Levels and Characteristics of Physical Activity Among a College Student Cohort

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ABSTRACT

The purpose of this study was to assess physical activity levels and the relationships between activity and personal characteristics among a cohort of college students and to determine personal characteristics that predict activity. A sample of 1,700 undergraduates was mailed a survey that requested demographic information and assessed health behaviors including self-reported physical activity. Of the 1,575 successfully mailed, a total of 903 completed questionnaires were received—a response rate of 57.3%. Nearly half of the respondents indicated they "exercised or participated in sports activities for at least 20 minutes that made you sweat or breathe hard" on three or more of the preceding 7 days (VIG). Nearly three-fifths reported they "walked or biked for at least 30 minutes at a time" on 3 or more of the preceding 7 days (MOD). Those reporting VIG were more likely to be younger Caucasian males. Those reporting MOD were more likely to be younger Caucasian females. Gender, race, being an intercollegiate athlete, and belonging to a fraternity or sorority were predictors of VIG. Gender, age, race, and being an intercollegiate athlete were predictive of MOD. These results are in agreement with other studies on the correlates of physical activity among college students. This study was funded by the University of Kentucky Prevention Research Center.

INTRODUCTION

The benefits of regular, consistent physical activity are well documented. Physical activity plays an important role in the prevention of chronic diseases and conditions including cardiovascular disease, certain types of cancer, type II diabetes, and obesity.[1] Furthermore, physical activity is critical for long-term weight control and is thought to be an effective means to decrease symptoms related to depression.[1,2] Despite these many positive outcomes of physical activity, the majority of Americans remain sedentary or are not active enough to experience its potential benefits. According to the U.S. Surgeon General, more than 60% of American adults do not engage in regular physical activity and about 25% of American adults do not engage in any type of physical activity beyond the requirements of daily life.[1] With regard to those of college age, Jones and colleagues[3] reported that only 35% of women 18–24 and 39% of men in the same age group met the Centers for Disease Control and Prevention-American College of Sports Medicine (CDC-ACSM) guidelines for moderate physical activity, which state that "Every U.S. adult should accumulate 30 minutes or more of moderate-intensity activity on most, preferably all, days of the week."[4] Similarly, data from the Centers for Disease Control and Prevention National College Health Risk Behavior Survey (NCHRBS) indicated that 42% of college students participated in vigorous activity at least three times a week, while an additional 20% participated in moderate activity.[5]

The high rates of inactivity and accompanying health consequences among college-age people are of concern. Weight control is an issue that is especially relevant

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to college students in light of research suggesting that being overweight during late adolescence is more strongly associated with an increased risk of being overweight in adulthood than being overweight as a child.[6] Sparling and Snow[7] reported that, in a study of recent college alumni, physical activity patterns established in the college years were maintained after graduation. Unfortunately, existing data provide evidence that physical activity rates decline from the high school years to the college years. Bray and Born[8] reported that among a cohort of students, 66.2% were classified as active during the last two months of high school, but that proportion decreased to only 44.1% during the first two months of college.

Because the college years are a time when young people have an opportunity to make decisions about their behaviors, it is important that healthy behaviors become an integral part of their daily lives that they will take with them when they leave the college campus. Portions of the southeastern region of the U.S. have been dubbed as part of the "Coronary Valley"[9] because of its high rates of cardiovascular disease. Not surprisingly, this part of the country also has the lowest rates of physical activity among all age groups.[10] For these reasons, assessing activity levels among college students from this region and identifying characteristics of those who are likely or unlikely to be physically active is crucial in order to intervene and impact physical activity among young people so they may continue these behaviors into adulthood.

The purpose of this study was to assess physical activity levels and the relationships between activity and personal characteristics among a cohort of college students. A secondary purpose was to determine which personal characteristics are predictive of activity.

METHODS

Design and Sample

The study employed a cross-sectional design, and the anonymity of the respondents was maintained. A sample of 1,700 undergraduates was randomly chosen by the university registrar from the total population of undergraduates registered for the spring 2004 semester (N=18,193). Each randomly selected undergraduate student was sent a survey with items pertaining to health behaviors and personal characteristics. Of the 1,700 mailed survey packets, 125 were returned as undeliverable due to inadequate or incorrect addresses.

Procedure

A two-wave mailing procedure was employed for this study. Potential respondents received a mailed questionnaire with a cover letter explaining the purpose of the study and the importance of participating. A two-dollar bill was included in each survey packet as an incentive to complete and return the questionnaire. Postcards with potential respondents' names were also included with the questionnaire. Recipients were asked to complete both the questionnaire and the postcard and return the postcard separately to indicate completion of the questionnaire. This procedure preserved the anonymity of participant responses while allowing the researchers to track who should receive a follow-up questionnaire. One week after the questionnaires were mailed, reminder postcards were sent to encourage survey recipients to complete and return the questionnaire. The study utilized an implied consent procedure that was approved by the university's Institutional Review Board.

Approximately three weeks following the initial mailing, follow-up survey packets were mailed to all who had not returned a postcard. After the second questionnaire mailing, those who did not return questionnaires were considered non-respondents and no further follow-up was made.[11]

Measures

Demographic and personal characteristics. The survey requested demographic and personal information including age, sex, race, marital status, employment status, membership in a social fraternity or sorority, living situation, class standing, and grade point average (GPA). The survey contained the additional items of height and weight, which were used to calculate body mass index (BMI). Perception of weight was rated on a 5-point ordinal scale ranging from 'very underweight' to 'very overweight.'

Health behaviors. The health behaviors items were taken, and in some cases adapted, from the Centers for Disease Control and Prevention National College Health Risk Behavior Survey.[5] These items assessed a variety of health behaviors including self-reported physical activity, dietary habits, alcohol, tobacco and drug use, and sexual behaviors. The NCHRBS website contains the items that were adapted for this survey (http://cdc.gov/nccdphp/dash/yrbs/previous_results/college1997.htm).[5]

This paper focuses on the physical activity findings and how activity relates to other respondent characteristics. Two items were used to assess both vigorous and moderate physical activity. Vigorous activity (VIG) was defined as activity engaged in for 20 minutes or more that "made you sweat or breathe hard." Moderate activity (MOD) was defined as "walking or bicycling for at least 30 minutes at a time." These items were taken verbatim from the NCHRBS.

Data Analysis

The survey data were first analyzed descriptively using frequency distributions or means and standard deviations, as appropriate. The bivariate associations between activity level and personal and demographic characteristics were assessed using chi-square analysis, Kruskal-Wallis tests, or two-sample t-tests, as appropriate to the level of measurement. Logistic regression was used to determine the significant predictors of level of activity, with separate models for vigorous and moderate levels. The Hosmer-Lemeshow test[12] was used to determine the goodness-of-fit of each model to the survey data. The variance inflation factors (VIFs) for each regressor included in the logistic models were examined to determine whether multicollinearity was affecting regression estimates for each model; lack of multicollinearlity was assumed if all VIFs were at most 4. All data analyses were performed using SAS version 8.2[13]; a significance level of .05 was used throughout.

RESULTS

Of the 1,575 successfully mailed, a total of 903 completed questionnaires were received, indicating a response rate of 57.3%. Of the 903 respondents, 61% were females and 91% were Caucasian. While not a diverse sample, it is similar to the demographics of the student population on campus (Table 1). The average age of respondents was 20.2 years (SD = 1.5) and ages ranged from 18 to 26. The range in GPAs was from 0.6 to 4.0, with an average of 3.1 (SD = 0.5). The mean BMI was 23.4 (SD = 4.2) with a range of 15.8 to 49.4.

Nearly half of the respondents (46%) indicated they "exercised or participated in sports activities for at least 20 minutes that made you sweat or breathe hard" on three or more of the preceding 7 days; this was used as the indicator for vigorous activity (VIG). Nearly three-fifths (58%) reported they "walked or biked for at least 30 minutes at a time" on 3 or more of the preceding 7 days; this was the indicator for moderate activity (MOD). The prevalence of VIG and MOD among the respondents compared favorably with the 1997 NCHRBS sample in which only 42% reported VIG and 20% reported MOD.

Factors associated with physical activity

Vigorous activity. Males were more likely to engage in VIG than females (χ^2=7.8, p=.005) and Whites were more likely to be VIG, compared with their minority counterparts (χ^2=7.2, p=.007). Those participating in VIG were slightly younger (t=2.0, p=.05) and more likely to be single (χ^2=4.6, p=.03) and a freshman or sophomore (χ^2=5.9, p=.02). Respondents with paying jobs were less likely to be VIG (χ^2=5.5, p=.02), while those who were a member of an intercollegiate athletic team were much more likely to do so (χ^2=23.4, p<.0001). Although participation in VIG was not related to where the student lived, those who were members of a social fraternity or sorority were more likely to be VIG (χ^2=15.9, p<.0001). VIGs were less likely to describe themselves as overweight, compared with their peers who did not participate in this type of activity (Kruskal-Wallis χ^2=9.2, p=.002), but there was no difference in BMI between the groups. There was no difference in GPA between those who did and did not perform VIG.

Moderate activity. Females were more likely than males to be MOD (χ^2=4.2, p=.04) and Caucasian respondents were more likely than minorities to participate in this level of activity (χ^2=6.0, p=.01). As with VIG, younger students were more likely to be MOD (t = 3.6, p = .003) as were students in the lower division of class standing (χ^2=7.5, p=.006); however, there was no relationship between MOD and marital status. Intercollegiate team members were more likely to be MOD than those not on teams (χ^2=5.5, p=.02), while there was no difference in the prevalence of MOD between those who were employed and those who were not. MOD was related to the living situation of the student (χ^2=6.3, p=.01), with students living in off-campus housing less likely to participate, compared with those living on campus. MODs reported higher GPAs, compared with those who did

Table 1. Descriptive Characteristics of the Sample (N=903) and of the University Population

Variable	Sample%	University%
Gender		
Female	61	52
Age		
<21	60	74
Race		
Caucasian	91	82
African-American	5	5
Asian	2	2
Hispanic	1	1
Other	1	10
Marital status		
Unmarried	98	NA*
Married	2	NA*
Living situation		
On-campus housing	48	31
Off-campus	49	69
Parents/other housing	3	NA*
Class standing		
Lower division (Freshmen/Sophomores)	49	48
Upper division (Juniors/Seniors)	51	50
Uncertain	0	2
Employed		
Yes	57	NA*
Member of intercollegiate athletics		
Yes	6	NA*
Member of fraternity/sorority		
Yes	27	15
Weight perception		
Very underweight	1	NA*
Slightly underweight	12	NA*
About the right weight	54	NA*
Slightly overweight	30	NA*
Very overweight	3	NA*

*These data were not available from the institution at the time of this paper.

Table 2. Logistic Regression Models for the Outcomes of Vigorous (n = 872) and Moderate (n = 856) Activity

Outcome	Variable	Parameter estimate	Standard error	Odds ratio (OR)	95% CI for OR
Vigorous exercise (VIG)					
	Male	0.35	0.15	1.41*	1.06 - 1.90
	Age	-0.052	0.071	0.95	0.83 - 1.09
	Caucasian	0.61	0.27	1.84*	1.09 - 3.09
	Unmarried	0.73	0.67	2.07	0.56 - 7.68
	Freshman/sophomore	0.086	0.22	1.09	0.71 - 1.68
	Employed	-0.031	0.15	0.97	0.72 - 1.30
	Intercollegiate athlete	1.49	0.36	4.44***	2.20 - 9.00
	Fraternity/sorority	0.58	0.16	1.78***	1.30 - 2.43
	Weight perception	-0.19	0.10	0.83	0.68 - 1.01
Moderate exercise (MOD)					
	Male	-0.29	0.15	0.75*	0.56 - 0.99
	Age	-0.16	0.074	0.85*	0.74 - 0.99
	Caucasian	0.68	0.25	1.97**	1.21 - 3.23
	Live on campus	0.19	0.17	1.21	0.87 - 1.70
	Freshman/sophomore	-0.77	0.29	0.93	0.59 - 1.45
	Intercollegiate athlete	0.72	0.34	2.06*	1.06 - 4.02
	GPA	0.17	0.14	1.19	0.91 - 1.55

*p < .05; **p < .01; ***p < .0005.

not exercise at this level (t=2.0, p=.05). MOD was not related to fraternity/sorority membership, perception of weight, or BMI.

Predictors of physical activity

A logistic regression model was tested for each of the levels of physical activity. Each logistic model contained the socio-demographic and personal characteristics that were significantly related to that level of activity in the bivariate analyses.

The significant predictors of VIG included gender, race, being an intercollegiate athlete, and belonging to a social fraternity or sorority (Table 2). In particular, females were only .71 times as likely to be VIG, compared with males, and Caucasian students were nearly twice as likely as their minority peers to be VIG. In addition, athletes were more than four times more likely than non-athletes to be VIG, and those in a social fraternity or sorority were nearly two times more likely than non-Greeks to do so. The Hosmer-Lemeshow χ^2 goodness-of-fit test was 8.8 for this model (p=.4), indicating the model fit the data well. All VIFs for the

regressors were at most 3, so the model was not impacted by multicollinearity.

As shown in Table 2, gender, age, race, and being an intercollegiate athlete were predictive of MOD. Females were about one-third more likely than males to be MOD, while for every 1-year increase in age, the odds of participating in MOD decreased by a factor of .85. White students were nearly two times as likely as minorities to be MOD, and intercollegiate athletes were slightly more than two times more likely than non-athletes to participate in MOD. The Hosmer-Lemeshow χ^2 goodness-of-fit test was 6.7 for this model (p=.6), with the conclusion that the model fit the data well. All VIFs for the predictors were at most 3, so the model was not affected by multicollinearity.

DISCUSSION

While results of this study provide important information about the levels and characteristics of physical activity of a cohort of college students, certain limitations must be acknowledged. These students reported

higher levels than have been reported elsewhere. While it is possible that these students are more active compared to their counterparts in other parts of the U.S., it is doubtful. It is more likely that activity was overestimated and/or more highly active students were over represented among those who decided to respond to the survey. In other words, with less than a 60% response rate, there may be a threat to the external validity of the findings. In a similar vein, this study was cross-sectional and all of the data are self-reported, which presents the same limitations as has been discussed at length in the literature.[14] Another explanation may be that the campus on which the study was conducted is expansive and may require more walking or biking compared to some other campuses.

Nonetheless, these data add to the body of knowledge related to physical activity among college students. One of the most compelling findings from this study is that they are so consistent with other research on the predictors of physical activity. These

findings indicated males were more likely to be vigorously active than females, while females were more likely to be moderately active. This result is consistent with many other studies demonstrating that males tend to be more physically active than females.[5] It is interesting that this trend persists despite the changing social norms regarding physical activity and traditional gender roles.[15] Although it is becoming increasingly more acceptable for women to be physically active, the data do not yet reflect equal levels of participation between men and women.

Additionally, these results are in agreement with other data showing that Caucasians are more likely to be physically active than minorities,[16] yet differ from results in the NCHRBS[5] indicating that minorities were more likely than Caucasians to report physical activity. Literature that focuses on racial or ethnic differences in physical activity identifies socioeconomic status and poor living conditions as being partly responsible for the lack of physical activity among minority populations. However, it might be expected that on a college campus, with fewer variations in living conditions and socioeconomic status among students, activity levels would be similar between Caucasians and minorities. Therefore, it is reasonable to question why the differences remain in physical activity levels between Caucasian and minority college students.

Belonging to a fraternity was predictive of vigorous physical activity but not of moderate activity. One plausible explanation for this finding is that, since vigorous activity is less typically engaged in, those who do engage in vigorous activity may be influenced by greater levels of social support such as might be found in a fraternity. Belonging to a fraternity or sorority was not determined to be predictive of moderate physical activity. This may be because the moderate activity engaged in by this cohort was due to transportation (i.e., walking or biking as an alternative to driving a car). The survey did not ask this question but if this were the case then the impact of social support would be expected to be much less than it is on vigorous activity.

The finding that being an athlete was predictive of vigorous and moderate activity is to be expected. Yet, an interesting aspect of these findings overall is that they present a picture of the typical physically active person as White and athletic. While we as health educators continue to encourage people in the general population to be more active, at least among this college student sample, these results suggest that we have not been successful in increasing activity among the traditionally inactive. In other words, we have not significantly influenced physical activity among minorities and non-athletes and have not brought women to the same level of activity as men.

People who are vigorously active and those who are moderately active but not vigorously active appear to be different from each other according to the correlational results in this study. For example, not having paid employment and being unmarried were associated with vigorous activity but not with moderate activity. Having a higher GPA was associated with moderate activity but not vigorous. Vigorously active people in this sample were less likely to describe themselves as overweight than moderately active people, yet BMI data were not different.

Finally, while living on campus was not predictive of vigorous or moderate activity, it was significantly correlated with moderate activity. Living on campus requires more walking and biking for transportation than living off-campus, which requires driving for transportation. While not a new result, this relationship provides important validation to the observation by researchers that the environment in which people live plays a critical role in the amount of daily physical activity in which they engage.[17,18] Students who live on a college campus may be more moderately active than those who live off-campus because the environment supports, or even demands, it. The self-contained nature of a college campus is such that most of the activities of daily living take place on-site. Residence halls, dining facilities, recreational facilities, and many social activities coexist in a "mixed-use"

design.[17] It is interesting to note that on the campus on which the study was conducted only about one-third of students live on campus. This is partly due to inadequate housing available to accommodate the student population. Determining ways to increase available housing on the campus potentially could impact the health of students.

IMPLICATIONS OF FINDINGS

Health educators and others committed to improving the health of college students can glean several valuable insights from this study. First, despite efforts to educate and encourage students to engage in vigorous activity, the majority is not doing so. This points to the need for more research to understand why this is the case and, therefore, how to design effective interventions to impact these low levels of activity, especially among groups currently reporting the lowest activity levels. Second, at least on the study campus, the need still exists to increase physical activity among all populations. Third, the campus environment is an important influence on physical activity. Emphasizing the benefits to students of walking and biking for transportation is one way health educators may encourage greater levels of physical activity. The place where students live, whether or not they work, and with whom they associate, may impact physical activity.

The need to increase physical activity in the U.S. has become evident. Health educators and other health professionals have a responsibility to learn as much as possible about how to impact this critical public health issue. This study is an attempt to continue progress in that direction.

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