Residency and Gender (n = 71).*

	On-campus (n = 31)			Off-campus (n = 40)		Sig. (p)
Weight (kg)	69.4 ± 21.7			65.6 ± 19.3		.445
Height (cm)	160.0 ± 12.1			162.9 ± 8.3		.236
BMI (kg/m2)	27.4 ± 9.0			24.8 ± 6.9		.188
	Male			Female		
	On-campus (n = 9)	Off-campus (n = 13)	Sig. (p)	On-campus (n = 22)	Off-campus (n = 27)	Sig. (p)
Weight (kg)	74.7 ± 21.1	63.7 ± 14.7	.172	67.2 ± 22.0	66.5 ± 21.3	.908
Height (cm)	166.8 ± 11.7	171.2 ± 3.7	.304	157.3 ± 11.4	158.9 ± 6.8	.524
BMI (kg/m2)	27.0 ± 7.6	21.8 ± 5.1	.074	27.5 ± 9.8	26.2 ± 7.3	.586

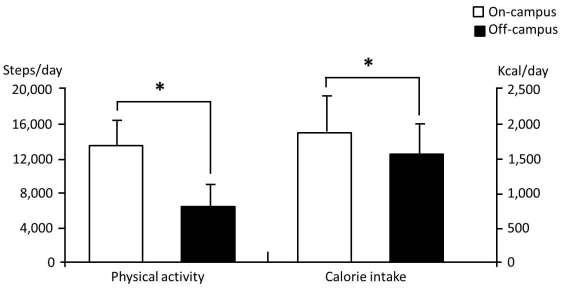

Fig 1. *Physical activity and calorie intake by on and off-campus residency.(*significant differences P<.05)*

(13,547.3 ± 2,897.8 steps vs. 6,488.9 ± 2,511.0 steps, P < .001) and calorie intake (1,874.0 ± 549.6 kcal vs. 1,574.3 ± 449.0 kcal, P = .014) between students who live on and off-campus (Fig. 1). Thus, to figure out the differences by their gender, we separated these results by gender in both on and off-campus (Table 1).

Level of physical activity and exercise habits

Physical activity level was monitored by pedometer for seven days and the exercise habit was surveyed by questionnaire to support the physical activity level. Physical activity was significantly higher in subjects living on-campus in both male and female by 86% (14,152.1 ± 1,220.2 steps vs. 7,611.2 ± 3379.5 steps, P = .001) and 119% (13,043.2 ± 3,864.3 steps vs. 5,948.5 ± 1,803.7 steps, P < .001), respectively. Since pedometer data could not give the intensity of physical activity, a survey was conducted to figure out the intensity of physical activity levels (light/moderate /vigorous). Especially in the survey of exercise habit, light physical exercise is the major difference between on and off-campus residents (Table 2). Moderate and vigorous intensity of exercise showed no significant differences.

Smoking and drinking habits, as a health related habits, were investigated with a questionnaire. No difference was found in smoking habits of males living on-campus and those living off-campus. Similarly, smoking habits of females living on-campus and off-campus showed no differences. However, drinking habit of alcoholic beverages has shown to be affected by the residency of females. Frequency of alcoholic beverage consumption was not affected by the residency of male students. For example, female students living on-campus drank alcoholic beverages more frequently than students living off-campus (Table 2).

Dietary pattern

Dietary pattern including calorie and nutrition intake was recorded by self-report for seven days of food consumption and analyzed by computer software (Diet power, Danbury, CT). All of the food intakes were categorized by nutrients. Total calorie intake was 19.0% higher for females living on-campus than off-campus (1,776.2 ± 414.7 kcal vs. 1,493.0 ± 419.5 kcal, P = .022). Calorie intake for males living on-campus was 21.2% higher (2,113.2 ± 768.4 kcal) than that of males

Table 2. Level of Physical Activity and Exercise, Smoking, and Drinking Habits for College Students Living On and Off-campus by Gender.

	Male			Female		
	On-campus	Off-campus	Sig. (p)	On-campus	Off-campus	Sig. (p)
PA (steps/ day)	14,152.1 ± 1,220.2	7,611.2 ± 3379.5	.001*	13,043.2 ± 3,864.3	5,948.5 ± 1,803.7	.000*
Exercise habit						
How many times do you practice physical activity (light/moderate/vigorous) every week (1 = none, 2 = once, 3 = twice, 4 = three times, 5 = four times or more)						
Light	2.9 ± 1.5	2.0 ± 0.8	.001*	2.6 ± 0.9	2.0 ± 1.3	.000*
Moderate	2.1 ± 0.6	2.1 ± 0.5	.874	2.3 ± 0.8	2.4 ± 0.8	.606
Vigorous	1.9 ± 0.8	1.8 ± 0.6	.865	2.0 ± 0.8	2.1 ± 0.9	.754
Smoking and drinking habits						
Do you currently use tobacco? (everyday = 1, some days = 2, or not at all = 3)						
Tobacco	3.0 ± 0.0	2.8 ± 0.4	.166	2.9 ± 0.3	3.0 ± 0.2	.487
How many times did you have 5 or more drinks on occasion during the past month? (1 = none, 2 = once, 3 = twice, 4 = 3 to 5 times, 5 = 6 times or more)						
AB	2.1 ± 1.8	1.8 ± 1.3	.593	1.9 ± 1.4	1.1 ± 0.4	.016*

* Significant differences for p<.05; PA = physical activity, AB = alcoholic beverage

living off-campus (1,743.2 ± 477.7 kcal), but this difference was not significant (P = .223). Monosaturated fat consumption (15.1 ± 6.7 g vs. 10.5 ± 5.4 g, P = .011) was 44% higher for females living on- campus than those of living off-campus. Vitamin C (53.8 ± 43.6 IU vs. 91.0 ± 79.8 IU, P = .045) and E (3.2 ± 2.0 IU vs. 7.7 ± 8.1 IU, P = .014) consumption were significantly higher for females living off-campus (Table 3).

Table 3. Calorie and Nutrition Intakes of College Students Living On and Off-campus by Gender.

	Male			Female		
	On-campus	Off-campus	Sig. (p)	On-campus	Off-campus	Sig. (p)
CI (kcal)	2,113.2 ± 768.4	1,743.2 ± 477.7	.223	1,776.2 ± 414.7	1,493.0 ± 419.5	.022*
Fat (g)	75.4 ± 32.2	72.4 ± 23.0	.803	66.2 ± 22.1	55.7 ± 21.1	.099
SF (g)	26.5 ± 12.2	25.6 ± 8.7	.841	20.2 ± 6.1	21.7 ± 13.5	.603
PSF (g)	5.1 ± 3.6	6.0 ± 4.0	.592	6.6 ± 3.5	5.2 ± 3.7	.187
MSF (g)	10.6 ± 7.4	15.3 ± 14.8	.399	15.1 ± 6.7	10.5 ± 5.4	.011*
Cholesterol (mg)	282.3 ± 205.4	361.2 ± 270.6	.469	221.4 ± 160.6	193.5 ± 70.4	.454
Sodium (mg)	3,145.0 ± 1,348.0	2,902.8 ± 1,115.8	.650	2,439.9 ± 764.3	2,213.5 ± 748.5	.304
Potassium (mg)	1,097.7 ± 560.0	1,175.2 ± 623.8	.769	1,363.7 ± 634.2	1,311.6 ± 649.2	.799
CH, Total (g)	265.3 ± 116.4	220.1 ± 86.8	.308	201.7 ± 56.1	204.3 ± 147.4	.939
DF (g)	12.7 ± 6.1	13.5 ± 5.9	.779	9.7 ± 4.6	10.2 ± 4.5	.698
Sugars (g)	15.0 ± 12.5	16.6 ± 10.2	.739	25.1 ± 20.3	20.9 ± 17.6	.441
Protein (g)	77.7 ± 21.1	82.3 ± 30.7	.707	59.7 ± 15.7	68.1 ± 19.3	.104
Vitamin A (IU)	1,247.2 ± 1,843.9	1,072.4 ± 1,515.4	.810	813.2 ± 619.4	994.8 ± 895.2	.407
Vitamin C (IU)	63.5 ± 34.8	69.0 ± 71.6	.835	53.8 ± 43.6	91.0 ± 79.8	.045*
Calcium (mg)	637.0 ± 239.6	628.3 ± 258.1	.937	570.2 ± 272.0	446.3 ± 168.4	.057
Iron (mg)	13.4 ± 5.6	11.8 ± 4.6	.476	10.2 ± 4.0	24.1 ± 51.7	.215
Vitamin E (IU)	2.7 ± 2.6	2.6 ± 1.6	.860	3.2 ± 2.0	7.7 ± 8.1	.014*

* Significant differences for p<.05; CI = calorie intakes, SF = saturated fat, PSF = polysaturated fat, MSF = monosaturated fat, CH = Carbohydrate, DF = Dietary fat

Discussion

Among young adults (aged 18–25 years), the transition period from high school to college is a critical time for establishing and maintaining a healthy lifestyle (Poobalan et al., 2010). Socio-environmental changes during this period could impact health related behaviour and have lasting effects on body weight. The purpose of this study was to examine the effect of school residency on the level of physical activity, eating, and other health related habits.

Most of the studies on the subject of physical activity in freshmen were performed with questionnaires (Butler et al., 2004; Jung et al., 2008; Kasparek et al., 2008; Wengreen & Moncur, 2009). This study is a direct investigation of the residency of college students and ambulatory physical activity levels in freshmen. Even though, pedometers do have limitations to measure the whole physical activity levels, specifically with regard to the measurement of sedentary behaviour and accounting for missing data, the pedometer has been provided to be useful in assessing physical activity in a large, free-living population (Sequeira et al., 1995; Tudor-Locke et al., 2002). A single day of collection is not acceptable, however, any three days can provide a sufficient estimate to assess physical activity (Tudor-Locke et al., 2005). In this study, we recorded steps for seven days that may provide useful data for assessing the physical activity levels. The results of this research indicate that ambulatory physical activity can be significantly different by residence of college residents in both genders. Physical activity was significantly higher in students living on-campus in both males and females by 86% and 119%, respectively. Compared with research in which Behrens and Dinger (Behrenes & Dinger, 2003) reported that college students walked approximately 10,000 steps/day, students who lived on-campus in this study took 30% more steps a day; students who lived off-campus took 30% less steps a day. Normally, physical activity levels were different by gender. Men are less sedentary and more active than women (Jago et al., 2005) and men participated in physical activity and exercise more than women (Buckworth & Nigg, 2004). Nevertheless, physical activity levels are higher in on-campus students than off-campus student in both genders in this study. These results support the hypothesis that residency of college freshmen makes differences in physical activity.

We believe that environmental factors including type of residence play a major role in developing health-related habits of college students, especially on freshman.

To figure out these differences between residencies, we examined the distance between the parking lot and the classrooms and the accessibility of the recreational facilities. According to the previous study, daily physical activity can be affected by environment. Sisson and McClain (Sisson et al., 2008) suggested that the built environment and transportation had a direct impact on physical activities of college students, and this environment directly supports and encourages the pedestrian activity, especially transportation (Cervero & Duncan, 2003; Ewing et al., 2003; Hoehner et al., 2005). In this study, we measured distances from parking lot or dormitory to classrooms by a measuring wheel (Data are not shown). Likewise, residence of on and off-campus may affect the transportation activity in this study because of the distance between the dorms and campus (on-campus: 1,400 - 2,900 feet, average 2,200 feet between the dorms and classroom vs. off-campus: 300 - 1,400 feet, average 800 feet between parking lots and classroom). Also, students living on-campus had to walk relatively far distances to access their classrooms. Therefore, it may be the direct reason for the difference of physical activities in this study, especially in low intensity exercise.

Also, the higher level of participation in intramural sports and recreational activities existed among dorm residents. In our preliminary study, we found out that the average percent of recreational center users were about 10% from the students who lived on-campus vs.

3% from off-campus students. The fact that exercise facilities were more likely accessible to on-campus residents may have also played a role. Brevard and Ricketts (Brevard & Ricketts, 1996) explained that exercise facilities on college campuses can greatly influence exercise habits. We surveyed the physical activity levels with a questionnaire because of limitations of pedometers to evaluate the physical activity levels. Interestingly, the results showed that only in light intensity of exercise was significantly higher in students living on-campus, not in moderate and vigorous intensity of exercise in both genders. This implies that level of physical activity can be modulated by light intensity of exercise, which could be easily accessed. Students living on-campus may be exposed to more chances of various exercise or physical activities than their off-campus counterparts (Table 2).

The habit of smoking has no significant difference between on and off-campus residents in both male and female groups. In the previous study, the use of smoke-free areas has been promulgated to reduce the second hand effects of smoking (Wechsler et al., 2001), and among college students, state and local community smoke-free policies have been found to reduce smoking (Chaloupka & Wechsler, 1997). In this study, not only the dormitory policies but also university policies strictly prohibits smoking on campus, and this may affect the smoking habits of students. Also, smoking initiation is influenced by a complex interplay of social, environmental, psychological and biological factors (Haire-Joshu et al., 1991), and the main reason why they start smoking is because of the influence of friends (Finkenauer et al., 2009; Muttarak & Sriburi, 2012). However, most of the students in this study do not smoke. Therefore, these environmental circumstances of peer pressure to smoke may serve as a preventive tool by limiting the opportunity and time for smoking in both genders.

Frequency of alcohol consumption was higher in males than in females, and these results are consistent with previous studies that male university students drink more often and in greater quantities than female students (C. E. Adams & Nagoshi, 1999; W. L. Adams, 1999; Brennan & Greenbaum, 2005; Hartzler & Fromme, 2003; O'Malley & Johnston, 2002). However, the pattern of alcoholic drinking was significantly different between on and off-campus residents in females. Students who live on-campus have a higher frequency of heavy drinking compared to their off-campus counterparts. As the previous study indicates, students' consumption of alcohol is influenced by social networks, such as living groups and close friends (O'Hegarty et al., 2006). Also, students living in fraternity or sorority houses consume alcohol more frequently and drink more than other students (Capone et al., 2007). These findings implicated that students living on-campus may have more influence on their alcohol consumption and especially, female students could be affected by socio-environmental factors, such as friends and residence.

According to the previous study, students' residence and gender could affect food choice and dietary patterns in college students (Beerman et al., 1990). Also, the transition from living at home or with relatives to living at a university can change dietary patterns (Jung et al., 2008). Dietary calorie intake was significantly different by residence of college students only in females. Total caloric consumption was significantly higher in female students living on-campus compared to those living off-campus. The results of dietary pattern analysis showed that monosaturated fat consumption was higher in students who live on-campus. On-campus students might have more exposure to monosaturated fat rich foods due to the university meal plan at the buffet style cafeteria on-campus. Also, students living off-campus might easily access nutritional supplements, such as vitamin C and E. Considering certain fruits contain various vitamins, these results agree with previous studies that reported that students on-campus have lower amount of fruit and vegetable intake (Freedman, 2010). Therefore, dietary patterns for female college student who live on campus are likely

to be affected by their residence in this study.

The purpose of this study was to compare the levels of physical activity, diet patterns, and health-related habits between students who live on and off-campus. We concluded that physical activity can be affected by residence of college students in both gender. Also, health-related habits and dietary patterns such as consumption of alcoholic beverage, calorie intakes, and consumption of supplementary foods are likely to be affected by residence of college students. Especially for female students, the tendency is more obvious. It seems that Students who avail themselves to school housing consume higher numbers of calories than their off-campus counterparts. On-campus students are believed to engage in higher levels of calorie-curbing physical activities, like walking more, having access to university resources like gym, and other on-campus activities. These issues can support the theory of "freshman 15" which is more vulnerable to female students.

The present study has the limitation of being conducted on a university. The lack of diversity at the selected university and the insufficient number of subjects limit the generalization of these findings to other universities that have a more diverse student population. Pedometers do have limitations to measure the whole physical activities, specifically with regard to the measurement of sedentary behaviour and accounting for missing data. Furthermore, pedometer may not be as accurate when used with overweight or obese participants (Swartz et al., 2003). Position and/or walking speed can affect the accuracy of the pedometer (Melanson et al., 2004). Also, this study is based on self-reported dietary data and is subject to error, either intentionally or unintentionally. Additional research will shed more light on the issue.

It is an important topic, especially in light of our nation's upward trend of obesity. This study simply adds to the understanding of the "Freshman 15" and should be repeated within various ethnic groups to ensure the accuracy of the data.

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