

Clinical and Program Note

Relationship Between Vigorous Exercise Frequency and Substance Use Among First-Year Drinking College Students

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Abstract. Objective: The authors explored the relationship between self-reported vigorous exercise frequency and alcohol, tobacco, and other drug (ATOD) use behaviors among first-year college students who self-identified as drinkers. **Participants:** The authors recruited 391 freshman college students in Northeast Florida to participate in an alcohol abuse prevention study. **Methods:** The authors conducted a multivariate analysis of variance to assess the relationship between vigorous exercise frequency and 6 measures of ATOD use at baseline. **Results:** Frequent exercisers drank significantly more often and a significantly greater quantity than did infrequent exercisers. However, frequent exercisers smoked cigarettes significantly less often than did infrequent exercisers. **Conclusions:** These findings suggest that vigorous exercise frequency is differentially associated with alcohol and cigarette consumption among college students. Researchers should further examine the reasons for these differences.

Keywords: alcohol, college students, exercise, physical activity, tobacco

The importance of physical activity for all people is well known.^{1,2} In addition to the numerous documented health and social benefits, there is a common perception that physical activity is linked to engaging in other positive health behaviors.³ Moreover, encouraging young people to participate in physical activity has been recommended as a means to help them avoid initiating risk-taking behaviors such as substance abuse.⁴ One rationale is that time spent in physical activity is time not available for engaging in negative health behaviors.³ Another rationale is that individuals who choose to engage in a health-promoting behavior such as exercise would not simultaneously engage

in health-damaging behaviors such as alcohol, tobacco, or other drug (ATOD) use.⁵

Few researchers have examined the relationship between physical activity and ATOD use among the general college population—many in the field have instead focused on athletes.^{6–10} The few who have studied the general college population report seemingly conflicting results.^{11–14} Some researchers have found a reduced likelihood of self-reported cigarette-smoking behavior among college students with higher levels of self-reported physical activity,¹¹ whereas others found no relationship between self-reported physical activity and health risk behaviors such as tobacco use,¹² alcohol use,¹³ and drinking and driving.¹² Still other researchers have found higher rates of reported binge drinking among female students who report participating more frequently in exercise.¹⁴ Hence, there is a critical need to determine whether a link exists between self-reported exercise and substance use among college students.

Our primary purpose in this study was to explore the relationship between self-reported vigorous exercise frequency and substance use among college students; we also wanted to investigate differential relationships by sex and ethnicity. We used baseline data collected from first-year, self-identified drinking students recruited to participate in a selective intervention on alcohol abuse prevention. This population of college students is typically considered to be at greater risk for substance use problems for 2 reasons. First, not only are students who come to college with already established drinking habits more likely to misuse alcohol than are their nondrinking counterparts,¹⁵ but self-reported drinking rates also have been found to increase during the transition period from high school to college.¹⁶ Second, younger students are more likely to report engaging in heavy drinking than are their older counterparts.¹⁷ Therefore, an urgent need exists to identify protective factors that could be used in the development of

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innovative and efficacious substance use interventions, which are sorely lacking for this high-risk population.

METHODS

Participants and Procedures

Participants were 391 freshman students from a midsized university in Northeast Florida. In fall 2002 and spring 2003, trained research staff approached students in heavily populated campus areas and asked them to participate in a study on an alcohol prevention program. The recruitment protocol described the study, its voluntary and confidential nature, and that nominal incentives would be given for participation. The research staff asked interested students 4 screening questions to ascertain whether they were aged at least 18 years, were first-year students, lived on campus, and had consumed alcohol in the past 30 days. The staff then took the individuals who met all criteria and consented to participate in the study to a nearby quiet room to complete the survey. Research staff used a standardized protocol to implement the surveys. The university's institutional review board approved the study.

Measures

We used the College Survey¹⁸ to collect data about self-reported alcohol and drug consumption, risk and protective factors associated with alcohol and other drug use, and other health behaviors, including exercise. Participants completed the survey in approximately 30 minutes. Extensive pilot testing of the questionnaire resulted in a psychometrically sound and highly readable instrument for adolescents.¹⁹

We adopted the 6 baseline substance use items for this analysis from commonly used college substance use instruments.^{20–22} All 6 questions started with the phrase “During the past 30 days” and were completed as follows. The frequency of alcohol use question asked: “On how many days did you have at least one drink of alcohol?” The frequency of heavy drinking question asked: “How many times have you had 5 or more drinks in a row if you are male or 4 or more drinks in a row if you are female?” Response categories for these 2 questions were 0 to 10 (times or days per month, depending on the question; these were individual numbers), 11–20 (times or days), 21–29 (times or days), and every day or 21–30 times. The questions assessing frequency of cigarette, smokeless tobacco, and marijuana use were worded the same: “On how many days did you use [respective drug]?” The response categories for these 3 questions were 0, 1–2, 3–5, 6–9, 10–19, 20–29, and all 30. The quantity of alcohol use item asked “On those occasions when you drank alcohol, how many drinks did you usually consume?” The response categories were 0 to 10 or more (individual numbers). Our test–retest analysis of these 6 variables yielded Pearson correlation coefficients of $r = .78–.97$ ($ps < .01$). Cronbach α for the alcohol-use measures was .84.

We measured physical activity frequency by 1 question assessing vigorous exercise²²: “During the past 7 days, on how many days did you exercise or participate in physical

activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bike riding, fast dancing, or similar aerobic activities?” Responses ranged from 0 days to 7 days, and, following previous research,²³ we recoded them to classify students as infrequent (0–2 days), regular (3–4 days), or frequent (5–7 days) exercisers. Our test–retest analysis yielded a Pearson correlation coefficient of $r = .89$ ($p < .001$). We also collected various demographic measures.

Data Analysis

We analyzed baseline data with SPSS for Windows, Release 11.5 (SPSS, Inc, Chicago, IL). We included frequencies, means, standard deviations, and chi-square tests in the descriptive statistics we conducted. We performed multivariate analyses of variance (MANOVAs) to assess the relationship between exercise frequency and ATOD use. We used factorial MANOVAs to assess differences in ATOD use between exercise frequency by sex and ethnicity.

RESULTS

Participants

Just more than half of the participants were female (52.7%). The majority of students were white (78.5%), followed by other ethnicities (ie, American Indian/Alaska Native, Asian, Hispanic/Latino, Native Hawaiian/Pacific Islander; 12.0%) and black (9.0%). The mean age of the students was 18.38 years ($SD = 0.52$). Most students reported infrequent exercise (45.0%), followed by regular (29.9%) and frequent exercise (24.8%). Significantly more men than women exercised frequently, 37.5% and 13.6%, respectively ($\chi^2[N = 390, 2] = 32.59, p < .001$), whereas about the same percentage exercised regularly (28.8% vs 31.1%, respectively), and more women than men exercised infrequently (55.3% vs 33.7%, respectively). Reported frequency of exercise did not differ significantly by ethnicity, although white students were most likely to be frequent exercisers, followed by other and black students (27.5%, 17.0%, and 11.4%, respectively); black students were most likely to be infrequent exercisers, followed by other and white students (62.9%, 53.2%, and 41.8%, respectively).

Exercise Frequency and Substance Use Behavior

Table 1 shows that the overall MANOVA model was significant ($F[12, 748] = 3.41, p < .001$), as was the univariate analyses for 30-day self-reported alcohol use frequency ($F[2, 379] = 2.96, p = .05$), alcohol quantity ($F[2, 379] = 5.94, p = .003$), and cigarette smoking ($F[2, 379] = 5.57, p = .004$). Tukey's honestly significant difference showed that frequent exercisers reported drinking significantly more often and consuming a significantly greater quantity of alcohol than did infrequent exercisers ($p = .05$ and $.003$, respectively). Students who were frequent exercisers reported significantly lower cigarette use than did students who reported infrequent exercise ($p = .003$).

We observed no significant interactions between sex and exercise frequency or ethnicity and exercise frequency on any ATOD use items. Last, because previous research findings

TABLE 1. Mean 30-Day Alcohol, Tobacco, and Other Drug Use, by Level of Exercise

Measure	Exercise level					
	Infrequent		Regular		Frequent	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Frequency of alcohol consumption ^a	6.83	3.93	7.53	3.69	8.00	4.08*
Amount of alcohol consumed ^a	5.42	2.67	6.08	2.53	6.56	2.89**
Drinking heavily	4.45	3.79	5.16	3.75	5.53	4.17
Smoking cigarettes ^a	2.88	2.56	2.55	2.17	1.92	1.74**
Using smokeless tobacco	1.10	0.62	1.31	1.14	1.25	0.81
Using marijuana	2.21	1.88	2.41	1.82	2.22	2.08

Note. The higher the score, the higher the level of use. Infrequent exercise = 0–2 d/wk; regular exercise = 3–4 d/wk; frequent exercise = 5–7 d/wk.

^aInfrequent exercisers differed significantly from frequent exercisers.

* $p < .05$. ** $p < .01$.

have shown increased self-reported alcohol use among athletes, we conducted post hoc analyses to investigate relationships between reported exercise frequency, substance use, and status as a university athlete. Athletes were significantly more likely to report exercising frequently than were non-athletes ($\chi^2[N = 390, 2] = 20.76, p < .001$; 44.2% vs 21.9%, respectively); however, a factorial MANOVA showed no significant interactions between reported exercise frequency and athletic status on any ATOD use items. Furthermore, MANOVAs excluding university athletes ($n = 52$) yielded the same basic relationships between reported exercise frequency and substance use as did our analysis of the whole sample.

The overall MANOVA model was significant ($F[12, 650] = 3.55, p < .001$), as was the univariate analyses for reported 30-day alcohol frequency ($F[2, 330] = 3.53, p = .030$), alcohol quantity ($F[2, 330] = 7.93, p < .001$), and cigarette smoking ($F[2, 330] = 3.98, p = .020$). In addition to the findings from the entire sample, self-reported 30-day binge drinking was significant ($F[2, 330] = 3.83, p = .023$). Tukey's honestly significant difference showed that frequent exercisers reported drinking significantly more often, consuming a significantly greater quantity of alcohol, and engaging in heavy drinking significantly more often than did infrequent exercisers ($p = .05, .001, \text{ and } .05$, respectively). Students who were frequent exercisers reported significantly lower cigarette use than did students who reported infrequent exercise ($p = .015$).

COMMENT

We are, to the best of our knowledge, the first to examine the association between self-reported vigorous exercise frequency and substance use among first-year college students who self-identified as drinkers. Results showed that college students who were frequent exercisers reported drinking alcohol significantly more often and drinking a significantly greater quantity of alcohol than did infrequent exercisers. Furthermore, this same pattern was also evident in that frequent exercisers reported drinking heavily more often than did infrequent exercisers, and regular exercisers drank a greater quantity and used smokeless tobacco more often

than did infrequent exercisers, although these differences were not significant ($p = .08, .10, \text{ and } .09$, respectively). At the same time, college students who were frequent exercisers reported smoking significantly less often than did infrequent exercisers. These findings confirm previous studies of the general college population showing an increased use of alcohol¹⁴ and a decreased use of cigarettes¹¹ among more frequent exercisers.

Because several researchers have found a relationship between college athletes and self-reported alcohol use^{6–10} (ie, supporting the stereotype that “jocks” drink more heavily), we conducted post hoc analyses to investigate whether the inclusion of athletes in the sample population influenced the relationship between exercise frequency and substance use. Results showed this was not the case. Greater frequency of exercise was related to reporting increased frequency and quantity of alcohol use and decreased smoking, regardless of athletic status. In addition, heavy drinking was significantly more likely to be reported among frequent exercisers than among infrequent exercisers when we removed athletes from the sample. Of course, those who exercised frequently may have been involved in sports in ways we did not assess in the current study.

Last, our results were consistent with the National College Health Risk Behavior survey in that men were more likely to report vigorous exercise than were women and that there were no significant differences by ethnicity.²⁴ Interestingly, within this particular sample population, we found no significant relationships between sex or ethnicity and exercise frequency and ATOD use, again confirming previous results.^{11,12}

These findings raise 2 important questions. Why are self-reported alcohol and cigarette use differentially related to exercise? Why would young adults report concurrently engaging in health-promoting and health-damaging behaviors? College-aged adolescents may hold different perceived risks of alcohol use versus cigarette use in terms of the effect each substance has on their athletic performance or overall physical health. Perceptions of cigarette use might

be influenced by current health messages, social norms, and personal experiences that highlight the counterproductive outcomes of smoking on health and physical capabilities. In contrast, alcohol use is viewed in our society as a more acceptable and healthy behavior.²⁵ In particular, older adolescents appear to view alcohol use as having not only few negative effects but rather multiple positive ones.²⁶ Hence, these beliefs do not lend themselves to a view of alcohol as contraindicative to exercise.

However, the potential explanations for the issues raised here do not answer the natural follow-up question: Why do frequent exercisers report drinking more than their less frequently exercising counterparts? In other research,²⁷ the second author (CW) hypothesized that images play an important role in linking health behaviors. This line of research would lead to investigating whether college students hold an image of frequent exercisers that includes drinking and whether this image influences their seemingly contradictory health behaviors.

Limitations

First, the analyses were limited to volunteer, first-year, self-identified current drinkers at a selected university in Northeast Florida, so generalizability is limited. However, first-year, self-identified drinking students are typically considered to be at greater risk for substance abuse for the reasons previously discussed. Hence, an investigation of their behaviors to develop selective prevention strategies was warranted. Furthermore, percentages of participants by sex and ethnicity were similar to the university demographics. Second, because we used cross-sectional data, we could not determine whether a causal relationship exists between physical activity and substance use. Third, although we took the exercise question from a previous national survey of college health behaviors,²² we may have misclassified some individuals' exercise frequency as a result of the wording of the question. Last, although we accounted for race and sex in the primary analyses, other potential factors—such as fraternity or sorority involvement and living environment—may have interacted with reported exercise frequency and substance use not examined in this study.

Conclusions

The findings presented here are not intended to deter support of physical activity participation as a means to improve adolescent health; numerous health benefits of engaging in regular physical activity are well documented.^{1,2} Nevertheless, educators cannot assume that involvement in physical activity alone is associated with less use of all substances for all young people. Providing adolescents and young adults with supervised, structured, prosocial physical activities may reduce their exposure to situations that can encourage risky health behaviors.³ In fact, researchers in studies of physical fitness and sport-themed drug-prevention programs have found significant reductions in the percentage of youth who report using alcohol and other drugs.^{28,29} Furthermore, ATOD programs that take a more positive approach to

promoting a healthy lifestyle might attract students more readily than do programs that focus solely on substance use, and addressing multiple behaviors might be more effective than targeting a single health behavior.^{13,29}

Clearly, more research is needed on the cognitive, social, and environmental factors that may influence substance use among college students engaged in varying levels of exercise and physical activity. In particular, researchers may want to examine these questions: Is there an image of self-reported frequent exercisers as being heavier drinkers (ie, “work hard, play hard”) that is supported among college students? Are college students who report being frequent exercisers more likely to be involved in various sports cultures that promote the link between alcohol and physical activity (eg, the college subculture coupling alcohol and sports³⁰), and does this link influence their behavior? At the least, our findings suggest that those who report being frequent exercisers might be at higher risk for alcohol abuse and therefore could be targeted for alcohol abuse prevention interventions.

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NOTE

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