Risk Profile of Male College Athletes Who Use Performance-Enhancing Substances*

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ABSTRACT. Objective: There is a general perception that use of performance-enhancing substances (PESs) does not fit the standard profile of substance use. This study sought to determine whether users of PESs report high-risk patterns of alcohol and other drug use and demonstrate risk behaviors associated with problematic substance use. **Method:** Anonymous self-report questionnaires were administered to a sample of 234 male student athletes. PES users were defined as college athletes who reported past-year use of a broad array of PESs (including stimulants, hormone precursors, and nutritional supplements). **Results:** Male athlete PES users (n = 73) compared with nonusers (n = 160) reported more problematic alcohol-use behaviors and more alcohol- and drug-use-related problems. The former compared with the latter was also more likely to report past-year use of tobacco products, marijuana, cocaine, psychedelics, and prescription drugs without a prescription. In addition, PES users demonstrated higher sensation seeking, and greater coping and enhancement motivations for drinking and marijuana use than non-PES users. **Conclusions:** Although banned PESs are not typically viewed as having a high addiction potential, male athletes who use these drugs may be more likely to participate in other problematic substance-use behaviors. Importantly, the male athletes in this study who reported PES use also participated in substance-use behaviors that can have profound negative effects on athletic performance. More research on the use of PESs in college athletes is needed. (*J. Stud. Alcohol Drugs* **70:** 919-923, 2009)

THE LIST OF LICIT AND ILLICIT SUBSTANCES that are touted to enhance athletic performance by increasing strength, combating fatigue, facilitating injury recovery, controlling body fat, or improving concentration is extensive. The use of these performance-enhancing substances (PESs) among high school, college, and professional athletes persists, even in the face of increasing public scrutiny and severe consequences. PESs are considered drugs of abuse. However, this class of substances may be somewhat distinct, in that they rarely appear to be used for their pleasurable or euphoric properties (Castillo and Comstock, 2007; National Collegiate Athletic Association [NCAA], 2006), and the addictive potential of many PESs (e.g., anabolic steroids) is generally considered to be low (Hartgens and Kuipers, 2004; Wood, 2008). This raises the question of whether users of PESs fit the standard high-risk profile of other substance users.

This study examines the prevalence of alcohol and other social drug use, as well as risk factors related with problematic substance use, in male college athletes who report past-year PES use compared with those who do not. This study uses an expanded definition of PESs that includes anabolic steroids, as well as a representative sample of other stimulants, hormone precursors and analogues, and nutritional supplements that are explicitly banned by the NCAA or considered impermissible (NCAA, 2000, 2008). Anabolic steroids, although most widely studied, represent only a small proportion of PESs being used by student athletes, with lifetime prevalence rates dwarfed by those of other PESs, such as creatine (Castillo and Comstock, 2007; NCAA, 2006). Studying a broader spectrum of PESs may more fully capture the subset of athletes who are willing to engage in the use of substances that carry the potential for substantial negative consequences (often similar to those associated with steroid use).

Like nonathlete students, male college athletes report using a variety of psychoactive substances for social and recreational purposes (NCAA, 2006; Wechsler et al., 1997). They are more likely to drink heavily than their nonathlete peers (Hildebrand et al., 2001; Leichliter et al., 1998; Yusko et al., 2008a) and may be more likely to engage in other high-risk recreational drug-use behaviors (NCAA, 2006; Wechsler et al., 1997; Yusko et al., 2008a). In addition, anabolic steroid use, which is more prevalent among male students and those involved in intercollegiate sports, is related to greater binge drinking, a higher prevalence of alcohol-use disorders, marijuana and other drug use, and more high-risk behaviors (e.g, drinking and driving; McCabe et al., 2007). Moreover, a recent review prepared for the World Anti-Doping Agency

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highlighted the importance of psychosocial factors, such as sensation seeking (Backhouse et al., 2007), in the decision to use steroids. It was, therefore, hypothesized that male student athletes who engaged in past-year use of any banned or impermissible PESs would also demonstrate a higher prevalence of alcohol and other recreational drug use and exhibit more risk factors for substance abuse (e.g., sensation seeking, maladaptive drinking motivations, and negative mood) compared with their non-PES-using counterparts.

Method

Participants and procedures

Participants were 234 male varsity student athletes (ages 18-26 years) from a single large northeastern university during 2005 and 2006. Recruitment occurred during an alcohol education seminar that was required for all student athletes. Completion of the anonymous, 30-minute survey was voluntary; yet, no athlete refused to participate. Participants were entered into a lottery for one of three possible prizes (two MP3 players and a video game system). The study was approved by the university human subjects committee. The average age of this male student-athlete sample was 20.1 years, and 84% identified themselves as white (non-Hispanic). All student athletes were subject to random drug testing for all university-banned substances during the academic year or while a resident on campus.

Measures

The alcohol and other drug-use questions were adapted from the Rutgers Health and Human Development Project (Pandina et al., 1984) and the Monitoring the Future survey (Johnston et al., 2007). Frequency of past-year alcohol use (ordinal scale from 0 = never to 7 = once or more per day), frequency of heavy episodic alcohol use (number of occasions of drinking five or more drinks), and the largest number of alcoholic beverages consumed in 1 day were assessed. Prevalence of past-year cigarette use was estimated from questions assessing the quantity of cigarettes smoked during the most recent athletic season and the most recent offseason. Prevalence of past-year use of other drugs was directly ascertained. Drugs were categorized as follows: smokeless tobacco, marijuana/hashish, cocaine/crack, psychedelics, nonmedical use of prescription drugs, central nervous system stimulants, ephedrine (for purposes other than weight loss), banned performance-enhancing drugs, and weight-loss drugs. Because of potential overlap in the categorization of some drugs, the questionnaire listed specific examples in several categories. LSD (lysergic acid diethylamide), mushrooms, mescaline, Ecstasy (3,4-methylenedioxymethamphetamine), GHB (gamma-hydroxybutyrate), and ketamine were offered as examples of psychedelics. Percocet (oxycodone/acetaminophen), Xanax (alprazolam), and Oxycontin (oxycodone) were listed as examples of prescription drugs. Speed, meth (methamphetamine), uppers, and nonprescription use of Ritalin (methylphenidate) and Adderall (amphetamine/dextroamphetamine) were included as examples of stimulants. Steroids, creatine, and Andro (androstenedione) were offered as examples of banned performance-enhancing drugs. Xenadrine, TRIMSPA, and Stacker 2 (all of which are reported to contain citrus aurantium, an NCAA-banned substance) were included as examples of weight-loss drugs. Based on the NCAA list of banned substances (NCAA, 2008) and impermissible nutritional supplements (NCAA, 2000) as well as on reported reasons for use (Green et al., 2001; NCAA, 2006), stimulants, ephedrine, banned substances, and weight-loss drugs were categorized as PESs. Any athlete who reported past-year use of any of these drugs was considered a PES user.

Risk and protective factors included alcohol and drug-related problems (adapted from the Rutgers Alcohol Problem Index; Johnson and White, 1995; White and Labouvie, 1989), stress (adapted from an 11-item scale developed by Selby et al., 1990), use of protective behaviors when drinking (from the Personal Protective Behaviors survey developed by Haines et al., 2006), sensation seeking (using a 9-item scale developed by Schafer et al., 1994), and current mood state (the total mood disturbance score from the Profile of Mood States; McNair et al., 1992). Motivations for drinking (from the Drinking Motives Measure; Cooper, 1994) and marijuana use (from the Marijuana Motives Measure by Simons et al., 1998) were assessed in individuals who reported lifetime use of alcohol (n = 220) or marijuana (n = 126), respectively. Complete descriptions of these scales and their psychometric properties in this sample can be found in Yusko et al. (2008a, 2008b).

Results

T tests and Fisher's exact tests were used to compare male student athletes reporting use of any PESs in the past year (PES users: n = 73; 31%) with those who reported no PES use (non-PES users: n = 160; 69%) in the past year (Table 1). One athlete was missing all data related to past-year PES use and was dropped from the analyses. Among the PES users, past-year use of ephedrine was reported by 7%, banned substances by 31%, weight-loss drugs by 22%, and stimulants by 73%. There were no differences between the groups in age or race (white, non-Hispanic vs nonwhite, non-Hispanic). Compared with nonusers, PES users reported significantly more frequent alcohol use (t = 7.19, 231 df, p < .0001), engaged in heavy episodic drinking more than twice as many times (t = 8.05, 212 df, p < .0001), consumed a significantly higher number of drinks on the heaviest drinking day (t = 6.32, 222 df, p < .0001), and reported more alcohol-related problems (t = 6.51, 230 df, p < .0001) in the

Table 1. Substance-use behaviors and risk profiles of male student athletes who did or did not report past-year performance-enhancing substance (PES) use

Variable	Non-PES users (n = 160)	PES users (n = 73)
Alcohol-use behaviors, mean (SD)		
Frequency of use in past year[a]	2.7 (1.3)	3.9 (1.0)[§]
Frequency of ≥5 drinks in one sitting in past year	23.8 (31.8)	69.2 (49.7)[§]
No. of drinks on the heaviest drinking day in past year	11.2 (6.8)	17.5 (7.2)[†]
Prevalence of past-year drug use, % yes		
Cigarettes	6%	21%[†]
Smokeless tobacco	11%	46%[§]
Marijuana	22%	70%[§]
Cocaine	3%	32%[§]
Psychedelics	3%	29%[§]
Prescription drugs without a medical prescription	6%	40%[§]
Consequences of use		
Alcohol problems	2.5 (3.0)	5.6 (4.0)[§]
Drug problems[b]	13%	52%[§]
Risk and protective factors		
Stress	2.3 (0.7)	2.5 (0.7)
Sensation seeking	2.8 (0.5)	3.1 (0.5)[†]
Coping motives for drinking[c]	1.4 (0.6)	1.8 (0.7)[†]
Conformity motives for drinking[c]	1.4 (0.7)	1.4 (0.5)
Enhancement motives for drinking[c]	2.5 (1.0)	3.1 (1.0)[§]
Coping motives for marijuana use[c]	1.2 (0.5)	1.5 (0.7)[†]
Conformity motives for marijuana use[c]	1.2 (0.4)	1.3 (0.5)
Enhancement motives for marijuana use[c]	2.3 (1.2)	3.1 (1.2)[†]
Protective factors	2.7 (0.6)	2.4 (0.5)[†]
Total mood disturbance	23.4 (11.7)	24.3 (10.1)

[a]Coded on a 8-point scale from 0 = "I did not drink in the last year" to 7 = "once a day or more"; averages reflect alcohol use two to three times per month for the non-PES users and one to two times per week for the PES users; [b]this scale was dichotomized because of the small number of athletes who reported past-year drug-related problems; these values represent the number of athletes in each group who experienced one or more drug-related problems; [c]only those individuals who reported lifetime use of alcohol (n = 220) or marijuana (n = 126) completed the Alcohol or Marijuana Motives Measures, respectively.
[†]$p < .01$; [§]$p < .0001$.

past year. PES users were also more likely to report past-year use of cigarettes ($p < .01$), smokeless tobacco ($p < .0001$), marijuana ($p < .0001$), cocaine ($p < .0001$), psychedelics ($p < .0001$), and prescription drugs used without a prescription ($p < .0001$). Only a limited number of athletes reported any drug-related problems in the past year. Thus, data were dichotomized (no problems vs one or more problems). PES users were significantly more likely to have experienced one or more drug-related problems ($p < .0001$) than non-PES users. In terms of their risk profiles, PES users demonstrated higher sensation seeking ($t = 3.60$, 229 df, $p < .01$), greater coping ($t = 3.49$, 216 df, $p < .01$) and enhancement ($t = 3.99$, 217 df, $p < .0001$) motivations for drinking, greater coping ($t = 2.94$, 118 df, $p < .01$) and enhancement ($t = 3.80$, 118 df, $p < .01$) motivations for marijuana use, and less frequent use of protective behaviors ($t = 3.75$, 217 df, $p < .01$) than non-PES users. PES users and nonusers did not differ significantly in stress levels, conformity motivations for drinking or marijuana use, or total mood-disturbance scores.

Discussion

PESs are often considered distinct from other drugs of abuse based on the general belief among athletes that they are nonaddictive and used for nonrecreational reasons (Hartgens and Kuipers, 2004; Wood, 2008). However, support for this assumption appears mostly anecdotal, and research directly testing this assumption is limited and often contradictory. Unlike other drugs of abuse, which are most often used for their psychological properties (e.g., relaxation, pleasure enhancing), PESs are used primarily for their direct effects on performance as well as their many indirect effects on an athlete's career (e.g., monetary gains through endorsements and contracts; Wood, 2008). Limited awareness of and/or value placed on the considerable evidence of serious physical and mental consequences of use may compound the problem and may result in a continued escalation in the prevalence of PES use among athletes (Carpenter, 2007). Accordingly, research addressing PES use among athletes at all levels of competition is needed.

In this preliminary study, male college athletes who engaged in past-year use of PESs demonstrated a general pattern of heavier alcohol use, more prevalent other social/recreational drug use, and more negative consequences from use compared with their non-PES-using male athlete counterparts. Thus, male college athletes who used PESs were also more likely to engage in recreational drug-use behaviors that may act counter to PESs. For example, alcohol can significantly reduce aerobic performance and increase the rate of injury (O'Brien and Lyons, 2000) and, thus, can clearly undermine the perceived benefits of many PESs. In addition, the PES-using athletes in this study clearly experienced greater negative consequences from their alcohol and drug use, suggesting that involvement in substance-use activities occurs regardless of the substantial personal and performance-related consequences.

This exploratory study also found that the athletes who were engaged in PES use demonstrated a high-risk profile of intra- and interpersonal factors that may influence substance-use decisions, including higher sensation seeking, more coping and enhancement reasons for drinking and using marijuana, and less frequent use of protective factors (e.g., "use a designated driver," "avoid drinking games"). Higher sensation seeking has been found to be more strongly associated with frequency of heavy drinking episodes in an overall student-athlete sample compared with a nonathlete student sample, and student athletes who reported coping as a greater motivation for drinking experienced more negative consequences as a result of that drinking than their nonathlete peers (Yusko et al., 2008b). Thus, this sample of PES-using college athletes exhibited higher levels of crucial substance abuse risk factors along with the higher prevalence of multiple types of drug use. Taken together, these findings indicate that users of PESs may fit a standard high-risk

profile of other substance users. However, further research is needed to confirm this preliminary finding before strong conclusions can be reached.

The results of this preliminary study are limited by the use of retrospective self-report data, the highly sensitive nature of the information collected, and the use of a convenience sample (i.e., based on coaches) from a single NCAA Division I school in the northeast. Data are cross-sectional, and thus a causal link between PES use and other substance use cannot be established. In several cases, individual PESs were categorized together (e.g., steroids, creatine, and Andro were combined under an "Any Banned Performance-Enhancing Drug" category) to reduce the overall length of the survey. Thus, it was not possible to specifically compare steroid users with nonusers. The present definition of PESs was based on published NCAA classifications and included licit and illicit substances. These results must be interpreted with caution because reasons for use of PESs and social drugs were not assessed and several of the surveyed drugs are known to be used for recreational as well as performance-enhancing reasons. For example, the survey item gauging stimulant use listed illicit use of Ritalin and Adderall as examples, both of which are frequently used for academic and recreational purposes (Teter et al., 2005). Nonetheless, stimulants were included in our definition of PESs because they are widely used to increase alertness and combat fatigue (Avois et al., 2006). Furthermore, the male college athletes in this sample had a higher prevalence of past-year use of stimulants than their male nonathlete student peers (Yusko et al., 2008a). In contrast, although nonprescription use of pain medicines may be used by athletes to mask injuries, the prevalence of use was higher among male students than the male athletes in this sample (Yusko et al., 2008a), and recreational use of this class of drugs, in general, has increased dramatically in recent years (Manchikanti and Singh, 2008). Future studies should carefully assess reasons for use, such as was done by the NCAA (2006).

This study importantly contributes to our understanding of the substance-use activities and risk behaviors of male college athletes who use a broad range of ergogenic products. In general, the male student-athlete population is considered to be a high-risk subset of college students in terms of heavy drinking and drinking-related consequences. This study further suggests that PES-using male college athletes may be at particularly high risk and should be viewed in light of their overall high-risk substance-use pattern and their willingness to engage in drug-use behaviors that both promote and impede athletic performance. Although this study did not address risk related to developing PES dependence, it does suggest that PES users also often use other recreational drugs that themselves carry high addiction potential. In conclusion, better understanding of PES use among athletes is needed, especially in light of the ever-increasing number and variety of PESs available to athletes.

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