Anabolic Steroid Use Among Adolescents in a Rural State

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Background. Anabolic-androgenic steroid use is an increasing problem among high school students. Previous reports have been mainly from metropolitan areas.
Methods. We report the first study of anabolic-androgenic steroid use to concentrate on rural communities. The study was conducted using an anonymous survey of a random sample of male high school students (N = 3900) in grades 10 through 12 encompassing 31 high schools in a predominantly rural state.
Results. Two-hundred five (5.3%) students reported using steroids. The prevalence of illicit drug use was significantly higher ($P < .05$) in steroid users (74%) than in nonusers (31%) ($P < .001$). The association was between anabolic-androgenic steroid use and illicit drug use rather than between sports participation of any type and illicit drug use ($P > .2$). Comparison of the prevalence of illicit drug use among athletic (63.2%) and nonathletic (36.8%) steroid users found no significant difference. Findings were similar with cigarette use. There was no difference in the rate of steroid use by school enrollment (69 to 1495) or by city population size (<200 to 64,000). The predominant reason for steroid use was to improve appearance (43%).
Conclusions. This study found the prevalence of steroid use throughout a predominantly rural state to be similar to that found by previous studies conducted in metropolitan areas; prevalence was not affected by city or school size. Steroid use was closely associated with illicit drug and cigarette use, a new finding that deserves further examination.
Key words. Anabolic steroids; adolescence; substance abuse; doping in sports. *J Fam Pract 1992; 35:401-405.*

Anabolic-androgenic steroid abuse has been described as one of the most pressing health problems in the sports world today. Despite the current ban on steroid use by various governing sports bodies, there is no evidence of a decline in the use of these ergogenic drugs in any population. Even some policemen are reportedly using steroids to make themselves more imposing to criminals.[1] The prevalence of steroid use among male adolescents is reported as ranging from 1.4% to 11%.[2–5] Steroid use may be on the rise among high school athletes.[4]

The mature testes secrete 2.5 mg per day of testosterone. Body builders may take anabolic-androgenic steroid combinations (stacking) roughly equivalent to 100 mg daily.[1] Some experts have suggested that steroid use could have more serious consequences for the adolescent population than for adults.[5] These complications and ill effects of therapeutic and illicit steroid use are extensively reported, although the data on adverse effects from illicit use are frequently anecdotal. Previous surveys have used schools in a particular city, region of a state, or selected area of the nation. The majority have been in metropolitan areas. This study is the largest reported survey of steroid use as well as the first survey to cover the majority of an entire state. It is also the first to attempt to identify patterns of illicit drug and tobacco use among steroid users. This study was designed to further analyze this increasing problem in the adolescent population. The main objectives of this study were (1) to document the prevalence of anabolic-androgenic steroid use among male adolescents in the state of West Virginia (a predominantly rural state); (2) to compare steroid users with nonusers regarding the use of illicit drugs and cigarettes; and (3) to compare steroid use in large, medium, and small high schools in rural and urban areas.

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Methods

The participants in this investigation were 10th, 11th, and 12th grade boys from 43 private and public schools

located throughout the state of West Virginia in 1990. To compare steroid use by school size and to assure adequate numbers from each, all schools were first divided into three groups (small, ≤298 students; medium, 299–604 students; large, ≥605 students). Schools were then randomly selected from each of these three groups. School principals acted as survey coordinators. A standardized instruction sheet was given to all teachers to read to the students before distribution of the survey questionnaires. The questionnaires were distributed to all 10th, 11th, and 12th grade boys during their homeroom periods. Voluntary participation and anonymity were emphasized, and any question that the student did not wish to answer could be omitted by the participant. The answers were scored on standard computer answer forms. The first 10 items of the 44-item questionnaire were answered by all respondents. The first 9 questions obtained general information such as age, grade, and the main sport, if any, in which they participated. Question 10 established present or past steroid use. Those who admitted to anabolic-androgenic steroid use were asked to answer questions in part A only, and those who answered no to the 10th question were asked to answer only part B. Duplicate questions on drug and tobacco use were placed in both sections.

This two-arm questionnaire design was used to ensure similar completion times. After completion of the questionnaires, an envelope was circulated around the class, and each individual placed his own answer sheet into the envelope. The envelope was then sealed by the teacher in the classroom. The forms were scanned using a Sentry 3000 scanner and the Microtest Score II plus software (NCS, Inc, Minneapolis, Minn). Data were analyzed using the SAS program for personal computers, version 6.03 FREQ procedure.[6] Chi-square statistics were used to test for significant differences between survey responses of steroid users and nonusers. The Wilcoxon rank sum test was used to examine city population as a variable for the use of steroids, cigarettes, and illicit drugs.[7] A stratum-adjusted Pearson chi-square statistic for comparing the association between two variables and controlling for a third variable was used to examine relationships among steroid use, illicit drug use, and type of sport. P values $< .05$ were considered significant.

To evaluate types of sports activity, we asked the student to mark only the sport which he considered to be his main sport. Also included were power lifting and body building, which are not school-sanctioned sports in this state. Sports were analyzed as either nonscholastic, meaning power lifting and body building, or scholastic sports (football, basketball, wrestling, baseball, track and field involving field events only, and track and field involving running only).

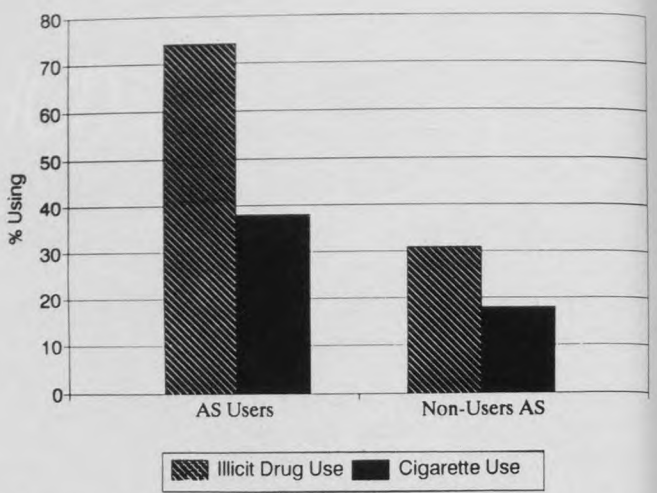

Figure 1. Prevalence of illicit drug and cigarette use among users of anabolic-androgenic steroids (AS) and nonusers. $P < .001$.

Results

Thirty-one of the 43 schools contacted returned the surveys (72.1%). A total of 8400 questionnaires were sent; the actual number distributed to the students is unknown; 4211 were returned; 3900 were scored. Some forms could not be scored because of incomplete responses, inappropriate markings, or blank answer sheets. For the purposes of calculating frequency percentages, the number of forms with a valid response to the question was used as the denominator. Because the sample size was so large, the small variations in the denominator made no significant difference in the results.

Of the 3900 male respondents, 205 (5.3%) reported past or present use of steroids. The range of use for the individual high schools was 1.6% to 12%. Illicit drug use (marijuana, crack, speed) was more prevalent (74%) among steroid users than nonusers (31%) ($P < .001$). Thirty-eight percent of steroid users admitted to regular cigarette use (>5 cigarettes per week) compared with 18% of nonusers ($P < .001$) (Figure 1).

School enrollment and city population were analyzed as a variable for the rate of steroid use. School enrollment ranged from 69 to 1495 students, whereas city population ranged from less than 200 to 64,000. The rate of steroid use did not vary significantly based on high school enrollment or city size ($P > .08$) (Table 1). There was also no difference in the prevalence of smoking or illicit drug use by school or city size.

The relationship between anabolic-androgenic ste-

Table 1. Prevalence of Anabolic Steroid Use, by School Size

School Size*	No. of Students Surveyed	Anabolic Steroid Prevalence, %
Large	2418	5.1
Medium	920	7.1
Small	542	4.9

P = .084.
**Large schools, ≥605; medium, 299–604; small, ≤298 total students enrolled.*

roid use and sporting activity was examined. Steroid use was not associated with any specific scholastic sport or with scholastic sports as a whole. However, steroid use was associated with power lifting or body building or both ($P < .001$). Among all power lifters and body builders, 8.9% used steroids, 5.4% of all boys in scholastic sports used steroids, and 3.8% of all those not in sports used steroids (Figure 2). Of the 205 steroid users, 36.8% denied participating in any type of sport. Of all those surveyed, 45.6% took part in some type of sport; 55.6% of those surveyed denied both anabolic-androgenic steroid use and sports participation of any type.

The relationship between steroid use, illicit drug use, and sports activity was analyzed. When controlling for steroid use, we found no direct association between illicit drug use and nonsports participation, power lifting and/or body building, or scholastic sports ($P > .20$). The association was between steroid use alone and illicit drug use, not illicit drug use and type of sport. This was also the case for cigarette use. Power lifters and body builders had the highest prevalence of steroid use and thus the greatest percentage of substance abuse.

The most frequently stated reason for taking steroids was to "improve appearance—look bigger or better" (43%). Another 10% took them "because a friend did."

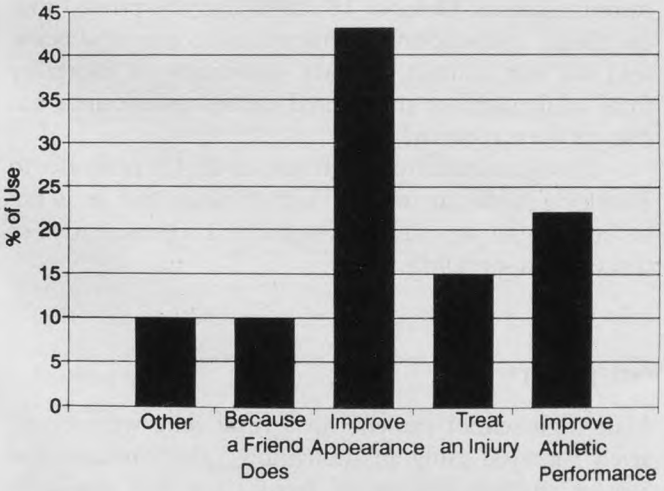

Figure 2. Reasons given for using anabolic-androgenic steroids.

Additional reasons included "to improve athletic performance" (22%), "to treat injuries" (15%), and "other reasons" (10%) (Figure 2).

Steroid users believed that some advantage had been gained by using anabolic-androgenic steroids. Overall, 82% of steroid users felt they had improved to some degree, and 44% said they had improved "a lot" while using steroids. Most steroid users (59.9%) felt that they were stronger than their peers, as compared with only 26% of nonusers. Only 17% of steroid users felt that they had the same strength as their peers, 10% felt that they were weaker, and 11% did not know. Among nonusers, 58% felt they and their peers were of equal strength, whereas 7.7% felt they were weaker, and 7.3% did not know. The differences in strength perception between users and nonusers were statistically significant ($P < .001$).

Over two thirds (69%) of the steroid users began use by age 15 years or younger. Tenth graders (29% of responders) represented 35% of steroid users, 11th graders (41% of responders) represented 35% of steroid users, and 12th graders (30% of responders) represented 30% of steroid users.

The most common method of obtaining anabolic-androgenic steroids was from a friend or dealer (48%). Other sources were: local gym (20%), physician (13%), mail order (12%), and pharmacist (7%). Both oral and injectable steroid preparations were used.

Comparing attitudes on personal health status revealed striking differences between steroid users and nonusers. Despite the higher rate of illicit drug and cigarette use, 80% of steroid users rated their health as "very good" or "excellent" compared with only 56% of nonusers. A remarkable number (64%) reported that they were not afraid of the side effects of steroids, although 21% believed that they had suffered side effects from steroid use. Of those afraid of side effects, 17% believed they had suffered from side effects. Nearly one half (48.7%) said they planned to take steroids longer than 1 year.

Discussion

The validity of self-reported data is often questioned. This study was designed to maximize validity by voluntary participation and the assurance of anonymity. Other variables such as standardized instruction sheets, similar test finishing times for steroid users and nonusers, permission for the participants to omit any of the questions they did not wish to answer, the circulation of a mailing envelope rather than passing the answer sheets forward, and the sealing of the envelopes by homeroom teachers before collection by coordinators were all methods to

increase the validity of the study. The self-report method of collecting data from high school students on drug and alcohol use using such a system has been supported by previous research.[5,8–10]

The prevalence of steroid use among male high school students in this study is comparable to the six previously published studies on this topic. Four of these studies surveyed both athletes and nonathletes, and reported that 6.6%, 5%, 6.5%, and 11% of male high school students used steroids.[2,5,11,12] Two other studies that included only high school athletes had the lowest prevalence of steroid use, 1.1% and 3.9%.[3,4]

This is the first study to focus on steroid use in rural communities. We found no difference in the prevalence of steroid use by city or school size. Schools with fewer than 100 students and towns of fewer than 2000 people had similar use rates when compared with previously published studies of major metropolitan areas.[2–5,11,12] These findings not only imply that steroid abuse has reached the rural communities of our country, but also suggests that this is a nationwide problem. It is possible that because West Virginia is predominantly rural (only two cities with a population over 50,000), conclusions regarding city size and steroid use may vary in other states with larger cities.

The relationship between steroid use and illicit drugs is interesting. Our intuitive feeling was that those who were very concerned about athletic performance would be the users of steroids. Thus, it seemed to us that they would be less likely to use illicit drugs and cigarettes. However, we found a much higher prevalence of illicit drug and cigarette use in steroid users. Comparing the prevalence of illicit drug use among steroid users in scholastic, nonscholastic, and nonsports participation revealed no significant differences. Thus, neither sports participation (scholastic or nonscholastic) nor nonparticipation were significant variables in this relationship.

Androgenic-anabolic steroids could be a part of the drug culture and not uniquely related to performance enhancement. Peer pressure would be likely to play a role in the initiation of steroid use if this is true. If the source of steroids is the same source from which illicit drugs can be obtained, which is often the case, the adolescent may be placed at higher risk to experiment with either substance.

Perhaps the relationship between steroids and illicit drugs can be viewed within the already recognized drug pattern in adolescents. The young age at which steroid use begins is part of the pattern of use for all illicit substances among adolescents. The window to initiation of cigarettes, alcohol, and marijuana is nearly closed by 20 years of age, diminishing thereafter.[13,14] Adolescence per se may be a risk factor for steroid use. The use of steroids might also be considered as part of the pattern of drug use, progressing from legal to illegal drugs. Once an adolescent begins the use of nonsanctioned legal drugs (cigarettes and alcohol), the progression to illicit drugs (marijuana, cocaine) may be more likely.[15] The role that steroids have in this progression has not yet been answered. Steroid use could place the user at greater risk for subsequent illicit drug use. Alternatively, use of other drugs could be an important prerequisite to steroid use. This new finding deserves future research if proper intervention strategies are to be developed.

The most common reported reason for using steroids was to improve appearance. This response was given twice as often as the second most common response, which was to improve athletic performance. Although this reason was given in previous studies, it was not used as frequently (26% and 27%) as in this study.[5,12] We feel that this, coupled with the fact that 36.8% of steroid users denied any athletic activity, suggests that steroid use is migrating out of the traditional high school athletic arena and into the general adolescent population. This theory is further supported by previous surveys of only athletes showing a lower prevalence of steroid use than studies including both athletes and nonathletes.[3,4] Adolescent insecurity with body image is likely a major driving force in these individuals.

In this study as in others, only about 20% of steroids were obtained through sources with access to legal "pharmaceutical grade" anabolic-androgenic steroids (from physicians or pharmacists).[2,3,5] What these adolescents are actually taking when supplied by a friend, mail order source, or drug dealer is unknown. This is supported by a number of federal cases against illegal steroid suppliers that have been lost in court. According to reports by the Food and Drug Administration[16] (D Leggett, personal communication, October 17, 1990), it was proved that the alleged anabolic-androgenic steroid compound being sold did not contain steroids. Morbidity or mortality from adulterated or substituted steroid compounds has not yet been reported.

The questionnaire return rate of 46.4% is similar to Buckley's study on steroids and adolescents.[5] It is believed that the population sampled was representative of those not responding.

Summary

Male high school students in a rural state were extensively surveyed using an anonymous questionnaire. The rate of anabolic-androgenic steroid use was similar to that found in other studies of high school students and

was not affected by the rural nature of the study site. City size or school size was not an important variable for steroid use in this study. These findings suggest a more prevalent problem throughout the United States, and one that is not confined to larger cities or schools. There was a significant association between steroid use and illicit drug and cigarette use. This association held true for both athletic and nonathletic steroid users. The association between steroid use and illicit drug and cigarette use in this population is new and raises questions that need to be addressed if proper intervention strategies are to be developed. Steroid use among adolescents is migrating out of the athletic arena, a conclusion supported by the finding that 36.8% of steroid users do not participate in sports. The predominant source of anabolic-androgenic steroids (80%) was through those without direct legal access to pharmaceutical-quality steroids. This places this population at risk for toxicity from counterfeit compounds as well as the side effects of steroid use. By far the most common reason given for steroid use in this population was to improve appearance, not to improve athletic performance. This study suggests that anabolic steroid abuse is now a national problem and that gaining an advantage in the athletic arena is not the dominant reason for adolescents using these ergogenic aids.

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References

1. Miller RW. Athletes and steroids: playing a deadly game. FDA Consumer HHS publication No. (FDA) 88-3170; US Government Printing Office, 1988-201-865/80014, 1988.
2. Windsor R, Dumitru D. Prevalence of anabolic steroid use by male and female adolescents. Med Sci Sports Exerc 1989; 21:494–7.
3. Krowchuk DP, Anglin TM, Goodfellow DB, Stacin T, Williams P, Zimet GD. High school athletes and the use of ergogenic aids. Am J Dis Child 1989; 143:486–9.
4. Boyea S, Bosworth E, Bents R, et al. Ergogenic drug use among high school athletes: a three year sequential study [abstract 378]. Med Sci Sports Exerc 1990; 225:563.
5. Buckley WE, Yesalis CE, Friedl KE, Anderson WA, Streit AL, Wright JE. Estimated prevalence of anabolic steroid use among male high school seniors. JAMA 1988; 260:3441–5.
6. Shlotzhauer SD, Littell RC. SAS System for elementary statistical analysis. Cary, NC: SAS Institute, Inc, 1987.
7. Shott S. Statistics for health professionals. Philadelphia: WB Saunders, 1990.
8. Petzel TP, Johnson JE, McKillip J. Response bias in drug survey. J Consult Clin Psychol 1973; 40:437–9.
9. Smart RG, Blair NL. Test-retest reliability and validity of information on a high school drug use questionnaire. Drug Alcohol Depend 1978; 3:265–71.
10. Stacy AW, Widaman KF, Hays R, Dimatteo MR. Validity of self-reports of alcohol and other drug use: a multitrait-multimethod assessment. J Pers Soc Psychol 1985; 49:219–32.
11. Terney MA, McLain LG. Use of anabolic steroids in high school students. Am J Dis Child 1990; 144:99–103.
12. Johnson MD, Jay MS, Shoup B, Rickert VI. Anabolic steroid use by male adolescents. Pediatrics 1989; 83:921–4.
13. Kendel DB, Logan JA. Patterns of drug use from adolescence to young adulthood: I. periods for initiation, continued use, and discontinuation. Am J Public Health 1984; 74:660–6.
14. O'Malley PM, Bachman JG, Johnston LD. Period, age, and cohort effects on substance use among American youth, 1976–82. Am J Public Health 1984; 74:682–8.
15. Yamaguchi K, Kandel DB. Patterns of drug use from adolescence to young adulthood: I. sequence of progression; II. predictors of progression. Am J Public Health 1984; 74:668–81.
16. Grigg B, Nida E. Black market steroids. FDA Talk Paper. June 24, 1987.