

An Investigation Into Anabolic Androgenic Steroid Use by Elite U.S. Powerlifters

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Reference Data

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ABSTRACT

This study surveyed U.S. Powerlifting Team members about anabolic androgenic steroid (AAS) use. Four hypotheses were investigated: (a) AAS have been used in the past by many powerlifters. (b) At the national/world level of competition, competitors conform to the regulations of doping controls. (c) Current technology is effective in identifying the use of AAS. (d) World level competitiveness is possible without AAS use. The survey return rate was 60%. Two-thirds of the respondents had used AAS, and 90% of the users indicated that cycling off AAS between 1 and 3 months prior to competition was the most effective method for passing doping controls. Practical considerations cite the overall ineffectiveness of current IOC doping controls, give suggestions for future research, and show how the current data can be generalized to Olympic sports with characteristics similar to powerlifting.

Key Words: doping control, hormones, weight training, performance enhancement, ergogenics

Introduction

You show me a sport where increased power, endurance, or speed can possibly benefit the athlete, and I'll show you a sport where AAS use exists.
(quoted from p. 17, *Drugs, Sport, and Politics*)

This quote by Robert Voy (8), a physician and former chief medical officer for the U.S. Olympic Committee,

is representative of the perception of the general public and the media in regard to anabolic androgenic steroids (AAS). Media attention has led some to believe that the use of AAS is a prerequisite for high level performance, especially in strength, speed, and power related sports.

When the term *steroids* is used in reference to sport, it generally refers to the category of hormones identified as AAS, which are derived from the male hormone testosterone. These drugs have less of an androgenic (virilizing) effect but retain significant anabolic, or tissue building, effects (1, 6, 12). For the athlete who seeks to maximize his or her performance, the muscle mass-increasing properties associated with AAS are a main factor in deciding to use this class of hormones (9, 10).

Although most athletes using AAS believe these drugs are beneficial, there has been much controversy over the interpretation and applicability of research on the effects of AAS (11). Studies investigating the benefits of AAS relative to athletic performance have been equivocal at best (11). Because these studies lacked consistency in terms of subjects, diet, training programs, testing procedures, dosages, type of drugs, and data interpretation, the findings have been inconclusive (1, 11).

In light of the ambiguity of research findings, Wright (11) stated, "if AAS have been as widely and extensively used for many years as many believe, then why is there not more evidence on adverse health effects?" (p. 67). Dr. Robert Voy's involvement with the USOC and doping control has allowed him to deduce that "people aren't continually dropping over dead from the use of AAS" (p. 23).

Considering the following statistics, one may hypothesize that the abuse of AAS by athletes is nothing more than media hype. At the Summer and Winter Olympics from 1984 to 1992, some 6,609 athletes were tested for performance enhancing drugs. Only 29 (0.4%) tested positive, 12 (0.2%) of these for AAS use (2, 3). Specific to powerlifting, the incidence of those testing positive at the national and international level was higher, but not at levels indicating widespread abuse. The data obtained for 1986 to 1989 and 1991 indicated that a total of 85 athletes were tested at the

national championships, resulting in 13 (11.05%) testing positive. At the 1990 and 1991 world championships a combined total of 51 athletes were tested, yet doping controls identified only 6 (11.75%) athletes who had used performance enhancing drugs in these two championships (7).

Few attempts have been made to measure the nature of AAS use at the elite level of sport (4, 13). Due to the sensitive nature of admitting AAS use, this study capitalized on the principal investigator's professional relationship with members of the U.S. National Powerlifting teams. The study sought information on previous and current AAS use by elite powerlifters at national/international competitions where International Olympic Committee (IOC) standards for doping controls were implemented. More specifically, the following hypotheses were investigated: First, AAS have been used in the past by many powerlifters. Second, at the national and world level of competition, competitors conform to the regulations of doping controls. Third, current technology is effective in curtailing and detecting the use of AAS. Fourth, competing at the world level is possible without AAS use.

Methodology

Subjects

The criteria for participation in this study were (a) winning the national championship and representing the U.S. at a world championship and (b) being tested for performance enhancing drugs twice in 1 year, once at the national championships and once at the world championships. The International Powerlifting Federation and its 80 member nations adopted IOC standards for doping controls in 1982. The U.S. Powerlifting Federation adopted these standards in 1986. Hence, for the years 1986 to 1991 six teams were taken to the world championships, each team comprising 10 lifters. However, since some lifters competed with more than one team, these six world teams totaled 28 athletes ranging in age from 23 to 45. Unfortunately, 2 athletes could not be located and thus the survey was mailed to 26 athletes.

It should be noted that this study investigated past experiences of *elite* athletes. Very few individuals qualify as being elite, so although the number of subjects in this investigation was small, it nevertheless represented a very special group of athletes. We believe the statistical analyses observed were in fact representative of elite athletes engaged in the sport of powerlifting.

This study defined users as individuals who at any time during their lifting career had used AAS for reasons other than medical. Nonusers were defined as individuals who had never used AAS.

Instrumentation

The questionnaire consisted of two sections that took about 45 min to complete. The first was a survey about

performance enhancing drugs titled The King Drugs in Sport Questionnaire (5). This questionnaire assessed knowledge about AAS use, side effects, where to get these drugs, and information about personal AAS use. Test-retest reliability was established at 0.72–0.92 and content validity was determined by a panel of 18 experts.

The second section consisted of powerlifting-specific demographic questions drafted especially for this study. These questions sought information on AAS use specific to powerlifting including efficacy of AAS use, effectiveness of testing procedures, personal experiences in terms of side effects and use, bogus drugs, other ergogenic aids, and whether the athlete would rather compete without doping control or prefer a situation with 100% effective detection techniques. Content validity was established by a panel of 9 experts who had the required statistical background. In addition to quantitative data, this section allowed the subjects to respond with open-ended comments as well.

Survey Distribution

Due to the extreme sensitivity of the information being requested, several steps were taken to protect the identity of the survey respondents. Previous research has shown that if the respondents of a survey know and trust the individuals conducting the research, the response rate will be greater than if the researchers are not known to the population being surveyed (13). Therefore the questionnaires were mailed with a personal letter from the principal investigator and fellow U.S. Powerlifting Team member explaining how each respondent's anonymity would be protected. Also included was a letter of inferred consent, adhering to the guidelines of the Advisory Committee on Human Experimentation at the University of Kansas. About 1 month after the surveys were mailed, each subject was sent a postcard thanking him for his time and asking those who had not returned the survey to do so soon. This note also appeared in *Powerlifting USA* magazine.

Data Analysis

Data analysis consisted of descriptive statistics that identified the frequency of responses to each item. In addition, descriptive information was obtained by group (i.e., nonusers and users). Multiple *t* tests ($p < 0.05$) were performed to ascertain whether there were reliable differences in responses, by group, to each item.

Results

Part 1: National Study

Of the 26 elite powerlifters who received the survey, 60% ($N = 15$) returned them. The survey identified 66.7% ($n = 10$) of the respondents as former and/or present AAS users and 33.3% ($n = 5$) as nonusers. One subject had used AAS for clearly delineated medical purposes as a child. But because he had not used AAS

during his competitive years, he was included in the nonuser group.

When questioned about other athletes in various sports using AAS, all 5 nonusers indicated being aware of such reports. Among the users, 80% responded affirmatively and 20% were not aware that other athletes used AAS. Still, all survey respondents indicated that AAS improve athletic performance.

Table 1 represents the respondents' knowledge about psychological and physical side effects often associated with AAS use. Items 4, 5, 7, 10, and 11 exhibited the highest total percentages in regard to side effects. Additionally, both groups of respondents were in general agreement that these side effects may occur. All nonusers believed that Items 1, 2, and 8 could be side effects of using AAS whereas the users did not identify these as being very prevalent.

Table 1
Knowledge of the Side Effects
Believed to be Associated With AAS Use

Item	Nonusers (n = 5)	Users (n = 10)
1. Liver damage	100%	60%
2. Heart damage	100%	40%
3. Circulation damage	60%	20%
4. Acne	80%	90%
5. Increased aggression	80%	80%
6. Stunted growth	20%	30%
7. Mood swings	80%	80%
8. Sexual problems	100%	60%
9. AIDS	20%	10%
10. Increased facial/chest hair in women	100%	80%
11. High blood pressure	100%	90%
12. Addiction	60%	60%

Table 2
Reasons for AAS Use Among Elite Powerlifters

Item	Nonusers (n = 5)	Users (n = 10)
1. To improve performance	2.6	1.7
2. To improve appearance	2.6	4.3
3. For fun	7.0	7.2
4. For weight gain	4.0	4.4
5. Increase chances of winning	4.0	2.3
6. Because competitors use AAS	4.2	2.5
7. Pressure from coaches	5.4	6.3
8. Pressure from teammates	5.0	6.8

Note. Mean values, 1 = "most important," 8 = "least important."

Questioned as to the reasons for AAS use among athletes (see Table 2), the powerlifters ranked improvement of athletic performance as the primary reason. Increasing the chances of winning was the second highest ranked variable, although the nonusers were rather neutral in their response to this item.

The powerlifters who identified themselves as users first used AAS between the ages of 20 and 28 ($M = 22.8$). In all, 70% of them admitted to using AAS within the last year while the remaining 30% insisted they had not used AAS within the last year. Only 20% indicated they had tested positive for AAS in the past.

When asked to identify what positive or negative effects they had experienced from AAS use, all users cited increased strength, decreased body fat, increased motivation, and increased recovery rate as positive effects; 80% of them also cited increased endurance. Increased aggression, or violence, was seen as a negative effect by 66.7% of the respondents, whereas the other 33.3% saw this as a positive effect.

Table 3 lists the sources for obtaining AAS; each subject could select more than one source. Clearly, friends were the most used source.

Next the athletes were required to rate various statements from 1 = "strongly agree" to 5 = "strongly disagree" (see Table 4). Data analysis revealed a significant difference between users and nonusers when questioned as to whether they would be hurting anyone else if they used steroids ($M = 2.2$ as opposed to the nonuser group, $M = 4.4$, $t[13] = 3.76$, $p < 0.05$). Item 4 inquired whether one needs steroids in order to compete. Data analysis indicated a significant difference in opinion between users and nonusers, $M = 3.4$, $t(13) = 2.54$, $p < 0.05$. A significant difference was also obtained for Item 12, $t(13) = -3.59$, $p < 0.05$, in which nonusers agreed strongly ($M = 1.2$) with the statement that steroids were not needed in order to reach their potential; the users' response was neutral ($M = 2.9$).

Part 2: Powerlifting-Specific Inquiry

All 15 respondents indicated that they believed their competitors at the national/international level of

Table 3
Sources of AAS Among Elite Powerlifters

Source of drug	Users (n = 10)
Friends	90%
Teammates	30%
Coaches	10%
Athletic trainers	40%
Physician	10%
Health club	50%
Pharmacy	10%
Off the street	10%
Mail order	20%

competition used AAS. Additionally, 80% of them indicated that a powerlifter would in fact gain an advantage by using AAS. Two-thirds of the respondents also suggested that current doping controls are ineffective. A difference in this item between users and nonusers (60% vs. 80%, respectively), although nonsignificant, should be noted.

The next series of inquiries dealt with the issues of passing a drug test and cycling off AAS. Cycling is the practice athletes employ to wean themselves off a drug. Most of the respondents (93.3%) agreed that some powerlifters use AAS and yet pass the drug tests. The questions regarding how to test negative were disregarded by some respondents, hence the numbers are incomplete. It appears that cycling down 3 months or more and about 1 month before a competition was recognized by both groups, 91.7% and 90.9%, respectively, as the primary method of passing the drug tests.

Table 4
General Statements About AAS From Elite Powerlifters

Item	Nonusers (n = 5)		Users (n = 10)
1. I would use AAS if I knew they would guarantee me of my ultimate goals in sport.	4.0		2.4
2. An athlete does not suffer adverse effects of AAS use if taken in dosages recommended by a physician.	4.0		2.7
3. I would not be hurting anyone else if I decided to use AAS.	4.4	*	2.2
4. Taking AAS is necessary if I am to be competitive in my sport.	4.8	*	3.4
5. AAS are only necessary in sports requiring strength.	4.8		4.6
6. I would consider taking AAS if the coach advised me to.	4.8		4.3
7. I have not been convinced that AAS are dangerous to my health.	4.2		3.0
8. I would use AAS if I knew I could help my team.	4.6		4.1
9. I would take AAS for sure if I knew I would not test positive for them.	4.4		3.7
10. I feel angry when I see teammates using AAS.	3.6		4.0
11. I feel that my competitors are cheating when they use AAS.	2.8		3.0
12. I do not need AAS to help me become the best athlete I can be.	1.2	*	2.9

Note. Mean values, 1 = "strongly agree," 5 = "strongly disagree."
* $p < 0.05$.

Use of a masking agent was also cited by 20% of the respondents. And 50% indicated it was possible to beat the system in other ways.

Of those users who used AAS before a national or international competition (90%), 77.7% tested negative. The most prevalent method (83.3%) for achieving this outcome was to begin cycling down about 1 month before competition. A few (66.7%) began cycling down 3 months or more before a competition. Although 85.7% indicated that they did not use a masking agent, 50% reported that they beat the system in another way.

Closer examination revealed that 73.3% of the respondents had observed or experienced side effects. Nevertheless, 64.3% indicated that AAS use could be safe yet effective in terms of performance enhancement. This position was supported by 88.9% of the AAS users. However, 80% of the nonusers felt that using AAS to enhance performance was unsafe. This difference in opinion between the groups was significant, $t(12) = 3.29$, $p < 0.05$.

In all, 90% of the users and 20% of the nonusers had observed or experienced AAS that were not authentic. Additionally, the use of AAS in combination (stacking) was observed or experienced by 90% of the users and was observed by 60% of the nonusers.

Anabolic androgenic steroids are not the only source of performance enhancement sought by athletes, nor are AAS the only banned substances. Table 5 lists various other groups of performance enhancing drugs that the respondents rated according to degree of concern. Anabolic androgenic steroids were identified as the primary concern of illegal performance enhancement ($M = 2.31$), followed by growth hormone ($M = 2.35$) and diuretics ($M = 2.66$).

All nonusers but only 60% of the users indicated they would not want to compete if there were no doping controls. This difference of opinion between the

Table 5
Concern for Other Drugs
Suspected of Performance Enhancement

Item	Nonusers (n = 5)	Users (n = 10)
Stimulants	2.6	3.6
Narcotic analgesics	3.2	3.4
AAS	1.6	2.4
Beta blockers	3.2	3.7
Diuretics	3.4	2.3
Blood doping	3.2	3.3
Physical manipulation	3.8	4.4
Growth hormone	2.2	2.4
Alcohol	4.0	3.1
Local anesthetics	3.6	3.0
Corticosteroid	3.0	3.5

Note. Mean values, 1 = "high concern," 5 = "no concern."

groups was significant, $t(12) = 1.51, p < 0.05$. When asked if they would prefer a situation in which no performance enhancing drugs were allowed and in which the detection methodology was 100% effective at all times, 80% of the users and 60% of the nonusers indicated that they would prefer this condition.

Discussion

The motivation for conducting the current study stemmed from the widely perceived use or abuse of AAS by many elite athletes, and our belief that these reports were exaggerated and lacking in empirical evidence. This contention was supported by a very low number of positive drug test results at the Olympic Games in all sports (2, 3) and at national or world level powerlifting competitions (7), but it was *not* supported by the high incidence of AAS use reported by the elite U.S. powerlifters we surveyed.

Considering that national level powerlifting has only been testing for AAS and other drugs since 1986, we had hypothesized that most of the athletes sampled have been exposed to AAS in the past. The hypothesis proved correct, as two-thirds of the respondents indicated they had used AAS. A closer analysis of the survey revealed that only 1 athlete had discontinued AAS use since doping controls were instituted.

Users and nonusers alike were aware of the side effects of AAS use (see Table 1). However, the great disparity in responses by users versus nonusers indicated that the former were less aware of AAS effects upon the liver, heart, and circulatory system. This lack of awareness may perhaps be related to the users' decision to use AAS, although this is highly speculative. Nevertheless, the sheer contrast in responses should provide strong impetus for the education of athletes as to the potentially harmful side effects associated with AAS use.

Our second hypothesis, that high-level competitors conform to drug control regulations, was unsubstantiated, as 60% of the athletes surveyed still used AAS in preparing for competition. It follows, then, that current AAS detection procedures are not as effective as they are thought to be, contrary to our third hypothesis. This was supported by the majority of respondents. As one athlete put it, "Random drug testing, not the day before the meet but 3 to 4 weeks before the meet and also random on the day of the meet" would be required for greater effectiveness. Our last hypothesis was that athletes did not need to take AAS to reach world level competition. Since 60% of the respondents used AAS at this level, one may conclude there was a perceived need for AAS use.

Three themes emerged from this study that may explain this high level of use: First, there is no fear of detection when users know they merely need to begin cycling off AAS at least 1 month prior to the competition. Second is the perception that one's performance will be enhanced. Third, considering that all 15 respondents believed their fellow competitors were using

AAS, abstaining from AAS would be perceived as placing them individually at a disadvantage. Still, some were reluctant about using AAS in preparing for competition. In the words of one athlete, "There is a sense of guilt of winning while on 'roids."

The nonusers believed strongly that athletes did not need AAS in order to be competitive or to reach their potential. The users' responses to this question varied but remained generally neutral, which suggests that as a group they were somewhat uncertain as to the personal need to use drugs to enhance performance. As one athlete wrote, "If I could be sure that my competitors are 'clean' I would be more than happy to match God-given talent and strength against anyone."

Most of the respondents indicated that doping controls were ineffective, as suggested by the low number of positive test results versus the high number of AAS users. However, there is some evidence as to the effectiveness of doping controls. In the sport of powerlifting, IOC standard doping controls were first implemented at the world championships in 1982 and at the national level in 1986. Conceivably then, an athlete could compete at the nationals until 1986 without being tested, and therefore use AAS without being detected.

In order to allow for an accurate comparison and statistical analysis of the totals, we compared the year 1983 to 1985 and the year 1986 to 1990. A mean difference of 120.2 lbs for the formers years versus 48.3 lbs for the latter years constituted a significant difference, $t(10) = 4.11, p < 0.05$, between totals at the national championships versus those at the world championships. While this merits further research, one could infer that (a) AAS were used at the nationals prior to 1986, (b) these drugs enhanced performance, and (c) drug testing procedures led many athletes to curtail AAS use prior to the world championships, thus lowering their performance. This would render doping controls effective.

There are several ways to view this information. The most obvious is that a high percentage of powerlifters have used AAS at some point. Since the mean difference in the totals between the national and world championships has fallen dramatically, it appears that drug testing since 1986 has had a positive effect on curtailing AAS use. One athlete reported that he has witnessed "a trend away from previous levels of steroid use." It is also important to recognize that one-third of the elite powerlifters who responded to our survey had never used AAS in conjunction with national or world level competition. This finding holds out hope that future powerlifters will realize they can make it to the top of this sport without the aid of AAS.

Practical Applications

Based on our findings, it is clear that current doping control procedures are not as effective as they need to be. Also, since the most prevalent method for passing

the drug tests is to begin cycling off AAS from 1 to 3 months before a competition, the question arises as to how much of a performance enhancing effect these drugs provide when they have been discontinued for such a long period before the competition. Since the testing technology allows a detection ratio of one part per billion (8), how rational is it to use AAS, discontinue it successfully enough to escape detection, and expect a benefit on competition day?

These considerations have not been addressed in the past and should receive primary emphasis in the research on performance enhancing drugs. If the findings indicate that a negative test result means that there are truly no performance enhancing properties present, then there would simply be no reason to continue AAS use. However, if the findings indicate that the performance enhancing qualities remain even after one cycle off AAS, future efforts must be guided toward developing better methods of detecting illegal drugs.

The results of the present study cast a shadow over the effectiveness of doping controls. Any sport that requires attributes similar to powerlifting (i.e., great force, closed skill, simple motor task, self-paced), and that has a history of reported AAS use, may have even higher levels of current AAS use than researchers have been able to determine. When an elite athlete can feel assured of confidentiality, as was the case in this study, actual levels of AAS use may be revealed to be significantly higher than current doping controls have indicated.

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