

## Does Involvement in Healthy Eating Among University Students Differ Based on Exercise Status and Reasons for Exercise?

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### Abstract

**Background.** Unhealthy nutritional habits are a major cause of morbidity and mortality in the US. Research indicates that regular physical activity can influence dietary habits of adults. **Purpose.** The purpose of this study was to examine whether university students' involvement in healthy eating differed based on current exercise status and reported reasons for exercising. **Methods.** A sample of 204 university students completed a 22-item survey on healthy eating and physical activity. **Results.** Less than 10% met all Food Guide recommendations. The leading barriers to healthy eating were time, convenience and healthy food availability. Less than half exercised on four or more days each week. The leading reasons for exercising were to improve appearance, improve health and lose weight. Being physically active did not have a significant effect on healthy eating, nor did specific reason for exercising. **Discussion.** Most students did not eat healthy and their physical activity levels did not significantly affect their nutritional habits. Increased awareness campaigns are warranted. **Conclusions.** Strategies other than physical activity promotion are needed to positively impact students' healthy eating behaviors. Students should continue to be educated about healthy nutrition and ways to reduce perceived barriers to healthy eating.

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### Background

Unhealthy eating habits are a major cause of morbidity and mortality in the US, contributing to greater than 300,000 deaths each year (National Center for Health Statistics, 2006). Four of the top six leading causes of US deaths — heart disease, cancer, stroke and diabetes are each associated with unhealthy eating. Poor diet also directly correlates with obesity (Coulston, 1998) which is the most prevalent morbid condition in the US and significantly increases the risk of several health problems including Type 2 diabetes, hypertension, hyperlipidemia, some cancers, menstrual disturbances, pregnancy complications, osteoarthritis, dyspnea, and varicose veins (James, Nelson, Ralph, & Leather, 1997; Vuori, 2001).

Several variables are involved in the etiology of obesity including genetics, lack of physical activity, and consumption of high-fat, energy-dense foods that are readily accessible, inexpensive, heavily advertised, and palatable

(Cohen, Scribner, & Farley, 2000; Schrauwen, & Westerterp, 2000; Wadden, Brownell, & Poster, 2002). Environmental factors also significantly contribute to eating behaviors (Dowda, Ainsworth, Addy, Saunders, & Riner, 2001). Wadden et al. (2002) have referred to our society as a "toxic food environment," comprised of gas stations, shopping malls, convenience stores, vending machines, ballparks, movie theaters, and restaurants, all contributing to poor nutritional habits daily practiced by individuals. Several obstacles to healthful eating have also been identified and include a reluctance to give up favorite foods (44%), satisfaction with current diet (39%), lack of time to keep track of diet (38%) and lack of understanding of nutrition guidelines (29%) (American Dietetic Association, 2000).

Specifically regarding the nutritional habits of young adults, research has shown their food choices to be inconsistent with the Dietary Guidelines for Americans (Story, Neumark-

Sztainer, & French, 2002). Nutrition-related concerns for young adults include unhealthy dieting; high intake of fast foods and other foods high in fat; low intake of fruits, vegetables, fiber, and dairy foods; and erratic eating behaviors, such as skipping meals (Centers for Disease Control and Prevention [CDC], 1996; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Neumark-Sztainer, Story, Resnick, & Blum, 1998). The National College Health Risk Behavior Survey (CDC, 1997) found that only one in four college students ate five or more servings of fruits and/or vegetables the day preceding the survey.

Factors contributing to poor nutritional habits among young adults include lack of knowledge about proper nutrition and recommended serving sizes of specific food groups (CDC, 1996), perceived importance of a healthy diet (Health and Welfare Canada, 1990), taste of healthy foods versus unhealthy foods (Bowman, McProud, Usiewicz, Gendreau, & Mitchler, 1995; Davis-Chervin, Rogers, & Clark, 1985; Joyce, Hanson, Ebro, Fair, & Warde, 1996), cost, and perceived time constraints and convenience (California Project Lean, 1998; Kubena, & Carson, 1988; Neumark-Sztainer, Story, Perry, & Casey, 1999; Story, & Resnick, 1986). In addition, growing independence and eating away from home, concern with physical appearance and body weight, the need for peer acceptance, and busy schedules all have an effect on eating patterns and food choices (Story, & Resnick, 1986). French et al. (1999) found that individuals rated taste as the most important factor to consider, followed by hunger and price. Taste and sensory perceptions of food studies with adolescents and adults have shown that taste is one of the most important influences on food choices (Barr, 1994; Glanz, Basil, Maibach, Goldberg, & Snyder, 1998; Horacek, & Betts, 1998; Neumark-Sztainer, Story, Perry, & Casey, 1999).

In addition to eating a healthy diet, regular participation in physical activity strongly influences health status and reduces the risk of obesity and overweight (Koffman et al., 2001). Exercise and sports participation have traditionally been regarded as a means of

encouraging development of healthy habits and deterring health risk behaviors (Pate, Heath, Dowda, & Trost, 1996). Gillman et al. (2001) reported that increased amounts of physical activity were associated with more healthy food choices and thus asserted that an additive or synergistic relationship may occur in health promotion programs that incorporate both healthy eating and physical activity. Similarly, Eaton et al. (1995) showed that individuals with higher levels of activity consumed more dietary fiber, antioxidant vitamins, and calcium, while consuming less total and saturated fat.

Since such a sizeable percentage of young adults are involved in poor nutritional habits, it becomes critical to identify effective strategies that can result in healthier food choices. Previous studies have identified some strategies that can be used at the individual, family and community levels (Story et al., 2002); however, additional strategies are clearly needed. In lieu of Eaton and colleagues' findings (1995), it is important to determine whether increased physical activity levels among young adults are associated with increased nutritional habits, as are adults. In so doing, novel strategies could be developed to ameliorate obesity and overweight among young adults.

### **Purpose**

The present study was conducted to further the research by Eaton et al. (1995) in examining the effect of physical activity on healthy eating. However, unlike Eaton's research which examined adult behaviors, the present study examined university students' involvement in physical activity and healthy eating. Specifically, the following research questions were examined:

- To what extent are university students involved in healthy eating?
- Does involvement in healthy eating differ based on exercise status, gender, age, and reason for exercise?
- Do perceived barriers to healthy eating differ based on exercise status, gender, age, and reason for exercise?

## **Methods**

### **Participants**

Students enrolled in general education classes (N= 11 sessions, N= 204 students) at a Midwestern university served as the participants of this study. All students voluntarily agreed to participate in this study. No incentives were offered. Confidentiality and anonymity of all responses were ensured.

### **Instrumentation**

After a comprehensive review of the literature on physical activity and healthy eating, a two-page, 22-item instrument was developed. The instrument comprised four sections: 1) students' involvement in healthy eating, 2) perceived barriers to healthy eating, 3) exercise behavior and reasons for exercising, and 4) demographics (i.e. gender, age, race, weight, height, and major). Section 1, "Involvement in Healthy Eating," consisted of 11 items that assessed students' involvement in healthy eating. The first nine items of this section required the students to record the number of days in the past seven days they ate certain amounts and types of foods (i.e., "On how many days of the past 7 days have you eaten at least 3 servings of vegetables?"). The remaining two questions addressed frequency of meals eaten away from home and amount of soda pop consumption. Individual item scores were calculated for the first seven items of this scale to achieve an overall healthy eating score. Healthy eating guidelines were established based on the Food Guide Pyramid. As a means to assess overall eating habits in this university sample and to control against individual variability allowed for in the new Food Guide Pyramid, the former Food Guide Pyramid was selected. The following criteria were used to determine whether a student followed a healthy diet: 1) ate at least 3 servings of vegetables on at least 4 of the past 7 days; 2) ate at least 2 servings of fruits on at least 4 of the past 7 days; 3) ate at least 2 servings of low-fat or non-fat dairy products or other calcium source on at least 4 of the past 7 days; 4) ate between 6 and 11 servings from the grain group on at least 4 of the past 7 days; 5) ate more complex carbohydrates than simple sugars on at least 4 of the past 7 days; and 6) ate at least 2 servings of lean meat or other protein

source on at least 4 of the past 7 days. Individuals received one point for each of the criteria that they met, thus totaling a maximum potential score of 7 points (range = 0 to 7).

The second section of the instrument examined potential barriers to healthy eating. Participants were presented with a list of seven potential barriers and requested to check all that applied. The third section of the instrument consisted of three questions regarding exercise behavior. The first two questions assessed the degree of involvement in physical activity (i.e., number of days and the duration (in minutes) that they typically exercise per week. The third question addressed the main reason participants exercise (i.e., "What is the main reason you exercise?"). Participants selected their main reason from a list of eight options and were asked to select only one response. Lastly, the demographic section required participants to provide demographic/background information on seven items by checking the appropriate response option. The demographic/background items included gender, age, race, year of college, height, weight, and major.

Content validity of the instrument was established by means of a panel of four experts: one registered dietitian, one exercise physiologist, and two health education professors with expertise in the areas of survey design and survey research. These individuals were selected based on their knowledge of proper nutrition/dietary practices and physical activity and their expertise in survey research. Each member of the panel was mailed a copy of the survey and was instructed to complete the survey and offer comments or suggestions regarding the instrument and its scoring system. The panel members were then asked to return the survey so the instrument could be revised to reflect the suggestions offered by the panel of experts. Suggested revisions were incorporated into the final survey instrument.

Stability reliability was established via a test-retest of a convenience sample of 15 university students in one undergraduate class. Students completed the survey on two consecutive occasions seven days apart. Pearson correlations

were subsequently computed yielding a .717 for the healthy eating subscale and .958 for the exercise behavior subscale. Internal consistency reliability was also computed yielding a Cronbach alpha of .721, thus ensuring that the survey was reliable.

### **Procedures**

Consent for study implementation was obtained from the institutional review board. After this consent was granted, surveys were distributed to students (N=204) in undergraduate general education courses (N=11) during regularly scheduled class times. Students were informed of the study purpose, the voluntary nature of the study, and that all responses would be kept anonymous and confidential. Students who opted to not complete the surveys were instructed to sit quietly until all surveys were completed and then to turn in their blank survey along with the completed survey, as a means to avoid any feelings of discomfort or embarrassment.

### **Data Analysis**

Descriptive statistics including frequencies and percentages were used to describe the demographic characteristics of the respondents and each variable. Analyses of variance were conducted to determine whether students'

involvement in healthy eating differed based on the age, gender, involvement in physical activity, and reasons for involvement in physical activity. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows. An alpha level of .05 was utilized for all data analyses.

## **Results**

### **Demographic and Background**

#### **Characteristics**

A total of 204 surveys were completed, resulting in an overall participation rate of 100% (204/204). No student refused to participate. All returned surveys were included in the final data analysis. Most students were female (54.4%) and white (62.4%) (Table 1). One in three was African American (32.2%). There was a fairly even distribution among freshmen (30.7%), sophomores (26.2%), juniors (13.4%), and seniors (29.7%). Most students were majoring in non-health related fields (75.9%). The overall mean age of the college students was 21.1 years (SD=3.06) with an age range of 18 to 44 years. The mean height of the students was 67.8 inches (SD=4.09) with a height range of 59 to 77 inches. The mean weight of the students was 159.9 pounds (SD=32.62) with a weight range of 93 to 260 pounds.

Table 1  
Demographic and Background Characteristics\*

Characteristic (nonparametric)	N	%
<b>Sex</b>		
Female	111	54.4
Male	93	45.6
<b>Race</b>		
African American	65	32.2
Asian	5	2.5
Hispanic	0	0
White	126	62.4
Other	6	3.0
<b>Years of College</b>		
Freshman	62	30.7
Sophomore	53	26.2
Junior	27	13.4
Senior	60	29.7
<b>Major</b>		
Health Related Field	49	24.1
Non-Health Related Field	154	75.9
<b>Age</b>		
Range=18-44	21.1	3.06
<b>Height</b>		
Range in Inches	67.8	4.09
<b>Weight</b>		
Range in Pounds (93-260)	159.9	32.62

\*N=204; Percents refer to valid percents. Missing values excluded from analyses

**Students' Nutritional Behaviors**

Results indicated that during the seven days prior to the survey, students on average reported that they had eaten: at least 3 servings of vegetables on 2.7 days (SD=1.93); at least 2 servings of fruit on 3.4 days (SD=1.99); at least 2 servings of low-fat or non-fat dairy products or

other calcium source on 4.4 days (SD=2.28); between 6 and 11 servings from the grain group on 4.5 days (SD=2.20); more complex carbohydrates than simple sugars on 3.3 days (SD=2.25); and at least 2 servings of lean meat or other protein source on 4.0 days (SD=2.21)

Table 2  
Students' Nutritional Behaviors in the Past Seven Days\*

Nutritional Behavior (Past 7 Days)	M	SD
Eaten between 6-11 servings from the grain group	4.5	2.20
Eaten at least 2 servings of low-fat or non-fat dairy products or other calcium source	4.4	2.28
Eaten at least 2 servings of lean meat or other protein source	4.0	2.21
Eaten at least 2 servings of fruit	3.4	1.99
Eaten more complex carbohydrates than simple sugars	3.3	2.25
Eaten at least 3 servings of vegetables	2.7	1.93

\*N=204; Missing values excluded from analyses. Means refer to mean number of days in the past seven days.

Two out of three students met the healthy eating criteria for the grain group (68.6%) and the dairy/calcium group (65.5%) (Table 3) while greater than half (55.7%) met the healthy eating criteria for the lean meat/protein group. Slightly more than 40% of the students surveyed met the healthy eating criteria for complex carbohydrates (46.5%) and fruits (42.2%). Only one in three students (33.3%) met the healthy eating criteria for vegetables. On average, students ate 6.1 meals (SD=5.23) away from home each week. Half (51.2%) reported that they drink pop each day. Of those students that

reported drinking pop, three out of four (77.9%) reported drinking regular, as opposed to diet pop. One out of four students (22.1%) reported drinking diet pop. On average, students drank 28.7 ounces (SD=21.90) of pop per day.

Regarding barriers to healthy eating, the most common barriers were convenience (56.9%), time (57.8%), and availability (43.6%) (Table 4). The least common barriers to healthy eating were peer influence (16.2%), lack of knowledge (21.6%), and taste (32.4%).

Table 3  
Students' Involvement in Healthy Eating by Food Group\*

<b>Student Involvement in Healthy Eating by Food Group</b>	<b>N</b>	<b>%</b>
Grain group (eaten at least 6-11 servings on at least 4 of the past 7 days)	140	68.6
Dairy/calcium group (eaten at least 2 servings on at least 4 of the past 7 days)	133	65.5
Lean meat/protein group (eaten at least 2 servings on at least 4 of the past 7 days)	113	55.7
Complex carbohydrates (eaten more complex carbohydrates than simple sugars on at least 4 of the past 7 days)	94	46.5
Fruit group (eaten at least 2 servings on at least 4 of the past 7 days)	86	42.2
Vegetable group (eaten at least 3 servings on at least 4 of the past 7 days)	68	33.3

\*N=204; Missing values excluded from analyses; Percents refer to valid percents

Table 4  
Students' Perceived Barriers to Healthy Eating\*

<b>Barriers to Healthy Eating</b>	<b>N</b>	<b>%</b>
Time	118	57.8
Convenience	116	56.9
Availability	89	43.6
Cost	80	39.2
Taste	66	32.4
Lack of knowledge	44	21.6
Peer influence	33	16.2

\*N=204; Missing values excluded from analyses; Percents refer to valid percents

### Students' Exercise Behaviors

Results indicated that students reported exercising an average of 3.4 days (SD=1.68) per week and 56.4 minutes (SD=42.30) per exercise session. Fewer than half (40.3%) exercised four days or more a week. One in four (24.2%) reported exercising for at least 60 minutes per

exercise session. Only 2.9% reported that they do not currently exercise. The top three reasons for exercising were to improve physical appearance (21.1%), improve health (12.7%), and lose weight (8.3%) (Table 5). One in three (39.2%) reported more than one main reason for exercising.

Table 5  
Students' Reported Main Reason for Exercising\*

Main Reason for Exercising	N	%
Improve my physical appearance	43	21.1
To improve my health	26	12.7
Weight loss	17	8.3
Weight management/control	13	6.4
Weight gain	4	2.0
Increase my energy	3	1.5
I do not exercise	6	2.9
Other reason not provided	12	5.9
More than one reason reported	80	39.2

\*N=204; Missing values excluded from analyses; Percents refer to valid percents

### Students' Involvement in Healthy Eating Based on Demographic Variables

A series of one-way analyses of variance (ANOVAs) were conducted to examine whether involvement in healthy eating differed based on specific demographic variables. Results showed no significant difference between college students who exercised 4 days or more a week (M=3.4, SD=1.81) and college students who exercised three days a week or less (M=2.93, SD=1.71) regarding healthy eating,  $F(1,199)=3.488$ ,  $p=.063$ . Similarly, there was no significant difference between female college students (M=3.26, SD=1.72) and male college students (M=2.92, SD=1.82) regarding healthy eating,  $F(1,202)=1.844$ ,  $p=.176$ . However, there was a significant difference based on grade level. Junior/seniors (M=3.41, SD=1.60) were significantly more involved in healthy eating than freshmen/sophomores (M=2.83, SD=1.84),  $F(1,200)=5.490$ ,  $p=.020$ . Results found no significant difference between those who exercised for health reasons (M=3.19, SD=1.78)

and those who exercised for non-health reasons (M=3.15, SD=1.63) regarding healthy eating,  $F(1,116)=.012$ ,  $p=.914$ .

ANOVAs were also conducted to examine whether the number of perceived barriers to healthy eating differed based on demographic variables. Results showed no significant difference between college students who were physically active (M=2.72, SD=1.37) and college students who were not physically active (M=2.62, SD=1.24) in the number of perceived barriers to healthy eating,  $F(1,199)=.286$ ,  $p=.594$ . Similarly, there was no significant difference between male college students (M=2.78, SD=1.41) and female college students (M=2.59, SD=1.23) in the number of perceived barriers to healthy eating,  $F(1,202)=1.159$ ,  $p=.283$ . Results also showed no significant difference between freshmen/sophomores (M=2.70, SD=1.40) and juniors/seniors (M=2.63, SD=1.22) regarding the number of perceived barriers to healthy eating,

F(1,200)=.146, p=.702. Results showed no significant difference between college students who were physically active for health reasons (M=2.54, SD=1.15) and college students who

were physically active for non-health reasons (M=2.63, SD=1.45) regarding the number of perceived barriers to healthy eating, F(1,116)=.124, p=.726.

Table 6  
Students' Involvement in Healthy Eating and  
Number of Perceived Barriers to Healthy Eating Based on Demographic Variables

Demographic Variable	M	SD	F	P
<b>Involvement in Health Eating</b>				
Sex				
Male	2.92	1.82	1.84	.176
Female	3.26	1.72		
Exercise Status				
Exercise 4 or more days per week	3.40	1.81	3.49	.063
Exercise 3 or fewer days per week	2.93	1.71		
Reason for Exercise				
Exercise for health reason(s)	3.19	1.78	0.01	.914
Exercise for non-health reason(s)	3.15	1.63		
Grade Level				
Freshmen/Sophomore	2.83	1.84	5.49	.020*
Junior/Senior	3.40	1.61		
<b>Number of Perceived Barriers to Healthy Eating</b>				
Sex				
Male	2.78	1.41	1.16	.283
Female	2.59	1.23		
Exercise Status				
Exercise 4 or more days per week	2.72	1.37	.286	.594
Exercise 3 or fewer days per week	2.62	1.24		
Reason for Exercise				
Exercise for health reason(s)	2.54	1.15	.124	.726
Exercise for non-health reasons	2.63	1.45		
Grade Level				
Freshmen/Sophomore	2.70	1.40	.146	.702
Junior/Senior				

Note: Involvement in healthy eating pertains number of days in typical week participants meet Food Guide Pyramid guidelines (range = 0-7). Number of perceived barriers to healthy eating based on 7 barriers presented to participants on survey (range = 0-7). \* p < .05.

### Discussion

Students in the present study demonstrated an overall lack of involvement in healthy eating. Less than 10% met all of the recommendations for healthy eating based on the Food Guide

Pyramid and the majority met less than three out of the six guidelines. Results also showed that meals eaten away from home continue to remain an issue for college students, with students eating approximately one meal a day away from



their home, dorm, or apartment. In agreement with the present study, other studies have shown that the food choices of most adolescents and young adults are not consistent with the Dietary Guidelines for Americans (Story et al., 2002). In fact, a study conducted by the US Department of Agriculture (2000) showed that only 1% of adolescent males and females met national recommendations for all of the Food Guide Pyramid groups. Dietary and nutritional habits of university students clearly need to be improved (Horwath, 1991). Previous studies examining the nutritional intake of university students have clearly indicated unhealthy eating habits among this population (CDC, 1996, 1997; Munoz et al., 1997; Neumark-Sztainer, 1998). The present study demonstrates that this a continuing problem, as evidenced by only one in three students reporting that they eat at least 3 servings of vegetables a day and less than half (42.2%) reporting that they eat at least 2 servings of fruit a day. Also, in agreement with previous studies, this study showed that dairy intake tends to be low among college students. Only two in three students (65.5%) reported consuming at least two servings of dairy a day, the minimum amount recommended for this age group.

Various factors affect young adults and university students' dietary choices (Koszewski, & Kuo, 1996). According to the CDC (1996), many young adults lack the knowledge about good nutrition, including information on recommended servings of specific food groups. However, as Contento, Manning and Shannon (1992) have asserted, knowing how and why to eat healthfully is important, but knowledge alone does not enable individuals to adopt healthful eating behaviors. Other factors, such as taste, cost, convenience, energy value, and time constraints also strongly influence adolescent food choices (California Project Lean, 1998; French, 1999; Neumark-Sztainer, 1999, Story, 1986). The present study confirms this, with more than half of the students reporting time (57.8%) and convenience (56.9%) as the most common barriers to healthy eating that they experience. In attempting to explain why students consistently report time as one of the most common barriers to healthy eating,

Neumark-Sztainer et al (1999) reported that students may want to sleep longer in the morning instead of taking time to eat or prepare breakfast, do not want to wait in a long lunch line, and prefer eating at fast food establishments because the food is served quickly. Such issues may also underscore the preference for immediate gratification and poor time management skills (i.e., preparing meals ahead of time) on the part of college-aged individuals.

The other three barriers mentioned frequently by students in the present study were availability (43.6%), cost (39.2%), and taste (32.4%) of healthy foods. Individuals' nutritional knowledge is often filled with inaccuracies and misconceptions that can result in individuals erringly believing they are eating healthy when in fact they are not. Interestingly, the present study found that only one in five (21.6%) students felt a lack of nutritional knowledge was an actual barrier to healthy eating.

Societal changes in the United States over the past 50 years have dramatically altered the eating behaviors of many Americans, including college students (Cassell, 1995). Many young adults find themselves eating away from home, eating on the run, and eating fast food. The trend of eating meals away from home continues to increase. In 1978, Americans ate 18% of their calories away from home, compared to 34% in 1995 (Liebman, Schardt, & Jones, 2001). Liebman et al. (2001) also noted that serving sizes for many foods offered in restaurants have increased in the past few decades and those restaurants tend to prepare and cook foods in a less than healthy manner. McCrory et al. (1999) noted that restaurant food has more fat, saturated fat, sodium, refined carbohydrates, and calories and less calcium than food prepared at home. The present study found that students, on average reported eating at least one meal a day away from home.

Regarding physical activity, the present study found that fewer than half of college students (40.3%) exercised four days a week or more. Silver Wallace and Buckworth (2002) similarly found that most college students (52%) were

physically inactive or only exercised irregularly. In that study, less than one-third (31%) had exercised regularly for six months or longer and only 17% had exercised regularly for less than six months. Main reasons that students in the present study exercised were to improve physical appearance, improve health, and to lose weight.

Interestingly, the present study found that students' gender, involvement in physical activity and reasons for involvement in physical activity had no significant effect on eating a healthy diet. However, grade level did significantly affect involvement in healthy eating, with juniors/seniors being significantly more likely than freshmen/sophomores to eat healthy. These findings did not support those of Eaton et al. (1995) but instead suggested that increases in exercise are not associated with increases in healthy food choices among young adults. Based on these results, it appears that additional strategies to increase university students' healthy nutritional habits are clearly warranted.

Since this study found that 97% of students had at least one barrier to healthy eating, novel strategies and interventions may need to be developed to more effectively address these barriers. Story et al. (2002) noted that at the individual level, interventions that emphasize the good taste of healthful foods and convenient ways to include them in the diet may be effective strategies. At the interpersonal level, family and friends are social influences that are proximal to the adolescent and therefore potential targets for intervention change. Effective strategies tend to create positive peer norms toward healthy eating and provide positive peer support for healthy eating (Story et al., 2002). In addition, at the community level, environmental barriers to healthful food choices need to be addressed and reduced.

Other research shows that greater availability of good tasting, convenient and less expensive foods would help college students improve their food choices (Barr, 1994; California Project Lean, 1998; Neumark-Sztainer, 1999; Story, 1986). In response to students' demands for

healthier foods, college and university food services now offer healthier foods (Belaski, 2001). However, Luquis and colleagues (2003) found that many students still report a strong dissatisfaction with the food selection available in dining halls. In addition, many students feel that the food is not nutritious and that there is not a good selection for those who want to eat healthy.

As aforementioned, the present study demonstrated that freshmen and sophomores were significantly less likely than juniors and seniors to be involved in healthy eating. This finding may be due to the fact that many freshmen and sophomores live in dorms and rely on dorm food or fast food as their main source of food. If this is the case, it is important that these barriers to healthy eating continue to be addressed by university foodservice establishments. Evans and Sawyer-Morse (2002) have stressed the importance of the college campus setting as a critical setting for the development and maintenance of healthful behaviors. One way to encourage more healthful choices in a dorm cafeteria is to make healthy foods more visible and accessible to students. Hampl, Anderson, and Mullis (2002) recommended exposing consumers to healthy foods at the point-of-purchase and offering price incentives promoting the use of healthy items.

In addition, other nutrition interventions have recently been developed to address the lack of nutrition knowledge and the unhealthful dietary patterns of college students. The Right Bite Program, for example was developed as a three-year nutrition intervention program to increase healthful eating behaviors among college students through the use of trained student peer educators and by providing an overall campus approach to a healthful eating environment (Evans & Sawyer-Morse, 2002). Additional college and university-based approaches are needed.

Limitations of this study should be noted. This study used a sample of university students enrolled in undergraduate general education classes at a Midwestern university. While the students enrolled in these classes consisted of a

wide array of majors, the findings may not generalize to students in other geographical locations and of other age levels. In addition, since this study used self-reported responses regarding nutrition and exercise-related items, some students may have offered socially desirable responses. Also, the majority of participants in this study were white or African American. A more racially and ethnically diverse sample could have provided different results. Caution should therefore be taken when attempting to extrapolate these results to other populations. Future studies should seek to build upon this study by assessing the nutritional intake of college students based on the new Food Guide Pyramid (American Dietetic Association, 2004). Studies are needed to examine students' understanding of the new Food Guide Pyramid and its impact on nutritional habits.

### **Implications for the Health Promotion Field**

The findings of this study have direct implications for the field of health promotion. These results found that increased physical activity was not significantly associated with increased nutritional habits among university students. Strategies to increase physical activity should obviously still be sought and utilized, however other strategies will be needed to positively impact students' healthy eating behaviors. The following recommendations are offered to health educators as a means to assist in increasing students' involvement in healthy eating: 1) continue educating university students about the Dietary Guidelines for Americans (Johnson, & Kennedy, 2000) and the new Food Guide Pyramid; 2) stress the importance of parents, other adults and peers as social support sources for healthy eating; 3) implement research-based programs; 4) improve food selection and availability in university food service establishments; and 5) reduce perceived barriers to healthy eating by making healthier foods more convenient and less time consuming.

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