

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/232581475>

# A Comparison of Health Risk Behavior in Adolescent Users of Anabolic-Androgenic Steroids, by Gender and Athlete Status

Article in *Sociology of Sport Journal* · December 2002

DOI: 10.1123/ssj.19.4.385

CITATIONS

33

READS

235

5 authors, including:



**Kathleen E Miller**

University at Buffalo, The State University of New York

44 PUBLICATIONS 1,913 CITATIONS

[SEE PROFILE](#)



**Merrill Melnick**

State University of New York College at Brockport

38 PUBLICATIONS 2,122 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Caffeinated Energy Drinks and Alcohol (CEDA) Study [View project](#)



Collaborative Circles [View project](#)

## **A Comparison of Health Risk Behavior in Adolescent Users of Anabolic-Androgenic Steroids, by Gender and Athlete Status**

Kathleen E. Miller, Grace M. Barnes, Don Sabo, Merrill J. Melnick, and Michael P. Farrell

K.E. Miller and G.M. Barnes are with the Research Institute on Addictions, University at Buffalo, Buffalo, NY; D. Sabo is with the Department of Sociology, D'Youville College, Buffalo, NY; M.J. Melnick is with the Department of Physical Education and Sport, S.U.N.Y. College at Brockport, Brockport, NY; and M.P. Farrell is with the Department of Sociology, University at Buffalo, Buffalo, NY.

Contrary to popular assumption, adolescent anabolic-androgenic steroid use is not limited to serious male athletes. This paper examines the relationships among gender, athletic participation, and health-related problem behaviors among adolescent steroid users. Regression analyses were performed on a nationally representative sample of over 16,000 high school students (the 1997 Youth Risk Behavior Survey), of whom nearly 500 had used steroids. Compared to nonusers, steroid users were significantly more likely to report substance use, suicidal behavior, and sexual risk-taking; however, patterns of risk behavior varied by the user's athletic status and gender. After controlling for age, race, ethnicity, and parental education, both athletic participation and female gender were negatively associated with most risk behaviors among users of anabolic steroids.

Contrairement à la croyance populaire, l'utilisation des stéroïdes anabolisants chez les adolescents n'est pas limitée aux athlètes masculins de haut niveau. Cette étude porte sur les relations entre le sexe, la participation sportive et les problèmes de comportement associés à la santé chez les adolescents utilisateurs de stéroïdes. Des analyses de régression ont été faites à partir d'un échantillon représentatif au plan national avec 16,000 étudiants de niveau secondaire (le «1997 Youth Risk behavior Survey») dont 500 avaient utilisé des stéroïdes. Comparativement aux non-utilisateurs, les utilisateurs de stéroïdes étaient significativement plus enclins à rapporter l'utilisation de substances, le comportement suicidaire et le comportement sexuel à risque. Cependant, le comportement à risque variait selon le statut sportif et le sexe de l'utilisateur. Après avoir contrôlé l'âge, la race, l'appartenance ethnique et l'éducation des parents, la participation sportive et le sexe féminin étaient négativement associés à la majorité des comportements à risque chez les utilisateurs de stéroïdes.

This paper explores the relationships among gender, athletic participation, and health-risk behaviors among adolescent users of anabolic-androgenic steroids (hereafter referred to as “anabolic steroids” or “steroids”). A substantial body of literature has explored the prevalence of, and adverse effects associated with, steroid use. Nonprescription use of steroids has been illegal in the United States for over a decade, subsequent to passage of the Anabolic Steroid Control Act of 1990 (Denham, 1997; Yesalis, Barsukiewicz, Kopstein, & Bahrke, 1997), and Olympic athletes have been banned from using them since 1976 (Holden, Calvo, & Sterling, 1990; Kleiner, 1991). However, there is general consensus on the part of both the scientific and athletic/fitness communities that illicit steroid use has not abated (Bamberger & Yaeger, 1997; Center on Addiction and Substance Use, 2000; Delbeke, Desmet, & Debackere, 1995; Zickler 2000, 2001). Substantial attention has been devoted to adolescent steroid use in particular (Bahrke, Yesalis, & Brower, 1998; Burnett & Kleiman, 1994; Committee on Sports Medicine and Fitness, 1997; Denham, 1997; Elliot & Goldberg, 1996; Goldberg et al., 1996; Kindlundh, Isacson, Berglund, & Nyberg, 1999; Krowchuk et al., 1989; Middleman, Faulkner, Woods, Emans, & DuRant, 1995; Stilger & Yesalis, 1999; Terney & McLain, 1990; Trenhaile, Choi, Proctor, & Work, 1998; Yarnold, 1998; Yesalis et al. 1997).

Conventional wisdom identifies anabolic steroid users as a subset of (presumptively male) athletes whose overriding motivation is to maximize performance in their sport through chemical means. This interpretation leads by logical extension to two problematic assumptions: first, that an adolescent who uses anabolic steroids must necessarily be a boy who participates in a sport; and, second, that the steroid user’s intense commitment to success in that sport precludes behaviors perceived as jeopardizing athletic performance such as use of other illicit substances and other risky activities. Uncritical acceptance of these assumptions undermines the effectiveness of both empirical research and public health policy with regard to adolescent steroid use. The purposes of this analysis are twofold: (a) to compare the sociodemographic characteristics of anabolic steroid users across categories of gender and athlete status, and (b) to identify significant patterns of other problem behaviors associated with steroid use by four distinct populations (female nonathlete users, female athlete users, male nonathlete users, and male athlete users). Each of these purposes is further elaborated below.

### **Adolescent Anabolic Steroid Use, Athletic Participation, and Gender**

Most of the literature on adolescent steroid use reflects an understandable preoccupation with athletes. Despite multiple clinical uses (e.g., treatment of hypogonadal males, burn victims, etc.), steroids have long been virtually synonymous with sports in popular public imagery. Anabolic steroids are most commonly used to improve performance by increasing muscle mass (Daigle, 1990; Holden et al., 1990; Millar, 1995), and in fact, the prevailing stereotype of the steroid user is one of the professional weightlifter or competitive athlete. However, not all adolescent users are athletes (Buckley et al., 1988; DuRant, Escobedo, & Heath, 1995; Gaa, Griffith, Cahill, & Tuttle, 1994; Johnson, Jay, Shoup, & Rickert, 1989; Radakovich, Broderick, & Pickell, 1993; Salva & Bacon, 1991; Windsor & Dimitru, 1989). Steroid use has spread beyond the competitive and even recreational sports community to include adolescents and adults who do not participate in sports at all (Bahrke, 1994; Shapiro, 1994; Yesalis et al., 1997). Though a substantial subset of nonathlete users may be bodybuilders or weightlifters who do not define their activities as “sport” (Grace, Baker, & Davies, 2002), many other users do not engage in routine physical exertion. Compared to athletes, whose rationale is often presumptively assigned to

all users, the reasons that nonathletes take steroids are less clear. Some evidence suggests that improving appearance may be a motivation that transcends the athletic participation boundary (Buckley et al., 1988; Melia, 1994; Stilger & Yesalis, 1999; Terney & McLain, 1990). In fact, some users may even perceive steroids as an alternative to exercise, rather than as a means of performance enhancement. Radakovich et al. (1993) found that 36% of their seventh-grade student sample erroneously believed that if they took steroids, they “did not have to exercise or eat well to get big or strong muscles” (p. 342). Kindlundh et al. (1999) also identified a substantial subset of adolescent users whose main reasons had little to do with physical strength, stamina, or appearance; they indicated that they took steroids “to become more ‘brave’,” “to get intoxicated,” “because it’s fun to try,” or “because friends do.”

Previous research has generally highlighted the distinctions between anabolic steroid users and nonusers (e.g., Burnett & Kleiman, 1994; Gruber & Pope, 2000; Kindlundh et al., 1999; Pope & Katz, 1994; Porcerelli & Sandler, 1995; Su et al., 1993; Yarnold, 1998; Yesalis, Kennedy, Kopstein, & Bahrke, 1993). This research is often predicated on the assumption that users are by definition athletes (e.g., Minelli, Rapaport, & Kaiser, 1992). Equating steroid use with athletic participation may lead to empirical oversights. For example, in a comparative study of steroid- using adolescent weightlifters, non-using weightlifters, and nonathletes, Burnett & Kleiman (1994) did not query the nonathlete respondents regarding steroid use at all; only the weightlifters (who were classified as athletes in the study) were asked if they used steroids.

In light of the cultural equation of bulging muscles with masculinity, it is not surprising that most research to date on steroid use has employed male subjects only. Certainly boys and men are at greater risk than girls and women; the prevalence of adolescent lifetime steroid use has been estimated at 4% to 12% for boys, compared to only 0.5% to 2.9% for girls (Buckley et al., 1988; DuRant, Rickert, Ashworth, Newman, & Slavens, 1993; Johnson et al., 1989; Terney & McLain, 1990; Windsor & Dumitru, 1989; Yesalis et al., 1997; Yesalis, Bahrke, Kopstein, & Barsukiewicz, 2000). However, female adolescents have been a fast-growing population of users in recent years (for reviews of national trend data, see Elliot & Goldberg, 2000; Yesalis et al., 1997). Researchers have now begun to turn their attention to use by, and adverse outcomes for, women in particular (Gruber & Pope, 1999, 2000; Honour, 1997; Scott-Dixon, 1998; Strauss, Liggett, & Lanese, 1985). Nevertheless, research on female adolescent steroid use remains sparse, largely descriptive rather than analytical in nature, and, with few exceptions, undertheorized.

The first step in tracing the parameters of adolescent steroid use is to identify the user. We address the first of the two research questions in the present study by exploring the social and demographic characteristics of the steroid-using adolescent population. What proportion of anabolic steroid users are in fact nonathletes? What proportion are female? In what ways do nonathlete and/or female users differ demographically (e.g., age, race/ethnicity, SES) from male athlete users? Answering these questions may put a new face on one of the erroneous assumptions about steroid use identified at the beginning of this paper: namely, that users are overwhelmingly drawn from the ranks of male athletes.

### **Adolescent Steroid Use and Jessor’s Problem Behavior Syndrome**

Previous research has documented some of the complex relationships among athletic participation, gender, and adolescent health-risk behaviors (Miller, Sabo, Farrell, Barnes, & Melnick, 1999, 1998; Miller, Sabo, Melnick, Farrell, & Barnes, 2001; Sabo, Miller,

Farrell, Barnes, & Melnick, 1998; Sabo, Miller, Farrell, Melnick, & Barnes, 1999). Teen athletes' odds of engaging in behaviors such as illicit drug use, unprotected sexual intercourse, attempted suicide, or cigarette smoking are generally lower than those of their nonathletic counterparts; but their odds are higher for smokeless tobacco use, fighting, and steroid use. Since the associations between sports participation and adolescent health risk behaviors vary substantially by risk domain, it is reasonable to posit that the relationship between steroid use and other health risks also may differ between teen athletes and nonathletes. In particular, the nature of steroid use as a form of illicit drug use invites closer examination. Adolescents who take steroids are breaking the law; moreover, those who inject steroids may in so doing be initiated into an intravenous drug subculture that facilitates experimentation with other drugs. However, it is commonly assumed that anabolic steroids are used for the specific purpose of athletic performance enhancement, toward which end the use of most illicit drugs is antithetical; and in fact, steroids do stand alone among illicit drugs as positively associated with adolescent athletic participation (Miller et al., 2001).

Jessor argued that adolescent problem behaviors tend to covary, designating the resultant clustering a "problem behavior syndrome" (e.g., Jessor & Jessor, 1977). The syndrome unfolds sequentially, beginning with substances that are legal for adults (such as cigarettes and alcohol) and progressing to illicit substances and other problem behaviors. How steroid use fits into this syndrome remains to be seen. Indeed, some researchers have found that anabolic steroid use was significantly associated with a variety of other adolescent problem behaviors, including other illicit drug use (DuRant et al., 1993, 1995; Middleman et al., 1995).

According to Jessor's conceptualization of the problem behavior syndrome, these behaviors are learned together and often acted out together. Yet the nature of the linkage between anabolic steroid use and athletics within a strongly gendered sport culture likely complicates this process, such that any problem behavior syndrome may be expected to vary by athlete status and gender. We attempt here, not to provide definitive conclusions, but to describe adolescent steroid use within a larger pattern of interlinked problem behaviors.

Thus, the second goal of this analysis is to compare the prevalence of other problem behaviors among female nonathlete, female athlete, male nonathlete, and male athlete steroid users. For each of these populations, is anabolic steroid use part of a problem behavior syndrome, consistent with Jessor's model? And can the findings be used to generate inferences about how the problem behavior syndrome differs among the four populations? Answering these questions addresses the second assumption about steroid use identified earlier: namely, that users are too committed to athletic performance enhancement to risk engaging in other problem behaviors that would jeopardize that end.

In summary, the analysis seeks to address two research questions: Do the social and demographic characteristics of adolescent anabolic steroid users differ by gender and athletic status? And does the relationship between steroid use and other problem behaviors vary among steroid-using adolescent populations by gender and athlete status? The means used in the present study to examine these questions are elaborated below.

## **Methodology**

This analysis draws on the 1997 Youth Risk Behavior Survey, a nationally representative survey of 9th through 12th grade students conducted by the Centers for Disease Control and Prevention. To gather a nationally representative sample, the survey employed a three-stage cluster sample design. First, the nation was broken down into primary sampling units (PSUs), consisting of large counties or groups of small, adjacent counties. Of the 1,719 PSUs thus identified, 54 were chosen from 16 strata organized on the basis of urbanization and the relative percentage of black and Hispanic students in the PSU. Second, 191 schools were chosen with probability proportional to school enrollment size, sampling schools with large numbers of students of color at higher rates than other schools. In this way, black and Latino/a respondents were oversampled to facilitate hypothesis testing. In the final selection stage, one or two intact classes of a required subject (e.g., English or social studies) were randomly selected at each grade level within each chosen school (Kann et al., 1997). Under the supervision of trained data collectors, students completed anonymous questionnaires in the classroom. Over 16,000 questionnaires were completed at 151 schools, with an overall response rate of 69% (based on an 87% student response rate within the 79% of schools responding).

Measures of adolescent problem behavior, including anabolic steroid use, are based on self-reports. Demographic data were collected on the respondents' gender (male = 0; female = 1), age (14 or younger, coded as 14, 15, 16, 17; 18 or older, coded as 18), race/ethnicity, and parental educational achievement. In order to measure race/ethnicity, students were asked to describe themselves as belonging to only one of the following categories: white, not Hispanic; black, not Hispanic; Hispanic or Latino; Asian or Pacific Islander; American Indian or Alaskan Native; and Other. Given the relatively small number of adolescent steroid users who chose the Asian (unweighted  $N = 19$ ) or American Indian (unweighted  $N = 14$ ) categories, and the conceptual ambiguity of the Other designation, these three categories were subsequently combined into a single variable, which has not been interpreted in this analysis. Demographic data have been provided only for white, black, and Hispanic students. Multivariate analyses included dummy variables for all racial/ethnic categories (black, Hispanic, Asian/Indian/Other) except for white, which served as the reference category.

Parental educational achievement was included as a rough proxy (the only one available) for social class. Students were asked to identify each parent's highest level of educational achievement, from four options: did not finish high school (coded as 10 years); graduated from high school (12 years); some education after high school (14 years); and graduated from college (16 years). Parental educational achievement was coded as the higher available response if mother's and father's education levels differed, or if the respondent provided data for only one parent. Cases where neither parent's educational attainment was available were recoded to the whole-sample mean of 13.92 years. Students were also asked if they had participated in one or more sports teams (run by the school or organizations outside the school, not including physical education classes) in the past year. Those who had played on at least one team were categorized as "athletes." Though a more nuanced assessment of steroid users calls for a more detailed breakdown of sports participation (e.g., a student-athlete who plays on three or more teams may differ substantively from one who plays on only one or two), small sample sizes of steroid users necessitated categorical parsimony.

In addition to anabolic steroid use, students were asked between two and five questions about their behavior in each of five health-risk domains: alcohol use, tobacco use, illicit drug use, sexual risk, and suicidal ideation/behavior. For each domain, we first recoded questions dichotomously, so that each question could be answered yes or no (for example, a question asking how many times a

respondent had used marijuana during her/his lifetime was recoded to indicate whether the respondent had ever used marijuana). The component questions for each domain are provided in Table 1. We then constructed scales, composed of question mean responses, as composite (0-1) measures of risk in each of the five health-risk domains. Alpha reliability scores for these composite measures ranged from a low of .63 for the Sexual Risk Scale to a high of .82 for the Suicide Risk Scale; the alpha reliabilities scores for Alcohol Risk, Tobacco Risk, and Illicit Drug Risk were .79, .69, and .64, respectively.

**Table 1 Risk Scales: Component Measures and Alpha Reliabilities**

<b>ALCOHOL RISK SCALE</b>	(Alpha = .79)	(N = 15,521)
* During the past 30 days, did you have at least one drink of alcohol?		
* During the past 30 days, did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?		
<b>TOBACCO RISK SCALE</b>	(Alpha = .69)	(N = 15,300)
* Have you ever smoked cigarettes regularly (at least one every day for 30 days)?		
* During the past 30 days, did you smoke cigarettes?		
* During the past 30 days, did you smoke any cigars, cigarillos, or little cigars?		
<b>ILLICIT DRUG RISK SCALE</b>	(Alpha = .64)	(N = 15,733)
* During your life, have you used marijuana?		
* During your life, have you used any form of cocaine, inc. powder, crack, or freebase?		
* During your life, have you sniffed glue, or breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?		
* During your life, have you used any other type of illegal drug, such as LSD, PCP, ecstasy, mushrooms, speed, ice, or heroin?		
<b>SEXUAL RISK SCALE</b>	(Alpha = .63)	(N=15,505)
* During the past 3 months, did you have sexual intercourse?		
* How old were you when you had sexual intercourse for the first time? (=1 if younger than 15 years old; = 0 if 15 or older)		
Did you drink alcohol or use drugs before you had sexual intercourse the last time? (= 0 if did not use, or if never had sexual intercourse)		

\* The last time you had sexual intercourse, did you or your partner use birth control?

(= 0 if did not use, or if never had sexual intercourse)

\* Have you ever been pregnant or gotten someone pregnant?

---

SUICIDE RISK SCALE (Alpha = .82) (N = 14,739)

---

\* During the past 12 months, did you ever seriously consider attempting suicide?

\* During the past 12 months, did you make a plan about how you would attempt suicide?

\* During the past 12 months, did you actually attempt suicide?

---

## Results

Table 2 presents weighted descriptive statistics comparing adolescent anabolic steroid users and nonusers. Athletes and nonathletes were about equally likely to report having used steroids; the proportion of respondents who had participated on at least one sports team during the year prior to the survey did not differ significantly between steroid users (58.5%) and nonusers (60.5%). Otherwise, the characteristics of these two populations were strikingly different. Steroid users were disproportionately male ( $F = 59.38, p < .001$ ), nonblack ( $F = 19.19, p < .001$ ), and lower in SES, as measured by parental educational achievement ( $F = 37.93, p < .001$ ). Most notably, steroid users took significantly more risks, with mean scores from two times as high (Alcohol Risk Scale) to three times as high (Illicit Drug Risk Scale, Sexual Risk Scale, Suicide Risk Scale) as those of their nonusing peers. These findings constitute compelling prime facie evidence that anabolic steroid use is a component of Jessor's problem behavior syndrome.

**Table 2 Weighted Descriptive Statistics by Anabolic Steroid Use**

	Steroid users (N = 504)	Nonusers (N = 15,688)	F
% Female	28.60% (144)	45.90% (7,196)	59.38***
% White	61.70% (306)	62.50% (9,729)	ns
% Black	6.10% (30)	12.70% (1,969)	19.19***
% Hispanic	10.80% (54)	9.70% (1,516)	ns
% Sports participation	58.50% (291)	60.50% (9,404)	ns
Age (14–18)	16.04 (503)	16.16 (15,672)	4.82*
Parental education (10–16)	13.92 (504)	14.44 (15,688)	37.93***
Alcohol risk scale (0–1)	0.81 (476)	0.4 (15,545)	391.65***



Tobacco risk scale (0–1)	0.62 (504)	0.27 (15,685)	506.52***
Illicit drug risk scale (0–1)	0.67 (504)	0.21 (15,688)	1478.26***
Sexual risk scale (0–1)	0.47 (476)	0.16 (15,564)	851.28***
Suicide risk scale (0–1)	0.42 (497)	0.14 (15,670)	414.93***

*Note.* Racial/ethnic percentages do not sum to 100% because data are not provided for respondents self-identifying as Asian/Pacific Islander, American Indian/ Alaskan Native, or Other.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Additional differences in problem behavior emerged among subgroups within the steroid-using adolescent population. Weighted means were calculated to test for significance of differences among specific categories of adolescent steroid users (see Tables 3–5). Table 3 presents descriptive statistics of anabolic steroid users by gender. The racial/ethnic makeup of the user population did not differ significantly between girls and boys; however, female users were significantly younger ( $F = 17.80, p < .001$ ) and less affluent ( $F = 11.36, p < .001$ ) than male users. Female users were also significantly less likely to have participated in any athletic teams during the year prior to the survey ( $F = 16.04, p < .001$ ). Girls who used steroids scored significantly lower on sexual risk ( $F = 5.28, p < .05$ ), and higher on suicide risk ( $F = 5.75, p < .05$ ), than boys who used steroids. However, in several other respects the widely documented gender gap in adolescent substance use was clearly reduced within the steroid-using population. Although adolescent girls overall tend to use less alcohol or other illicit drugs than boys do (Johnston, O’Malley, & Bachman, 2001), among steroid users, the mean scores for girls and boys on each of the substance use risk scales were strikingly similar.

**Table 3 Weighted Descriptive Statistics of Anabolic Steroid Users by Gender**

	Female users ( $n = 144$ )		Male users ( $n = 360$ )		$F$
% White	60.60%	(86)	62.20%	(220)	ns
% Black	5.00%	(7)	6.50%	(23)	ns
% Hispanic	14.20%	(20)	9.40%	(33)	ns
% Sports participation	44.80%	(64)	64.00%	(227)	16.04***
Age (14–18)	15.67	(144)	16.19	(360)	17.80***
Parental education (10–16)	13.4	(144)	14.13	(360)	11.36***
Alcohol risk scale (0–1)	0.82	(141)	0.81	(334)	ns

Tobacco risk scale (0–1)	0.6 (144)	0.63 (360)	ns
Illicit drug risk scale (0–1)	0.67 (144)	0.67 (360)	ns
Sexual risk scale (0–1)	0.42 (143)	0.49 (333)	5.28*
Suicide risk scale (0–1)	1 (144)	0 (354)	5.75*

*Note.* Racial/ethnic percentages do not sum to 100% because data are not provided for respondents self-identifying as Asian/Pacific Islander, American Indian/Alaskan Native, or Other.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Table 4 compares the demographic and risk-behavioral characteristics of athlete and nonathlete adolescent steroid users. Nonathlete users were nearly twice as likely as athlete users to be female ( $F = 16.04, p < .001$ ), indicating a weaker relationship between sports participation and steroid use for girls than for boys. Conversely, athlete users were twice as likely as nonathlete users to be Hispanic ( $F = 5.94, p < .05$ ), suggesting ethnic differences in the dynamic underlying adolescent steroid use. Athlete steroid users also reported significantly higher parental educational achievement ( $F = 47.82, p < .001$ ) than nonathlete users, an unsurprising finding in light of the fact that adolescent athletes tend to be more affluent than their nonathletic peers (Miller et al., 1998). Athlete and nonathlete users also reported notably different health-risk profiles. Athlete users indicated more alcohol use ( $F = 5.92, p < .05$ ) but less illicit drug use ( $F = 42.76, p < .001$ ), sexual risk-taking ( $F = 20.13, p < .001$ ), or suicide-related ideation/behavior ( $F = 14.05, p < .001$ ) than nonathletes. The lack of a significant difference in tobacco use is an interesting omission, in light of the well-documented tendency for athletes overall to smoke less than their nonathletic counterparts.

**Table 4 Weighted Descriptive Statistics of Anabolic Steroid Users by Athletic Status**

	Athlete users ( $n = 291$ )		Nonathlete users ( $n = 206$ )		$F$
% Female	22.00%	(64)	38.30%	(79)	16.04***
% White	61.70%	(178)	62.20%	(128)	ns
% Black	6.70%	(19)	4.80%	(10)	ns
% Hispanic	13.60%	(39)	6.70%	(14)	5.94*
Age	16.05	(291)	16.02	(206)	ns
Parental education	14.51	(291)	13.19	(206)	47.82***

Alcohol risk scale (0–1)	0.85 (270)	0.77 (199)	5.92*
Tobacco risk scale (0–1)	0.61 (291)	0.62 (206)	ns
Illicit drug risk scale (0–1)	0.59 (291)	0.78 (206)	42.76***
Sexual risk scale (0–1)	0.41 (267)	0.53 (202)	20.13***
Suicide risk scale (0–1)	0.36 (290)	0.51 (206)	14.05***

*Note.* Racial/ethnic percentages do not sum to 100% because data are not provided for respondents self-identifying as Asian/Pacific Islander, American Indian/Alaskan Native, or Other.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Table 5 further compares athlete and nonathlete steroid users within each gender, revealing several unexpected differences. First, it has been established elsewhere that, in general, adolescent athletes tend to be significantly younger than their nonathletic cohorts and to enjoy substantially more social and economic resources (e.g., Miller et al., 1998). While the anticipated SES distinction held true among steroid users of both genders, only among female users were athletes significantly younger than nonathletes ( $F = 4.46, p < .05$ ). Second, the racial/ethnic composition of the athlete and nonathlete steroid-using populations differed for girls but not for boys; steroid use was disproportionately common in Latina athletes ( $F = 10.35, p < .01$ ), whereas a higher proportion of white female users were nonathletes ( $F = 4.70, p < .05$ ). No significant differences obtained between athlete and nonathlete users for black girls or for black, Hispanic, or white boys.

**Table 5 Weighted Descriptive Statistics for Anabolic Steroid Users by Gender and Athletic Status**

	Female users				<i>F</i>	Male users				
	Athlete users ( <i>n</i> = 64)		Nonathlete users ( <i>n</i> = 79)			Athlete users ( <i>n</i> = 227)		Nonathlete users ( <i>n</i> = 127)		<i>F</i>
% White	51.1%	(32)	68.8%	(54)	4.70*	64.7%	(146)	58.1%	(74)	
% Black	5.1%	(3)	4.3%	(3)	ns	7.1%	(16)	5.2%	(7)	ns
% Hispanic	24.4%	(15)	6.0%	(5)	10.35	10.5%	(24)	7.2%	(9)	ns
Age (14-18)	15.44	(64)	15.87	(79)	4.86*	16.22	(227)	16.22	(127)	ns
Parental education (10-16)	13.84	(64)	13.04	(79)	4.86*	14.70	(227)	13.28	(127)	38.87***
Alcohol risk scale (0–1)	0.84	(62)	0.81	(78)	ns	0.85	(207)	0.74	(121)	7.34**

Tobacco risk scale (0–1)	0.56 (64)	0.62 (79)	ns	0.63 (227)	0.61 (127)	ns
Illicit drug risk scale (0–1)	0.59 (64)	0.74 (79)	7.80**	0.59 (227)	0.80 (127)	37.31***
Sexual risk scale (0–1)	0.28 (63)	0.52 (79)	21.12***	0.45 (204)	0.54 (123)	8.18**
Suicide risk scale (0–1)	0.46 (64)	0.53 (79)	ns	0.33 (226)	0.50 (127)	11.79***

*Note.* Racial/ethnic percentages do not sum to 100% because data are not provided for respondents self-identifying as Asian/Pacific Islander, American Indian/ Alaskan Native, or Other.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

For steroid users of both genders, athletic participation was significantly associated with reduced levels of illicit drug risk and sexual risk, with the former association stronger for males ( $F = 37.31, p < .001$ ) and the latter association stronger for females ( $F = 21.12, p < .001$ ). No other health risk behavioral scales differed significantly by athletic status for female steroid users. However, male users were at significantly greater risk for alcohol use ( $F = 7.34, p < .01$ ), but at less risk for suicidal behavior ( $F = 11.79, p < .001$ ), if they participated in organized sports. Neither gender reported rates of tobacco use that differed significantly by athlete status.

Significance testing of descriptive statistics offers a bird's-eye view of the demographic and risk-behavioral parameters of the steroid-using adolescent populations under study. However, multivariate analysis is required to control for potentially confounding demographic variables (i.e., age, race/ethnicity, and social class) and to more rigorously test for interactive impacts of gender and athletic participation on health-risk behaviors among steroid users. In Table 6, we present the results of hierarchical regression analyses predicting each of the five risk behaviors, controlling for age, race, ethnicity, and parental educational attainment.

**Table 6 Hierarchical Regression Analyses Predicting the Health-Risk Behaviors of Steroid Users ( $N = 485$ )**

	Alcohol risk		Tobacco risk		Illicit drug risk		Sexual risk		Suicide risk	
	<i>F</i>	<i>R</i> <sup>2</sup>	<i>F</i>	<i>R</i> <sup>2</sup>	<i>F</i>	<i>R</i> <sup>2</sup>	<i>F</i>	<i>R</i> <sup>2</sup>	<i>F</i>	<i>R</i> <sup>2</sup>
DEMOGRAPHICS <sup>ab</sup>		0.09		0.05		0.02		0.03		0.02
Age	0.16	13.25***	0.07	ns	0.02	ns	0.08	ns	0.02	ns
Black	-.29	36.12***	-.20	16.23***	-.13	6.77**	-.00	ns	-.02	ns
Hispanic	-.03	ns	-.15	9.16**	-.07	ns	-.11	4.21*	0.02	ns
Parental education	-.03	ns	-.05	ns	-.10	4.15*	-.10	4.79*	-.12	7.03**
MAIN EFFECTS <sup>a</sup>		0.09		0.06		0.06		0.1		0.05

Female	0.04	ns	-.09	ns	-.15	10.06**	-.24	29.47***	0.13	8.03**
Sports	0.02	ns	-.03	ns	-.13	7.80**	-.14	10.39***	-.11	5.99*
2-WAY INTERACTION			0.10		0.06		0.07		0.1	0.05
Female by sports	0.05	ns	0.07	ns	0.17	5.90*	0	ns	0.08	ns

Note. <sup>a</sup>Entered as a block. <sup>b</sup>Coefficients and F-statistics for the Asian/American Indian/Other variable have been omitted.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Neither the main effect variables (gender and sports participation) nor the two-way interaction between them was a significant predictor of alcohol risk, suggesting that the adolescent steroid- using populations under study are not appreciably different in this regard after controlling for age, race/ethnicity, and SES. Similarly, neither gender nor athletic participation predicted adolescent risk of tobacco use. Each of the three remaining risk scales illicit drug risk, sexual risk, and suicide risk was significantly predicted by both gender and athletic participation. Athlete users were less likely to think about or attempt suicide than nonathlete users; female users, conversely, were more likely to do so than their male peers. Both female users and athlete users were less likely to engage in illicit drug use or in sexual risk behaviors. Moreover, for illicit drug risk, the interaction of gender and sports participation was statistically significant.

To probe the gender/sports interaction for illicit drug risk, we conducted confirmatory follow-up analyses (data not shown in tabular form). Gender-specific hierarchical regression analyses indicated that athletic participation effectively buffered male adolescent steroid users ( $\beta = -.20$ ,  $F = 13.38$ ,  $p < .001$ ) against use of other illegal substances (i.e., marijuana, cocaine, inhalants, and other drugs), but did not do so for their steroid-using female counterparts ( $\beta = .02$ ). Although female users overall generally report less involvement with these substances than male users, the resultant gender gap in drug use applied primarily to nonathletes. Gender was a significant predictor of illicit drug use among nonathlete steroid users ( $\beta = -.28$ ,  $F = 16.17$ ,  $p < .001$ ) but not among athlete users ( $\beta = -.04$ ).

## Discussion

At the outset of this paper, we introduced two assumptions about adolescent steroid users: that they are necessarily male athletes, and that the commitment to athletic performance enhancement that fuels their steroid use makes it unlikely that they would voluntarily engage in health-risk behavior perceived as jeopardizing that performance. In order to assess the viability of these assumptions, we have identified significant differences in the demographic characteristics and, more importantly, the health-risk behavior of four populations of adolescent anabolic steroid users: female athletes; female nonathletes; male athletes; and male nonathletes. While these groups are similar in that they all engage in substantially more health risks than nonusers, our data also show that they differ in their reported patterns of risk behavior. In fact, of the five health risk domains examined, gender was a significant predictor of four risk domains and athletic participation of three risk domains.

Clearly, the logic behind anabolic steroid use is not monolithic. Unearthing the reasons for these disparate patterns is an ambitious undertaking, and one for which these data are not ideal; our theorization in this regard will need to be tested elsewhere, either through naturalistic observation or subsequent to the collection of new data tailored specifically to answering these questions. For example, the fact that nearly 25% of female athlete steroid users were Hispanic, compared to only six percent of female nonathlete users, is a startling disparity calling for closer examination. It is possible that Latinas were particularly disposed to use steroids in a goal-directed way, to enhance sports performance as a route to social mobility; yet no such clear pattern obtained for black male athlete steroid users, who would as a group seem likelier candidates for such reasoning (Eide & Ronan, 2001; Ewing, 1995). Data limitations preclude more than tentative speculation, but unexpected findings such as these support the need for further research to distinguish among disparate populations of adolescent steroid users.

However, some general conclusions can be drawn on the basis of our findings. First, net of the impact of demographic differences in user populations, athletic participation appears to have a protective effect against some risk behaviors. Athlete users are somewhat less prone than nonathlete users to engage in risky sexual activity or to manifest suicidal ideation/behavior, and male athletes in particular are less likely to use other substances. It may be that athletes tend to define their own steroid use in pragmatic rather than sensation-seeking terms. The gender/sport interaction for illicit drug use supports this interpretation. Though the reasons for the interaction remain unsubstantiated in the absence of data that directly probe users' motivations, we speculate that anabolic steroid use by male athletes is more narrowly performance-oriented than use by other adolescents. Certainly, athlete users are still markedly more inclined to engage in other risk behaviors than nonusers of any stripe. However, for those users whose primary intention is to improve athletic performance, steroid use may serve, in relative terms, as more of a route to athletic success than a gateway to other problem behaviors. Adolescents are well aware of the stereotypes about steroid use in American culture; thus athletes may be able to neutralize the label of "drug user" by locating their steroid use within the conventionally acceptable arena of sports. Nonathlete users have no such rationale available, and may be more susceptible to the imposition of a drug user identity. Whereas the athletic identity may confer some protection against other problem behaviors, nonathletes are subject to the full effects of the problem behavior syndrome.

Second, after controlling for demographic differences, being female confers some protection for steroid users against sexual risk, but increases suicidal risk. These gender effects are fairly consistent with those commonly found for nonuser populations, except that unlike nonusers gender does not significantly affect alcohol risk among steroid-using adolescents. The expected gap in prevalence of female and male adolescent problem drinking disappears among steroid users, perhaps because gender scripts that militate against female adolescent substance use have been weakened. It is important to keep in mind that the measures of steroid and alcohol use employed in this analysis cannot provide a timeline for initiation of each behavior.

Third, of the five types of risk studied, only the relationship between illicit drug risk and sports participation differed significantly by gender. This is surprising because earlier research has documented other such interactions, notably among gender, athletic participation, and teen sexual behavior. For girls, athletic participation is associated with markedly lower rates of sexual activity, precocity, and risk-taking, as well as pregnancy; for boys, the reverse is true (Miller et al., 1998, 1999; Sabo et al., 1998, 1999). That

both gender and sports operate straightforwardly to buffer sexual risk in the present analysis further supports the conclusion that the risk behavior of adolescent steroid users differs from that of their nonusing counterparts.

Several caveats should be noted when interpreting these findings. First, as noted earlier, our measures of substance use and other risk behaviors are broad but shallow, and may gloss over important nuances such as type of sport, or context/frequency of steroid use. Nor do they permit evaluation of the motives underlying adolescent health risk behaviors beyond the level of tentative speculation. It is probable that steroid use has a different meaning for nonathletes than it does for athletes and that girls' reasons for using steroids do not parallel boys' reasons for doing so. In order to adequately assess the role of steroid use in Jessor's problem behavior syndrome, it would be necessary to evaluate the family, peer, and community contexts of adolescent users; the sequences by which they initiate and maintain other problem behaviors; and the meanings they assign to their own steroid use. To date, opportunities to explore these parameters of adolescent steroid users have been severely circumscribed by data limitations.

Second, the findings rely on adolescents' self-reports of sensitive behaviors, increasing the likelihood of some accidental and even deliberate misreporting. Some of these behaviors are illegal, for minor respondents (alcohol use, tobacco use) or for the population at large (illicit drug use); the accuracy of responses necessarily depends on the respondents' confidence in the anonymity of the survey procedure. Steroid use in particular may be subject to underreporting (Minelli et al., 1992; Yesalis et al., 1993); Yesalis has opined that athletes would rather confess to cocaine use than steroid use (NIDA, 1994). Furthermore, adolescents who feel sufficiently comfortable reporting their use of one substance may be more willing to acknowledge use of other substances, even if they are no more likely to do so than their more reticent peers, exaggerating the risk-clustering effect of the problem behavior syndrome. Moreover, these findings can be generalized only to those high school student steroid users who were present when the 1997 Youth Risk Behavior Survey was administered. This sampling procedure excluded not only home-schooled adolescents but also those who have dropped out of school or are habitually absent, adolescents at particularly high risk for the problem behaviors under study.

In this analysis, we have established some of the parameters of distinct steroid-using populations and explored the implications of nonathlete and female anabolic steroid use for other risk behaviors. Further research is needed to determine the exact nature of these relationships. In the absence of a timeline for onset of each of the behaviors studied, we have refrained from claiming causal relationships among gender, sports participation, steroid use, and other health risk behaviors. Untangling the linkages among problem behaviors for these at-risk populations calls for longitudinal analyses that establish temporal order and control for confounding factors. Above all, it demands the utilization of research methodologies that probe the beliefs, motivations, and intentions of specific populations of potential users.

Designing effective programmatic interventions for current and potential adolescent steroid users must begin with identifying who they are; and identification must begin by venturing outside the door of the boys' locker room. Overlooking either nonathletic or female steroid users has serious implications for existing prevention policy. Typically, these programs focus exclusively on male adolescents participating on school-sponsored sports teams, relying on the questionable assumption that athletic performance enhancement is the *raison d'être* of anabolic steroid use. In order to successfully address the adolescent steroid use problem, we must

reconceptualize steroid use as part of a wider pattern of problem behaviors; recognize that the pattern is population-specific; and tailor interventions to meet the disparate needs of those populations.

## References

- Bahrke, M.S. (1994). International conference on abuse and trafficking of anabolic steroids. *International Journal of Drug Policy*, **5**(1), 23-26.
- Bahrke, M.S., Yesalis, C.E., & Brower, K.J. (1998). Anabolic-androgenic steroid abuse and performance-enhancing drugs among adolescents. *Child and Adolescent Psychiatric Clinics of North America*, **7**(4), 821-838.
- Bamberger, M., & Yaeger, D. (1997). Over the edge. *Sports Illustrated*, **86**(15), 60-67.
- Buckley, W.E., Yesalis, C.E., Friedl, K.E., Anderson, W.A., Streit, A.L., & Wright, J.E. (1988). Estimated prevalence of anabolic steroid use among male high school seniors. *JAMA*, **260**(23), 3441-3445.
- Burnett, K.F., & Kleiman, M.E. (1994). Psychological characteristics of adolescent steroid users. *Adolescence*, **29**(113), 81-9.
- Center on Addiction and Substance Abuse, National Commission on Sports and Substance Abuse. (2000). *Winning at any cost: Doping in Olympic sport. A Report Prepared for the U.S. Office of National Drug Control Policy*. New York: Author.
- Committee on Sports Medicine and Fitness, American Academy of Pediatrics. (1997). Adolescents and anabolic steroids: a subject review. *Pediatrics*, **99**(6), 904-908.
- Daigle, R.D. (1990). Anabolic steroids. *Journal of Psychoactive Drugs*, **22**(1), 77-80.
- Delbeke, F.T., Desmet, N., & Debackere, M. (1995). The abuse of doping agents in competing body builders in Flanders (1988-1993). *International Journal of Sports Medicine*, **16**(1), 66-70.
- Denham, B.E. (1997). Sports Illustrated, the 'war on drugs,' and the Anabolic Steroid Control Act of 1990: A study in agenda building and political timing. *Journal of Sport and Social Issues*, **21**(3), 260-273.
- DuRant, R.H., Escobedo, L.G., & Heath, G.W. (1995). Anabolic-steroid use, strength training, and multiple drug use among adolescents in the United States. *Pediatrics*, **96**(1), 23-8.
- DuRant, R.H., Rickert, V.I., Ashworth, C.S., Newman, C., & Slavens, G. (1993). Use of multiple drugs among adolescents who use anabolic steroids. *New England Journal of Medicine*, **328**(13), 922-926.
- Eide, E.R., & Ronan, N. (2001). Is participation in high school athletics an investment or a consumption good? Evidence from high school and beyond. *Economics of Education Review*, **20**, 431-442.



- Elliot, D.L., & Goldberg, L. (1996). Intervention and prevention of steroid use in adolescents. *The American Journal of Sports Medicine*, **24**(6), S46-47.
- Elliot, D.L., & Goldberg, L. (2000). Women and anabolic steroids. Pp. 225-246 In: C.E. Yesalis (Ed.), *Anabolic steroids in sport and exercise*, 2nd ed. (pp. 225-246). Champaign, IL: Human Kinetics.
- Ewing, B.T. (1995). High school athletics and the wages of black males. *The Review of Black Political Economy*, **24**(1), 65-78.
- Gaa, G.L., Griffith, E.H., Cahill, B.R., & Tuttle, L.D. (1994). Prevalence of anabolic steroid use among Illinois high school students. *Journal of Athletic Training*, **29**(3), 216-222.
- Goldberg, L., Elliot, D., Clarke, G., Mackinnon, D., Moe, E., Zoref, L, et al. (1996). Effects of a multidimensional anabolic steroid prevention intervention: The Adolescents Training and Learning to Avoid Steroids (ATLAS) program. *JAMA*, **276**(19), 1555-1562.
- Grace, F., Baker, J., & Davies, B. (2002). Anabolic androgenic steroid use in recreational gym users. *Journal of Sports Sciences*, **20**(1), 49.
- Gruber, A.J. & Pope, H.G., Jr. (1999). Compulsive weight lifting and anabolic drug abuse among women rape victims. *Comprehensive Psychiatry*, **40**(4), 273-277.
- Gruber, A.J., & Pope, H.G., Jr. (2000). Psychiatric and medical effects of anabolic-androgenic steroid use in women. *Psychotherapy and Psychosomatics*, **69**, 19-26.
- Holden, S.C., Calvo, R.D., & Sterling, J.C. (1990). Anabolic steroids in athletics. *Texas Medicine*, **86**, 32-36.
- Honour, J.W. (1997). Steroid abuse in female athletes. *Current Opinions in Obstetrics and Gynecology*, **9**(3), 181-6.
- Jessor, R., & Jessor, S.L. (1977). *Problem behavior and psychosocial development*. New York: Academic Press.
- Johnson, M.D., Jay, M.S., Shoup, B., & Rickert, V.I. (1989). Anabolic steroid use by male adolescents. *Pediatrics*, **83**, 921-924.
- Johnston, L.D., O'Malley, P.M., & Bachman, J.G. (2001). *Monitoring the Future national results on adolescent drug use: Overview of key findings, 2000*. (NIH Publication No. 01-4923). Bethesda, MD: National Institute on Drug Abuse.
- Kann, L., Kinchen, S.A., Williams, B.I., Ross, J.G., Lowry, R., Hill, C.V., et al. (1998). Youth risk behavior surveillance United States, 1997. In CDC Surveillance Summaries. *Morbidity and Mortality Weekly Report*, **47**(SS-3), 1-91.
- Kindlundh, A.M.S., Isacson, D.G.L., Berglund, L., & Nyberg, F. (1999). Factors associated with adolescent use of doping agents: Anabolic-androgenic steroids. *Addiction*, **94**(4), 543-553.
- Kleiner, S.M. (1991). Performance-enhancing aids in sport: Health consequences and nutritional alternatives. *Journal of the American College of Nutrition*, **10**(2), 163-176.

- Krowchuk, D.P., Anglin, T.M., Goodfellow, D.B., Stancin, T., Williams, P., & Zimet, G.D. (1989). High school athletes and the use of ergogenic aids. *American Journal of Diseases of Children*, **143**, 486-489.
- Melia, P. (1994). Sport for all but is it suitable for children? *International Journal of Drug Policy*, **5**(1), 34-39.
- Middleman, A.B., Faulkner, A.H., Woods, E.R., Emans, S.J., & DuRant, R.H. (1995). High-risk behaviors among high school students in Massachusetts who use anabolic steroids. *Pediatrics*, **96**(2), 268-272.
- Millar, A. (1995, March). *The medical prescription of anabolic steroids*. Paper presented at the 6th International Conference on the Reduction of Drug Related Harm, Florence, Italy.
- Miller, K.E., Sabo, D., Farrell, M.P., Barnes, G.M., & Melnick, M.J. (1998). Athletic participation and sexual behavior in adolescents: The Different worlds of boys and girls. *Journal of Health and Social Behavior*, **39**, 108-123.
- Miller, K.E., Sabo, D., Farrell, M.P., Barnes, G.M., & Melnick, M.J. (1999). Sports, sexual activity, contraceptive use, and pregnancy among female and male high school students: Testing cultural resource theory. *Sociology of Sport Journal*, **16**(4), 366-387.
- Miller, K.E., Sabo, D., Melnick, M.J., Farrell, M.P., & Barnes, G.M. (2001). *The Women's Sports Foundation report: Health risks and the teen athlete*. East Meadow, NY: The Women's Sports Foundation.
- Minelli, M.J., Rapaport, R.J., & Kaiser, D.A. (1992). Preventing steroid use: The role of the health/physical educator. *Journal of Physical Education, Recreation, and Dance*, **63**, 68-74.
- National Institute on Drug Abuse. (1994). *Anabolic steroids: A threat to mind and body* (DHHS Publication No. ADM 91-1810). Washington, DC: U.S. Government Printing Office. Retrieved December 11, 2001, from <http://www.health.org/govpubs/phd561.st3.htm/>.
- Pope, H.G., Jr., & Katz, D.L. (1994). Psychiatric and medical effects of anabolic-androgenic steroid use. A controlled study of 160 athletes. *Archives of General Psychiatry*, **51**(5), 375-82.
- Porcerelli, J.H., & Sandler, B.A. (1995). Narcissism and empathy in steroid users. *American Journal of Psychiatry*, **152**(11), 1672-1674.
- Radakovich, J., Broderick, P., & Pickell, G. (1993). Rates of anabolic-androgenic steroid abuse among students in junior high school. *Journal of the American Board of Family Practitioners*, **6**, 341-345.
- Sabo, D., Miller, K.E., Farrell, M.P., Barnes, G.M., & Melnick, M.J. (1998). *The Women's Sports Foundation report: Sport and teen pregnancy*. East Meadow, NY: The Women's Sports Foundation.

- Sabo, D., Miller, K.E., Farrell, M.P., Melnick, M.J., & Barnes, G.M. (1999). High school athletic participation, sexual behavior and adolescent pregnancy: A regional study. *Journal of Adolescent Health, 25*(3), 207-216.
- Salva, P.S., & Bacon, G.E. (1991). Anabolic steroids: Interest among parents and nonathletes. *Southern Medical Journal, 84*(5), 552-556.
- Scott-Dixon, K. (1998, October). *Cyborgs in the gym: The technopolitics of female muscle*. Paper presented at the conference on Discipline and Deviance: Genders, Technologies, Machines, Duke University, Durham, NC.
- Shapiro, H. (1994). 'The pound is strong, inflation is up': A future market for anabolic steroids? *International Journal of Drug Policy, 5*(1), 11-14.
- Stilger, V.G., & Yesalis, C.E. (1999). Anabolic-androgenic steroid use among high school football players. *Journal of Community Health, 24*(2), 131-145.
- Strauss, R., Liggett, M., & Lanese, R. (1985). Anabolic steroid use and perceived effects in ten weight-trained women athletes. *JAMA, 253*(19), 2871-3.
- Su, T., Pagliaro, M., Schmidt, P.J., Pickar, D., Wolkowitz, O., & Rubinow, D.R. (1993). Neuropsychiatric effects of anabolic steroids in male normal volunteers. *JAMA, 269*(21), 2760-4.
- Terney, R., & McLain, L.G. (1990). The use of anabolic steroids in high school students. *American Journal of Diseases of Children, 144*, 99-103.
- Trenhaile, J., Choi, H., Proctor, T.B., & Work, P. (1998). The effect of anabolic steroid education on knowledge and attitudes of at-risk preadolescents. *Journal of Alcohol and Drug Education, 43*(2), 20-35.
- Windsor, R., & Dumitru, D. (1989). Prevalence of anabolic steroid use by male and female adolescents. *Medicine and Science in Sports and Exercise, 21*, 494-7.
- Yarnold, B.M. (1998). Steroid use among Miami's public school students, 1992: Alternative subcultures: Religion and music versus peers and the 'body cult.' *Psychological Reports, 82*(1), 19-24.
- Yesalis, C.E., Bahrke, M.S., Kopstein, A.N., & Barsukiewicz, C.K. (2000). Incidence of anabolic steroid use: A discussion of methodological issues. In: C.E. Yesalis (Ed.), *Anabolic Steroids in Sport and Exercise*, 2nd ed. (pp. 73-115). Champaign, IL: Human Kinetics.
- Yesalis, C.E., Barsukiewicz, C.K., Kopstein, A.N., & Bahrke, M.S. (1997). Trends in anabolic-androgenic steroid use among adolescents. *Archives of Pediatric and Adolescent Medicine, 151*, 1197-1206.
- Yesalis, C.E., Kennedy, N.J., Kopstein, A.N., & Bahrke, M.S. (1993). Anabolic-androgenic steroid use in the United States. *JAMA, 270*(10), 1217-21.

Zickler, P. (2000). NIDA initiative targets increasing teen use of anabolic steroids. *NIDA Notes*, **15**(3), 1, 6-7.

Zickler, P. (2001). Annual survey finds increasing teen use of ecstasy, steroids. *NIDA Notes*, **16**(2), 6-7.

***Acknowledgment***

This research was funded by grant DA13570-01 from the National Institute on Drug Abuse. The authors wish to thank Joseph Hoffman for statistical consultation and Barbara Dintcheff for data management.