Anabolic Steroid Use by Male and Female Middle School Students

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ABSTRACT. Background. The prevalence of anabolic steroid use by high school and college students has been reported in the literature. However, rumors persist regarding the use of steroids by younger populations.

Objective. To assess the extent of steroid use by male and female middle school students and to explore their attitudes and perceptions about these drugs.

Methods. A confidential self-report questionnaire was administered to 466 male and 499 female students between 9 and 13 years of age (mean ± SD, 11.4 ± 0.9 years) in 5th, 6th, and 7th grades from four public middle schools in Massachusetts. The number of students reporting steroid use and differences between users’ and nonusers’ underlying attitudes and perceptions about these drugs were evaluated.

Results. The response rate was 82% (965/1175 eligible). Results indicated that 2.7% of all middle school students reported using steroids; 2.6% were males and 2.8% were females. When steroid users were compared with nonusers, 47% versus 43% thought that steroids make muscles bigger; 58% versus 31% thought that steroids make muscles stronger; 31% versus 11% thought that steroids improve athletic performance; 23% versus 13% thought that steroids make one look better; 23% versus 9% knew someone their own age who currently took steroids; 38% versus 4% were asked by someone to take steroids; 54% versus 91% thought that steroids were bad for them; and 35% versus 2% indicated that they would take steroids in the future. Additional analyses determined steroid user involvement in sports and activities.

Conclusion. The results of this study suggest that the problem of illicit steroid use extends to children and young adolescents and that a segment of this population is mindful of the potential physiologic effects of steroids. This information will be useful to pediatricians, sport authorities, and school teachers whose guidance will be required to enhance sports performance or favorably alter body size. Although medical, legal, and ethical issues related to the nonmedical use of AS continue to be discussed, a growing number of adolescents appear to be using these agents for nonmedical purposes.

The perceived benefits from AS use are not without untoward consequences. The use of AS has been associated with serious side effects including hypertension, alterations in lipid profiles, liver dysfunction, clotting abnormalities, and psychologic effects including changes in mood, behavior, and somatic perceptions.17,18 AS use during adolescence poses additional concerns because the use of these drugs during this developmental period may result in the premature closure of the epiphyseal growth plates.17 AS users who share contaminated needles also increase the risk of transmitting the human immunodeficiency virus.19,20 Many health professional organizations including the American Academy of Pediatrics,21 the American College of Sports Medicine,22 and the National Strength and Conditioning Association23 have denounced the nonmedical use of AS.

Although the prevalence of AS use at the Olympic, professional, college, and high school levels has been reported,24–28 rumors persist regarding the use of AS by younger populations. Several researchers have suggested that some students begin using AS before they enter high school.1–2,10,29 Data from Tanner et al9 show that 54% of adolescent AS users started at ≤14 years of age, and Nutter30 recently found that ~3% of students between 12 and 16 years of age had used or were currently using AS. At this time, the prevalence of AS use by children and young adolescents is poorly understood and is limited primarily to preliminary reports.30,31

This study was designed to gather baseline information regarding the magnitude of AS use among male and female middle school students between 9 and 13 years of age and to assess their underlying attitudes and perceptions about AS. To our knowl-

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http://www.pediatrics.org/cgi/content/full/101/5/e6
edge, no other AS survey has been administered to a similar population. The impetus for this study was provided by physicians and sport administrators who suggested—based on clinical impressions and anecdotal information—that the use of AS may have trickled down to children and young adolescents.

**METHODS**

**Subjects**

The participants in this investigation were 965 students (466 boys and 499 girls) between 9 and 13 years of age (mean ± SD, 11.4 ± 0.9 years) in 5th, 6th, and 7th grades from four public middle schools in Massachusetts (Table 1). The four schools were located within a 15-mile (24-km) radius of each other. Originally, 20 randomly selected middle schools in Massachusetts were solicited for participation in this study, but school administrators declined because they stated that surveys of this nature could not be given at their schools or that the use of AS was not a childhood problem. Subsequently, four middle schools with which we had worked with in the past or that expressed a willingness to participate were contacted. Informed consent was obtained from each school principal. If requested, consent forms were sent home for parental approval; only parents of 7 students denied permission for their children to complete the survey. The only criteria for inclusion in this study was that the child be currently enrolled in middle school.

**Design and Protocol**

Before administering the survey, students and school administrators were informed that participation was totally voluntary and that all responses were confidential. Students did not write their names on the surveys, and anonymity was guaranteed. School administrators were assured that the identity of their institution would not be disclosed. The survey was administered to students during 1995 and 1996. A health education teacher at each school acted as the survey coordinator. All participants were informed about the purpose of this study, and each survey coordinator was given a standardized instruction sheet to read to the students before distributing the survey. Coordinators administered the surveys to all students who were present in physical education or health education class on the study date. Students were reminded to answer all questions independently and honestly and to the best of their ability. Students recorded their answers directly on the survey sheet. When finished completing the surveys, students were asked to fold them in half and place them in a closed box at the front of the classroom. After all surveys were returned, the box was then sealed by the survey coordinator and returned to the principal investigator. Five surveys were not analyzed because of ambiguous answers.

**Instrument**

A one-page self-report questionnaire was used to collect the data. The first section obtained general information regarding age, grade, and gender. The second section evaluated participation in sports and recreational activities. Students were asked to mark all sports and activities in which they participate regularly. Selections included traditional school-sanctioned sports such as football, basketball, and soccer, as well as recreational activities such as weight training and karate. The third section of the survey consisted of a series of yes-or-no questions that assessed AS use, knowledge, attitudes about AS, and intent to use AS in the future. The prevalence of AS use was ascertained with the question: Have you ever taken steroids?

Pilot surveys were conducted to ensure that this instrument could be used by children without difficulty. The survey was offered in both English and Spanish. Identifying information such as race and socioeconomic status was purposefully omitted from this questionnaire. Descriptive statistics included means and SD units. The tabular analysis included simple frequency counts and percentages. The results pertaining to attitudes and perceptions are reported to the nearest whole percentage.

**RESULTS**

Of 1175 students who were eligible from the four schools, 965 (82% response rate) participated voluntarily. AS use was reported by 2.7% (26/965) of all middle school students surveyed. Of the 26 AS users, 1 (3.8%) was in 5th grade, 17 (65.4%) were in 6th grade, and 8 (30.8%) were in 7th grade. A total of 2.6% (12/466) of the males and 2.8% (14/499) of the females reported using AS. The prevalence of AS use generally increased with age within a range of 11 to 13 years for males and 10 to 12 years for females. The range of AS use among the four schools was from 1% to 5%. A detailed prevalence of AS use is presented in Table 2.

When the use of AS was analyzed with respect to sport and activity participation, it was observed that AS users on average participated in three to four sports and activities. Our results show that the highest percentage of male and female AS users participated in gymnastics (3 users [9%], 33 participants) and weight training (3 users [9%], 34 participants), respectively. The activities with the lowest incidence of AS use in males and females were soccer (2 users [1%], 219 participants) and football (2 users [2%], 95 participants), respectively. As outlined in Table 3, no sport or activity was secure from AS use.

In assessing attitudes and perceptions about AS, differences between the self-identified AS users and students who denied use of AS (nonusers) are evident (Table 4). More AS users than nonusers thought that AS would make muscles bigger and stronger and that AS users were more likely than nonusers to believe that AS would improve athletic performance or enhance appearance. Of the users, 23% knew someone their own age who currently took AS, and 39% were asked by someone to take AS. In terms of evaluating students’ attitudes about the potential harm from AS, fewer users than nonusers reported that AS are bad. In addition, when asked if they would take steroids in the future, 35% of the users reported that they would take AS, whereas 2% of nonusers responded positively to this question.

**DISCUSSION**

This study represents the first attempt to assess the prevalence of AS use among male and female middle school students.

**TABLE 1.** Demographic Variables of the 965 Students Completing the Survey

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>Male (% n = 466)</th>
<th>Female (% n = 499)</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>7</td>
<td>8</td>
<td>1.5</td>
</tr>
<tr>
<td>10</td>
<td>71</td>
<td>77</td>
<td>15.3</td>
</tr>
<tr>
<td>11</td>
<td>172</td>
<td>202</td>
<td>38.8</td>
</tr>
<tr>
<td>12</td>
<td>140</td>
<td>158</td>
<td>30.6</td>
</tr>
<tr>
<td>13</td>
<td>76</td>
<td>54</td>
<td>13.5</td>
</tr>
</tbody>
</table>

**TABLE 2.** Percentage of Students by Age and Gender Who Reported Having Used AS

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>All students (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>3.5</td>
<td>5.1</td>
<td>4.3</td>
</tr>
<tr>
<td>11</td>
<td>1.4</td>
<td>0</td>
<td>0.7</td>
</tr>
<tr>
<td>12</td>
<td>5.3</td>
<td>0</td>
<td>2.9</td>
</tr>
<tr>
<td>13</td>
<td>3.1</td>
<td>0</td>
<td>3.3</td>
</tr>
</tbody>
</table>
school students between 9 and 13 years of age. Although the results of this regional study may not be indicative of national trends, our data provide important information about the magnitude and nature of AS use that may be helpful to pediatricians, sport authorities, and school teachers who may design and participate in AS educational interventions. Particularly noteworthy is the finding that children as young as 10 years of age reported that they had used AS and that the prevalence of AS use is similar between young males and females. Although reports from the 1980s and early 1990s confirmed earlier suspicions that high school students had used AS, new findings from this study suggest that AS use has now reached the middle school level.

A number of studies have used self-report surveys to determine the prevalence of AS use at the high school level, but few studies are available for comparison at the middle school level. The overall prevalence of AS use among middle school students in this study (2.7%) was similar to prevalence rates reported by Gray for 10- to 14-year-old youth sport participants (2.0%) and by Nutter for 12- to 16-year-old middle school students (3.4%). Our findings also are consistent with data from Melia et al, who assessed the prevalence of AS use among school-age Canadians (2.8%), and from Yesalis, who reviewed AS prevalence rates among junior high school students in the United States (2% for 6th-grade students and 2.3% to 3% for 8th-grade students).

Unlike findings from previous investigations, our study results reveal similar overall AS prevalence rates between males and females (2.6% and 2.8%, respectively). It must be emphasized, however, that the students surveyed in our study were between 9 and 13 years of age (grades 5, 6, and 7). Researchers who studied older students typically reported AS prevalence rates about three to five times higher for males and females. For example, Nutter noted AS prevalence rates of 5.3% and 1.5%, respectively, for males and females between 12 and 16 years of age, and Komoroski and Rickert reported AS prevalence rates of 7.6% and 1.5%, for 11th-grade males and females, respectively.

Although AS use traditionally has been associated with male-dominated strength and power sports, our findings suggest that an equal percentage of young females now are using these agents. Although the specific explanations for using AS were not identified in this study, it is reasonable to conclude, although not with complete confidence, that increased pressure on young women to excel in sport has resulted in a perceived need for chemical interventions to enhance performance or to alter body size favorably. Also, it is possible that young females now feel less need to be secretive about AS use. Interestingly, AS use generally increased with age in males, peaking at age 13, whereas AS use in females peaked at age 12; however, no 13-year-old females reported AS use. This unanticipated decrease in AS use among females may be related to the reported decrease in female sport participation during the early adolescent years, or perhaps female AS users found the virilizing effects of AS to be socially unacceptable.

The variability in AS use rates among the participating schools is somewhat expected (1% to 5%), yet it is surprising that all participating schools have AS users. This could indicate that AS use among middle school students in Massachusetts may be more widespread than previously suspected; however, the survey was administered to four schools in a region with high sports participation. Although these data do not represent a randomized sample, the results of this study are of serious concern because one potentially permanent side effect of AS use in children and adolescents is the premature closure of the epiphyseal growth plates, which may result in stunted growth. The cost and availability of AS were not determined in this study, yet these factors may explain, in part, the variability in AS use among students at the four schools. In a nationwide survey of AS use at the high school level, Buckley reported that students at larger schools (>700 students) had higher rates of AS use, and it is possible that similar trends may occur at the middle school level. All four middle schools that participated in our study had enrollments of more than 700 students. In addition, all students were from a middle-class socioeconomic status, and sports participation rates were similar among schools. AS educational programs were not offered at any of the participating schools.

Our data suggest that AS use among young males and females is occurring in a variety of sports and activities. Students were asked to indicate all the sports and activities in which they participate; thus, the survey neither distinguished between competitive athletics and recreational participation nor identified specific school-based sports and activities. All AS users in this study participated in at least one sport or activity; however, unlike the results of other studies involving adolescents, findings indicated that football was not the sport with the highest per-

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**TABLE 3. Percentage of Students by Gender and Activity Involvement Who Reported Having Used AS**

<table>
<thead>
<tr>
<th>Sport</th>
<th>No. of Participants</th>
<th>No. of Users (% Users)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gymnastics</td>
<td>33</td>
<td>3 (9)</td>
</tr>
<tr>
<td>Weight training</td>
<td>85</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Basketball</td>
<td>332</td>
<td>9 (3)</td>
</tr>
<tr>
<td>Football</td>
<td>296</td>
<td>8 (3)</td>
</tr>
<tr>
<td>Baseball</td>
<td>285</td>
<td>7 (2)</td>
</tr>
<tr>
<td>Hockey</td>
<td>168</td>
<td>4 (2)</td>
</tr>
<tr>
<td>Swimming</td>
<td>246</td>
<td>6 (2)</td>
</tr>
<tr>
<td>Karate</td>
<td>91</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Tennis</td>
<td>91</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Track and field</td>
<td>86</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Soccer</td>
<td>219</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight training</td>
<td>34</td>
<td>3 (9)</td>
</tr>
<tr>
<td>Baseball</td>
<td>138</td>
<td>9 (6)</td>
</tr>
<tr>
<td>Hockey</td>
<td>58</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Gymnastics</td>
<td>138</td>
<td>6 (4)</td>
</tr>
<tr>
<td>Tennis</td>
<td>123</td>
<td>5 (4)</td>
</tr>
<tr>
<td>Karate</td>
<td>49</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Basketball</td>
<td>272</td>
<td>10 (4)</td>
</tr>
<tr>
<td>Track and field</td>
<td>112</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Swimming</td>
<td>321</td>
<td>11 (3)</td>
</tr>
<tr>
<td>Soccer</td>
<td>168</td>
<td>5 (3)</td>
</tr>
<tr>
<td>Football</td>
<td>95</td>
<td>2 (2)</td>
</tr>
</tbody>
</table>

*Students indicated all activities in which they participate.*
percentage of male AS users. It is likely that several factors, including the age of the respondents in this study and the degrees of aggressiveness and competition in middle school football compared to high school football, may partly explain this finding. It also is possible that football players were fearful of detection and therefore did not answer the survey honestly.

The sports or activities with the highest percentage of male and female AS users were gymnastics (9%) and weight training (9%), respectively. Because gymnastics is a sport in which muscular strength is a major asset, the relatively high prevalence of AS use is not surprising. Yet this finding is particularly disturbing, because it has been suggested that some young gymnasts may take AS to stunt their growth because they believe that a small stature is advantageous in gymnastics. The relatively high use of AS by young weight trainers was not unexpected, because the use of these drugs by adolescents and adults who weight train has been reported in the literature. Although no evidence indicates that weight training in and of itself encourages AS use, when weight training is used to enhance sports performance or body appearance, the temptation to use AS is likely to be greater.

The results from this study indicate that more AS users that nonusers were knowledgeable about the potential physiologic effects of AS (eg, increases in muscle size and strength) and the potential influence of AS on athletic performance and physical appearance. It is particularly distressing to report that only 54% of AS users (versus 91% of nonusers) thought that AS were “bad,” although it is possible that some AS users denied what they know to be true to justify their use of these drugs. Other investigators reported similar observations in adolescent AS users and nonusers.6–7 The implications of these findings are noteworthy because AS education counselors should be aware that some children and young adolescents already believe that AS offer desirable benefits. Equally revealing is the finding that 35% of AS users and 2% of nonusers reported that they would take steroids in the future. These observations suggest that developmentally appropriate educational interventions for this population are wanted and that positive messages children receive about the use of AS from peers, television, and muscle magazines are effective.

Of particular concern is that 23% of AS users and 9% of nonusers knew someone their own age who currently took AS. Because previous reports have suggested that only a small percentage of adolescent AS users stated that they received the drugs directly from a physician,9,12 friends, family members, or other individuals seem to be the primary sources of AS. Komoroski and Rickert6 reported significant associations between AS use and the knowledge of other male adolescents who use AS. Certainly, the influence of peer pressure during childhood and early adolescence should be considered one of the primary factors associated with the initiation of AS use. These findings are particularly troubling because there is no control over the illicit market supply of AS; thus, the degree of AS content or purity is unknown.

The results of this study suggest that AS educational interventions should probably begin before adolescence and should be direct toward both males and females. Adults in contact with children need to be aware of AS prevalence rates in this age group and should be cognizant of children’s attitudes and perceptions about these agents. Adults also need to be aware of the challenges associated with changing a behavior that results in noticeable benefits. Despite previous reports that questioned the potential usefulness of AS, current evidence indicates that changes in muscle strength and size will be evident after AS use if appropriate strength training guidelines are followed.35,36 Moreover, it has been suggested recently that the side effects associated with moderate doses of AS are primarily benign and reversible.37 This contention undoubtedly will make its way from the scientific literature to the weight room and may be used by some young AS users who are trying to justify their use of these drugs.

Health care providers including pediatricians, school nurses, and athletic trainers all can play an important role in AS intervention strategies, but the responsibility also should be shared by teachers, coaches, youth sport administrators, and fitness instructors. Although many AS users may participate in sports that are school-based, some AS users also may belong to fitness centers (eg, local gyms) or sport centers (eg, gymnastics clubs). AS interventions may need to be extended to public and private centers where children exercise. Data from our study suggest that the weight room may be a good place to educate middle school students about AS, because a high percentage of both male and female AS users appear to participate in weight training, which now is recognized as an important component of youth fitness programs.38

At the high school level, a multidimensional AS
prevention intervention program consisting of classroom sessions, weight-room sessions, and a parent evening session reduced factors that encouraged AS use and lowered intent to use AS. Similar multidimensional programs also may be effective at the middle school level; however, this has not yet been determined. AS interventions that focus only on the toxic side effects of these agents (ie, scare tactics) have been shown to be ineffective at the high school level, and it is likely that this unidimensional approach would not be effective at the middle school level as well.

Although the advantage of this type of study design is that a large number of individuals can be questioned in a nonthreatening and inexpensive manner, a major concern involves the possibility for false-negative and false-positive responses. Although it is impossible to ensure the validity of every response in this type of self-report study, it is well established that a significant level of validity can be achieved if appropriate research guidelines are followed (eg, assurance of anonymity and voluntary participation). Additionally, this type of questionnaire has proven to be a valid measure of recreational drug use in adolescent populations and has been used by other investigators who identified AS use patterns in adolescents.

The prevalence of AS use was assessed with the question, “Have you ever taken steroids?” Although this question did not distinguish between the medical and nonmedical use of AS, other studies have used a similar question to assess AS use in adolescents. It is possible, however, that some respondents may have confused AS with similar medications (eg, corticosteroids). In fact, nine respondents answered positively to the aforementioned AS question, but noted on the questionnaire that steroids were “in their asthma medication.” Although these false-positive responses were excluded from the final analysis, other students may have unintentionally reported AS use. On the other hand, students may have underreported AS use for fear of punishment or disqualification. Although no information is available on students who chose not to participate or who were absent when the survey was administered, it is reasonable to infer that a number of those who did not participate were AS users.

Another important consideration is the prevalence of AS use in middle schools that did not participate in this study. School administrators who perceived that AS use was a problem in their schools may have been less willing to participate in this study to preserve a desired image of their school and student body. Although school administrators were assured that no school would or could be identified individually, it is apparent that the topic of AS use remains sensitive and controversial.

CONCLUSION

AS use is no longer limited to the confines of bodybuilding gyms or adult sport training centers. Despite the probability of underreporting or overreporting in this study, our data suggest that a small but significant portion of middle school males and females had used AS and that a striking number of young respondents already are aware of the potential physiologic effects of AS. These findings are of particular concern because of the potential adverse complications associated with AS use. Although reports from other investigations suggest that students do not rely on physicians for information about AS, anticipatory guidance from these health professionals will become increasingly more important as proactive educational interventions are developed for male and female middle school students. Future studies should examine children’s primary source of AS, the predictors of AS use and dependency, and effective AS prevention interventions for male and female students.

ACKNOWLEDGMENT

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REFERENCES


