# High-Risk Behaviors Among High School Students in Massachusetts Who Use Anabolic Steroids

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ABSTRACT. *Objective.* **To assess the association between the frequency of anabolic steroid use and the frequency of other health risk and problem behaviors among high school students in Massachusetts.**

*Methods.* **The 1993 Massachusetts Youth Risk Behavior Survey was conducted on a random sample of 3054 high school students (49% male; mean age, 16 ± 1.2 years). The frequency of lifetime anabolic steroid use was measured on an ordinal scale from 1 to 6, representing "0" to "40 or more times." Other health risk and problem behaviors measured were sexual behaviors, suicidal behaviors, frequency of not wearing a passenger seat belt, riding a motorcycle, not wearing a helmet while riding a motorcycle, driving after drinking alcohol, riding with a driver who had been drinking alcohol, fighting, and carrying a weapon. The associations between the frequency of anabolic steroid use and other high-risk behaviors were determined using the Spearman correlation coefficient for ordinal data and the Kruskall-Wallis analysis of variance for categorical data. Representative indicators of each risk behavior significantly associated with anabolic steroid use were then analyzed using a stepwise multiple-regression analysis.**

*Results.* **The frequency of anabolic steroid use was associated with all of the other high-risk behaviors analyzed. Using multiple-regression analysis, driving after drinking alcohol accounted for 12.5% of the variance of the model. Carrying a gun, the number of sexual partners within the past 3 months, not using a condom during last intercourse, injury in a physical fight requiring medical attention, history of a sexually transmitted disease, not wearing a helmet on a motorcycle, not wearing a passenger seatbelt, and a suicide attempt requiring medical attention accounted for an additional 9.0% of the variance. The full model accounted for greater than 21% of the variation.**

*Conclusions.* **The frequency of anabolic steroid use among adolescents is associated with other high-risk behaviors, thus supporting the hypothesis that anabolic steroid use is part of a "risk behavior syndrome" rather than an isolated behavior. This finding emphasizes the need for comprehensive high-risk behavior screening and counseling among teens who use anabolic steroids.** ***Pediatrics*** **1995;96:268–272;** ***anabolic steroids, health risk behaviors, risk behavior syndrome.***

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Received for publication Sep 6, 1994; accepted Nov 10, 1994.

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ABBREVIATION. YRBS, Youth Risk Behavior Survey.

The lifetime prevalence of anabolic steroid use among adolescents in the United States has been reported to be between 4% and 12% for male adolescents and 0.5% to 2.9% for female adolescents.[1–16] In his Problem Behavior Theory, Jessor[17] has proposed that there is intraindividual covariation among adolescent problem risk behaviors such that they cluster to form a "risk behavior syndrome". The evidence for covariation is strongest for those risk behaviors that are also problem behaviors. In support of Jessor's hypothesis, adolescent anabolic steroid use has been associated with the use of other harmful drugs, including cigarettes and smokeless tobacco, marijuana, alcohol, cocaine, and injected drugs.[4–7,18–20] It is not known, however, whether steroid use is associated with other high-risk behaviors.

This study examined the associations among anabolic steroid use and multiple other risk behaviors among Massachusetts school students in grades 9 through 12. Based on the Problem Behavior Theory, it was hypothesized that the frequency of anabolic steroid use in adolescents would be associated with the frequency with which they reported engaging in high-risk sexual behaviors, suicidal behaviors, driving after ingesting alcohol, riding with a driver who has been drinking alcohol, not wearing seat belts, riding a motorcycle, not wearing a helmet while riding a motorcycle, fighting behaviors, and weapon carrying.

## METHODS

### Sample

Data for the study were obtained from the 1993 Massachusetts Youth Risk Behavior Survey (YRBS). The YRBS was conducted between February and May 1993. Forty-five of the 51 randomly selected high schools across the state agreed to participate. Within each of the 45 schools, approximately 70 students from five randomly chosen classrooms of grades 9 through 12 participated, for a total of 3054 students. The demographic characteristics of the students are presented in Table 1.

### Questionnaire

The questionnaire consisted of 89 multiple-choice questions based on a standardized YRBS instrument produced by the US Centers for Disease Control and Prevention. The questionnaire was available in both English and Spanish. The instrument was self-administered, and all participants were assured that the survey was anonymous and voluntary. Schools had the option of obtaining parental consent for participation; fewer than 10 students' parents denied permission for their children to complete

**TABLE 1.** Demographic Characteristics of the Massachusetts 1993 YRBS Student Sample (Unweighted)

| | n | %* |
|---|---|---|
| Grade | | |
| 9th | 817 | 26.8 |
| 10th | 929 | 30.4 |
| 11th | 649 | 21.3 |
| 12th | 643 | 21.1 |
| Other† | 16 | 0.5 |
| Gender | | |
| M | 1501 | 49.2 |
| F | 1549 | 50.7 |
| No answer | 4 | 0.1 |
| Race/Ethnicity | | |
| White | 2306 | 75.5 |
| Black | 122 | 7.9 |
| Hispanic | 109 | 6.3 |
| Other‡ | 147 | 9.9 |
| No answer | 12 | 0.4 |
| Total | 3054 | 100.0 |

* Percent of total sample.
† Includes higher grade, ungraded, and no answer.
‡ Includes Asian, Pacific Islander, Native American, and other races and ethnicities.

the questionnaire. Fewer than 5 of the selected students who were in school on the days that the questionnaire was administered did not complete the survey.

Anabolic steroid use was assessed with the question, "During your life, how many times have you taken **steroid** pills or shots **without** a doctor's prescription?" (words in bold on questionnaire). The responses were based on an ordinal scale from 1 to 6 representing "0" to "40 or more times." The wording of this question is identical to that used in previous studies.[5-7,19] The words "**without** a doctor's prescription" distinguish these steroids from steroids prescribed for asthma. Studies have shown that a single-question assessment of anabolic steroid use is valid[6] and reliable.[7]

Sexual risk behaviors were measured with questions asking the number of people with whom the respondent had sexual intercourse both in the last 3 months and in his or her life, whether a condom was used during the last intercourse, and whether the respondent had ever been told by a health care professional that ". . . you have a sexually transmitted disease such as genital herpes, genital warts, chlamydia, syphilis, gonorrhea, AIDS, or HIV infection."

Questions used to evaluate suicidal behaviors asked whether the respondent had seriously considered suicide in the past 12 months, and whether he or she had had an attempted suicide in the past 12 months that resulted in injury requiring medical attention. Violent behaviors were assessed with questions about how many times the respondent had been in a physical fight in the past 12 months, how many times he or she had been in a fight that resulted in an injury requiring medical attention, how many times in the past 30 days the respondent had carried a weapon (defined as a gun, knife, or club), and how many times in the past 30 days the respondent had carried a gun.

Other risk behavior questions addressed how many times the student had ridden a motorcycle in the past 12 months, how often a helmet had been worn when riding a motorcycle in the past 12 months, and how often the student wore a passenger seat belt. The number of times in the past 30 days the respondent had driven a car after drinking alcohol and had ridden as a passenger after the driver had been drinking alcohol were also measured.

### Statistical Analysis

The data underwent weighting procedures to correct sample bias. Data cleaning and the computation of the weight were performed by Westat, Inc (Rockville, MD) under contract by the Centers for Disease Control and Prevention. Weighting compensated for differing patterns of nonresponse and reflected the likelihood of sampling each student. Weighting was also used to adjust for the oversampling of students from Boston; this oversampling was done to coordinate the state YRBS with the Boston school district's YRBS. The weight used for estimation is given by: $W = W_1 * W_2 * f_1 * f_2 * f_3$, where $W_1$ is the inverse of the probability of school selection; $W_2$, the inverse of the probability of classroom selection; $f_1$, a school-level nonresponse adjustment factor calculated by school size; $f_2$, a student-level nonresponse adjustment factor calculated by the class; and $f_3$, a poststratification adjustment factor by gender and grade.

All analyses were performed on weighted data. Pairwise associations for anabolic steroid use with the other high-risk behaviors were measured with Spearman rank-correlation coefficients. The association between anabolic steroid use and categorical variables was assessed using the Kruskall-Wallis analysis of variance. Chi square analysis was used to compare high-risk behaviors among anabolic steroid users versus nonusers. From each area of risk behaviors, representative variables significantly associated with anabolic steroid use were analyzed using a stepwise multiple-regression analysis.

## RESULTS

The reported prevalence of lifetime anabolic steroid use differed significantly ($P < .0001$) between males (5.7%) and females (1.7%). No differences in frequencies of anabolic steroid use were found among ethnic and racial groups, and anabolic steroid use was not associated with age or school grade.

Higher mean frequencies of anabolic steroid use ($P < .0001$) were found among students reporting having had sex, not using condoms during the last intercourse, and having had sexually transmitted

**TABLE 2.** Frequency of Anabolic Steroid Use and Other Risk Behaviors

| Risk Behavior | Frequency of Steroid Use | | |
|---|---|---|---|
| | Mean Score (Scale 1–6) | SD | *P* |
| Ever had sexual intercourse | | | <.0001 |
| Yes | 1.12 | 0.58 | |
| No | 1.02 | 0.16 | |
| Considered suicide seriously (in the past 12 mo) | | | <.0001 |
| Yes | 1.16 | 0.68 | |
| No | 1.05 | 0.34 | |
| Suicide attempt requiring medical attention (in the past 12 mo) | | | <.0001 |
| Yes | 1.61 | 1.47 | |
| No | 1.10 | 0.40 | |
| Use of condom at last intercourse | | | <.0001 |
| Never had intercourse | 1.06 | 0.16 | |
| Yes | 1.08 | 0.49 | |
| No | 1.15 | 0.68 | |
| History of a sexually transmitted disease | | | <.0001 |
| Yes | 1.35 | 1.16 | |
| No | 1.06 | 0.38 | |

diseases (Table 2). The numbers of sexual partners in life and within the past 3 months were significantly ($P < .001$) associated with an increased frequency of anabolic steroid use. Students reporting serious suicidal behaviors also had a higher ($P < .0001$) mean frequency of anabolic steroid use.

Significant ($P < .001$) associations were found among steroid use and the frequency of not wearing protective seat belts, riding a motorcycle, riding a motorcycle without a helmet, riding with a driver who had been drinking alcohol, driving after drinking alcohol, weapon carrying, and fighting (Table 3). The strength of these associations was weak.

Lifetime anabolic steroid use was also analyzed as a dichotomous variable (Table 4). A significantly ($P < .0001$) higher percentage of students who reported having used anabolic steroids also reported other high-risk behaviors (Table 4).

When analyzed with multiple-regression analysis, driving after drinking alcohol accounted for 12.5% of the variation in the frequency of anabolic steroid use (Table 5). In order of decreasing importance, carrying a gun, the number of sexual partners in the past 3 months, and use of a condom during the last intercourse accounted for a further 7.6% of the variation. Injury in a physical fight, history of a sexually transmitted disease, not wearing seat belts and helmets, and history of a suicide attempt requiring medical attention in the past 12 months were significant variables ($P < .05$) but accounted for minimal variation in the model. The full model had an adjusted multiple $R^2$ of .215, with the first five variables in the model accounting for 20.5% of the variation. Student gender did not account for a significant amount of additional variation in the model.

## DISCUSSION

Jessor[17] has proposed a general conceptual framework for understanding adolescent risk behavior that is based on his Problem Behavior Theory. He argues that there is intraindividual covariation among risk behaviors such that they cluster to form a "risk behavior syndrome." Although the evidence for covariation is strongest for those risk behaviors that are also problem behaviors, such as drug use, delinquency, alcohol abuse, and sexual precocity, covariation also has been found among nonproblem health risk behaviors, such as nonuse of safety belts, unhealthy eating patterns, and lack of exercise.[17] The covariation and patterning of these behaviors reflect an adolescent's way of being in the world. The social ecology of adolescent life provides socially organized opportunities to learn risk behaviors together and normative expectations that they be performed together.[17] Jessor states that part of the reason that risk behaviors cluster is that different risk behaviors may serve the same social and/or psychologic function for adolescents, such as affirming individuation from parents, trying to achieve adult status, and seeking acceptance from peers.[17]

Based on this conceptual framework, we hypothesized that adolescents who use anabolic steroids more frequently may be more likely to engage in other risk and problem behaviors. In support of this hypothesis, an association between anabolic steroid use and other health risk behaviors has been previously reported in the literature. Yesalis et al[4] found an association between previous anabolic steroid use and self-reported aggressive acts (including fighting or hurting someone physically) and crimes against property. Homicides and near homicides committed by anabolic steroid users also have been reported.[21] Komoroski and Rickert[9] found an association between anabolic steroid use and a scale measuring attitudes toward high-risk behaviors; however, individual risk behaviors were not studied. Multiple recent studies also have found significant associations between anabolic steroid use and other drug use, including injecting drugs.[4–7,18–20]

Cause-and-effect relationships between anabolic steroid use and other high-risk behaviors is still not known. Other high-risk behaviors simply might follow from the psychologic effects of anabolic steroid use, including irritability, aggressive behavior, and affective disorder symptoms.[15,22,23] For example, multiple other drug use and even some sexual behaviors might help alleviate the irritability and depression that often arise during withdrawal from anabolic steroid use. The aggressive, more violent behaviors associated with anabolic steroid use might be caused by these same psychologic symptoms or the "roid rages" associated with extensive use of anabolic steroids.[15,22]

Anabolic steroid use also may stem from the same constellation of psychosocial factors, including genetic, social environment, perceived environment,

**TABLE 3.** Spearman Correlation Coefficient ($r$) Among Frequency of Anabolic Steroid Use and Other Risk Behaviors

| Risk Behavior | Anabolic Steroid Use ($r$)* |
|---|---|
| Frequency of | |
| Not wearing a passenger seat belt | .10 |
| Riding a motorcycle (in the past 12 mo) | .14 |
| Not wearing a helmet on a motorcycle (in the past 12 mo) | .14 |
| Riding with a driver who had been drinking alcohol (in the past 30 d) | .18 |
| Driving after drinking alcohol (in the past 30 d) | .22 |
| Carrying a weapon (ie, gun, knife, club) (in the past 30 d) | .21 |
| Carrying a gun (in the past 30 d) | .22 |
| Physical fighting (in the past 12 mo) | .19 |
| Injury in a physical fight requiring medical attention (in the past 12 mo) | .13 |
| No. of lifetime sexual partners | .17 |
| No. of sexual partners (in the past 3 mo) | .16 |
| Minimum pairwise n of cases | 2748 |

* $P \leq .001$.

**TABLE 4.** Percentage of Students Reporting High-Risk Behaviors

| Risk Behavior | Percentage of Students Reporting Behavior | | *P* |
|---|---|---|---|
| | Non–Steroid Users | Steroid Users (≥1 Time Use) | |
| Considering suicide seriously (in the past 12 mo) | 23.4 | 49.6 | <.0001 |
| Suicide attempt requiring medical attention (in the past 12 mo) | 2.8 | 21.2 | <.0001 |
| Not using condom at last intercourse | 20.9 | 45.4 | <.0001 |
| History of a sexually transmitted disease | 4.6 | 15.9 | <.0001 |
| Not wearing a passenger seat belt | 18.6 | 45.9 | <.0001 |
| Riding a motorcycle (in the past 12 mo) | 21.5 | 49.0 | <.0001 |
| Not wearing a helmet on a motorcycle (in the past 12 mo) | 3.4 | 13.9 | <.0001 |
| Riding with a driver who had been drinking alcohol (in the past 30 d) | 31.2 | 65.8 | <.0001 |
| Driving after drinking alcohol (in the past 30 d) | 10.2 | 44.8 | <.0001 |
| Carrying a weapon (in the past 30 d) | 18.6 | 61.3 | <.0001 |
| Carrying a gun (in the past 30 d) | 5.2 | 32.9 | <.0001 |
| Physically fighting | 40.0 | 83.6 | <.0001 |
| Injury in a physical fight requiring medical attention (in the past 12 mo) | 3.8 | 17.5 | <.0001 |

**TABLE 5.** Regression Analysis of the Frequency of Anabolic Steroid Use

| Variable | β | $R^2$ Change* | *P* |
|---|---|---|---|
| Driving after drinking alcohol (in the past 30 d) | .12 | .125 | <.0001 |
| Carrying a gun (in the past 30 d) | .09 | .043 | <.0001 |
| Number of sexual partners (in the past 3 mo) | .08 | .020 | <.0001 |
| Not using condom at last intercourse | −.08 | .013 | <.0001 |
| Injury in physical fight requiring medical attention (in the past 12 mo) | .08 | .005 | <.0001 |
| History of sexually transmitted disease | −.10 | .003 | <.0008 |
| Not wearing a helmet on a motorcycle (in the past 12 mo) | .02 | .002 | <.014 |
| Not wearing a passenger seat belt | .01 | .002 | <.03 |
| Suicide attempt requiring medical attention (in the past 12 mo) | .04 | .002 | <.04 |
| Constant | .79 | | |

* Adjusted multiple $R^2 = .215$; $F = 70.04$; $P \leq .0001$.

and personality factors that contribute to other high-risk behaviors.[17] A longitudinal prospective study to determine whether anabolic steroid use precedes or develops parallel to other high-risk behaviors would be required to fully investigate this question. However, in congruence with the Problem Behavior Theory, we found associations not only between anabolic steroid use and violent or medicating behaviors, but between steroid use and nonviolent and nonmedicating health risk behaviors, such as not wearing seat belts, not wearing motorcycle helmets, and driving after drinking alcohol.

There are several limitations to this study. The analysis was based on self-reported behaviors. The questionnaire was distributed in school and may not have included some of the most high-risk teens. The population studied is from one geographic area. As DuRant et al[19] noted, anabolic steroid use and associated drug use behaviors vary geographically. This same geographic variation may exist for the association between anabolic steroid use and other high-risk behaviors as well. An analysis of national data would illuminate any of these potential variations.

In summary, anabolic steroid use was associated with other high-risk behaviors among high school students in Massachusetts. The other high-risk behaviors included both violent and nonviolent behaviors that could not be explained by the increase in aggression that often results from anabolic steroid use. Patients suspected of using anabolic steroids should receive comprehensive health risk assessments and problem behavior screening and counseling. In addition to efforts to help adolescents discontinue anabolic steroid use, behavioral interventions may be necessary to address other problem behaviors that may accompany the use of anabolic steroids.

## ACKNOWLEDGMENTS

This work was supported in part by project MCH-MA 259195 from the Maternal and Child Health Bureau (Title V, Social Security Act), Health Resources and Services Administration, Department of Health and Human Services.

We thank the Massachusetts Department of Education for providing us with the data from the 1993 Massachusetts Youth Risk Behavior Survey.

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