

## SUBSTANCE ABUSE

# Adolescent use of anabolic–androgenic steroids and relations to self-reports of social, personality and health aspects

ANNA M.S. KINDLUNDH, BERIT HAGEKULL, DAG G.L. ISACSON, FRED NYBERG \*

**Background:** Over the last decade adolescent males have been shown to use anabolic–androgenic steroids (AAS) in order to improve their sports performance and appearance, as well as in combination with alcohol and psychotropic drugs. However, the risk profile of AAS use is still not well understood. This study analysed the importance of social, personality and health factors for the use of AAS. **Methods:** More than 2,700 senior high school students in Uppsala, Sweden, filled out an anonymous closed-response questionnaire. **Results:** The findings from multiple logistic regression analyses of adolescent males (n=1,353) showed that immigrant status, average/low self-esteem, average/low perceived school achievement and use of prescription tranquillisers/sedatives had independent significant associations with the use of AAS after controlling for age and previously known factors such as strength training, truancy and heavy alcohol consumption. **Conclusion:** The characteristics of AAS users extend beyond activities such as strength training and multiple drug use to include social, personality and health aspects.

**Keywords:** adolescents, anabolic–androgenic steroids, immigrant status, peer relations, psychotropic substance use, self-esteem, school achievement

Since the 1950s and 1960s use of anabolic androgenic steroids (AAS) – endogenous and synthetic testosterone, as well as synthetic derivatives of testosterone – has broadened beyond athletes and body-builders to include adolescent males seeking an idealised appearance<sup>1–3</sup> and adolescents associated with multiple drug use.<sup>2,4–7</sup>

In order to gain a more comprehensive understanding of AAS use, the mechanisms involved should be studied from biological, social and psychological perspectives in multivariate approaches. Some have studied the importance of different factors in AAS use.<sup>2,7–10</sup> It has been shown that adolescent AAS use is connected to strength training, injected drug use, and the use of multiple drugs respectively, even after controlling for sports participation and poor academic performance.<sup>5</sup> However, knowledge about the importance of personality and health factors with regard to patterns of AAS use is still inadequate, in particular among potential AAS users.

Aspects of personality and health are of great concern for several reasons. Because of the suggested associations between AAS use and the desire to improve appearance

and gain body mass,<sup>11</sup> the impact of personality aspects such as self-esteem have to be examined further. Body-builders have been reported to being at risk for body image disturbances as well as for eating disorders such as anorexia nervosa and ‘reverse anorexia’,<sup>12</sup> illnesses that have been connected with low self-esteem among adolescent females.<sup>13</sup> It has also been assumed that patterns of AAS use include some psychological aspects also seen with the use of psychotropic substances (i.e. cannabis, opiates, cocaine, amphetamine, methamphetamine, LSD, MDMA (ecstasy) and psilocybin). Some studies have indicated that AAS might act on biological mechanisms similar to those affected by psychotropic substances,<sup>14–17</sup> and other studies have pointed to a tendency to use both AAS and psychotropics.<sup>4–6</sup> Reports have documented various adverse effects associated with use of AAS on mental health.<sup>2,18–24</sup> As is the case with psychotropic substances, biological research has shown that AAS influence the reward regions of the brain<sup>14,15</sup> as well as leading to the development of dependence,<sup>14,15,20,25,26</sup> aggression<sup>16</sup> and violent behaviour.<sup>27,28</sup>

Several multifactor theoretical models have been constructed in order to explain the phenomena of alcohol and psychotropic substance use<sup>29,30</sup> and these may be important to keep in mind in order to gain a better understanding of AAS use. Among the factors shown to be relevant for psychotropic substance use are general attributes of the interpersonal environment, including sociodemographics such as family circumstances and socio-

\* A.M.S. Kindlundh<sup>1</sup>, B. Hagekull<sup>2</sup>, D.G.L. Isacson<sup>3</sup>, F. Nyberg<sup>1</sup>

<sup>1</sup> Department of Pharmaceutical Biosciences, Division of Biological Research on Drug Dependence, Uppsala University, Uppsala, Sweden

<sup>2</sup> Department of Psychology, Uppsala University, Uppsala, Sweden

<sup>3</sup> Department of Pharmacy, Pharmaceutical Services Research, Uppsala University, Uppsala, Sweden

**Correspondence:** Anna Kindlundh, M.Sc., Division of Biological Research on Drug Dependence, Department of Pharmaceutical Biosciences, Uppsala University, PO Box 591, S-751 24 Uppsala, Sweden, fax +46 18 501920, e-mail: Anna.Kindlundh@farmbio.uu.se

economic status<sup>31–35</sup> Other variables of importance in substance use are aspects of peer influence.<sup>29,31–33,36–38</sup> In the stress-coping model, life stress is posited as a general risk factor predisposing to various kinds of problems. Coping processes are proposed to operate by either retarding or accelerating the development of problems in combination with buffering protective factors such as certain types of competence variables or personality related variables. In accordance with the stress-coping model, it has been shown that low social, behavioural and academic competencies are directly related to substance use.<sup>30</sup>

The main aim of the present cross-sectional study was to analyse specific factors in multivariate models concerning social, personality, and health aspects of senior high school students with lifetime use of AAS in Uppsala, Sweden. We assessed the importance of one social factor (immigrant status), three personality characteristics (self-esteem, perceived peer relations and perceived school achievement) and two health factors (perceived health and use of tranquillisers or sedatives both with and without a doctor's prescription). A second aim was to apply factors, which have been shown to be relevant in the use of doping agents<sup>39</sup> to models focused on the use of AAS, i.e. to determine the importance of strength training, tobacco use, heavy alcohol consumption, truancy and living alone in comparison with the above social, personality, and health factors. A third aim was to relate models of AAS use to models for psychotropic substance use considering social, personality, and health aspects alone as well as in combination with strength training, tobacco use, heavy alcohol consumption, truancy and living alone.

## METHODS

Data were collected during one week in May 1995 from all students in the first and third years of senior high school in Uppsala (with 180,000 inhabitants, this is the fourth largest city in Sweden). The students were administered a multiple-choice questionnaire, which they answered anonymously while supervised by a teacher. Of the students who participated in the survey, 1,592 were in their first year and aged 16–17 years and 1,150 were in their third year and aged 18–19 years. The non-participation rate was 19.2%, 99% of which consisted of students absent from class and 1% of students who did not answer the survey.

### Questionnaire

The questions used in this survey were mainly taken from the annual school questionnaire of The Swedish Council for Information on Alcohol and other Drugs (CAN) and the National Institute of Public Health (B. Hibell, personal communication).

The questionnaire asked students about their use of doping agents – based on the list adopted by the International Olympic Committee and accepted by the Swedish Sports Confederation – as well as sociodemographics, sports, personality and health factors. Although the study

was primarily focused on doping agent use, questions about use of psychotropic substances, tobacco, alcohol and tranquillisers/sedatives were included.

In order to avoid misunderstandings among the respondents, the more commonly understood term 'anabolic steroids' was used in the survey instead of 'anabolic-androgenic steroids', and testosterone was listed as a separate kind of doping agent. However, in the data analyses testosterone was included as an anabolic-androgenic steroid.

The extent of doping agent use was assessed by the question 'Have you ever used any of the following doping agents without a doctor's prescription?' The most common doping products were listed as choices for testosterone and anabolic steroids, respectively. The products listed for testosterone were Sustanon, Testoviron-Depot and Undestor and for anabolic steroids the list included Russian Metahapoctehonol, Parabolan, Primobolan, Winstrol, Anasteron, Anadur and Decadurabolin.

Questions on lifetime psychotropic substance use concerned cannabis (hashish, marijuana and cannabis oil), opioids (heroin, morphine, methadone and opium), cocaine (cocaine and crack), amphetamine, methamphetamine (ICE), LSD, MDMA (ecstasy) and psilocybin. The variable tobacco use included both smoking and snuff. The occurrence of this use was assessed by the questions 'Do you smoke?' and 'Do you take snuff?' Different answers were listed according to frequency of use. Tobacco users were defined as those who responded that they were still smoking or taking snuff. The questionnaire defined heavy alcohol consumption as consuming at least half a bottle of spirits, one bottle of wine, four bottles of beer (5.2% volume), or six bottles of beer (4.2% volume) on the same occasion. The survey asked about lifetime use of prescription and non-prescription tranquillisers or sedatives.

An estimate of immigrant status was based on the question 'How long have you been living in Sweden?' Statistically, high immigrant status was given to senior high school students who had moved to Sweden after the age of 8 years, whereas adolescents who were native born or had moved to Sweden before age 9 years were given a low immigrant status. Respondent self-esteem and perceived peer relations were investigated in a set of 17 statements (*table 1*). Each statement had responses on a five-step scale ranging from 'do not agree at all' to 'completely agree' The questions about health, school achievement and truancy were based on self-perceptions and framed as follows. 'How would you describe your health?' 'What do you think about your school achievements in comparison to those of other youths of your age?' 'Do you play truant?' Further, a set of questions was assessed in order to obtain knowledge about respondents' sports activities 'Are you active in sports in your spare time?' and 'If so, do you practice any of these sports activities?' Among other sports, strength training was listed.

### Data analysis and measurements

Statistical analyses were performed using the Statistical Analysis System, SAS.<sup>40</sup> The dependent variables of

these analyses were the use of AAS and psychotropic substances respectively.

Factor analysis was employed in order to create measures of the background factors self-esteem and perceived peer relations. A two-factor orthogonal Varimax solution of the 17 items showed that two dimensions could be reliably measured. As shown in *table 1*, the first factor – including ten items with loadings  $>0.40$  – clearly mirrored self-esteem. The internal consistency of the ten items, as expressed by Cronbach's  $\alpha$ -coefficient, was 0.83. Six items describing perceived peer relations had factor loadings  $>0.40$  in the second factor. Cronbach's  $\alpha$ -coefficient amounted to 0.76. The item 'I am a curious person' did not load on either factor and was not included in the scales. Individual scale values were constructed by averaging the individual ratings in each scale.

The independent variables reflecting immigrant status, perceived health, school achievement and use of tranquillisers or sedatives were dichotomised in the analyses (*table 2*). Self-esteem and perceived peer relations had three levels in the descriptive analyses, but were dichotomised in the multivariate approach. The variables self-esteem and perceived peer relations – based on the factors in *table 1* – were defined as low for answers with rankings of 4 and above, average for answers with rankings above 2 and below 4, and high for answers with rankings of 2 and below. When dichotomised, persons with a high level of self-esteem and peer relations respectively were

selected as the reference groups, whereas those with average and low levels were given the dummy value 1. The average group was consequently combined with the low ranking group in the dichotomised variables.

The factors already known to be associated with doping agents, such as strength training, tobacco use, heavy alcohol consumption, truancy and living alone, were also dichotomised in this study (*table 3*).<sup>39</sup>

Cross-tabulations were initially carried out in order to identify the differences between groups for categorical variables and evaluate factors potentially associated with the dependent variable i.e. use of unprescribed AAS. Fisher's exact test and  $\chi^2$ -statistics were applied for comparisons of proportions. Factors potentially associated with the dependent variable i.e. AAS use, were tested by bivariate logistic regression analyses. Different multiple logistic regression models were created in order to determine the combination of variables that best described and gave independent significant contributions to use of AAS.

Multiple logistic regression analyses were then performed in order to study the importance of self-reported health, social and personality factors for the other dependent variable i.e. psychotropic substance use.

## RESULTS

The extent of AAS use was more common among senior high school males than females; 2.1% (n=29) of the male adolescents and 0.2% (n=3) of the female adolescents had used AAS. Only data for males were used in the analyses in this study. The findings of the descriptive analyses relating self-reports of social, personality and health factors to male adolescent use of AAS are described in *table 2*. The results showed that senior high school males with high immigrant status had a higher rate of AAS use than did males with a low immigrant status. However, there were only four subjects with high immigrant status who reported a lifetime use of AAS. Further, AAS use was more common among senior high school males with average/low perceived peer relations and those with average/low self-esteem compared with those with high perceived peer relations and high self-esteem respectively. Self-perceived school achievement was not significantly related to AAS use, although the extent of use was more frequent among boys reporting average to poor achievement than among others. Use of tranquillisers or sedatives both with and without a doctor's prescription was highly associated with AAS use. Even though use of AAS seemed to be more common among those reporting poor to good health compared to those reporting very good to excellent health, this was not significantly different.

Multiple logistic regression analyses controlling for age as a potential confounder showed that high immigrant status, average/low self-esteem, perceived school achievement around average or below and use of prescription tranquillisers or sedatives gave independently significant contributions to AAS use model 1 in *table 3*. This model held even when already known factors such as strength

Table 1 Item description and factor loadings ( $>0.40$ ) for the two-factor Varimax factor analysis

Item description	Factor loadings	
	1	2
Factor 1: self-esteem		
On the whole I am satisfied with myself	0.76	0.20
I have a positive view of myself	0.75	0.21
I have positive expectations for my future	0.62	0.24
I can manage things just as well as others can	0.59	0.09
I do not think I can do anything properly	-0.51	-0.16
When planning something I am almost sure of succeeding	0.50	0.11
I am worth as much as other people	0.47	0.17
People like me do not have good chances of success in life	-0.45	-0.16
I haven't done many good things in my life	-0.45	-0.24
Sometimes I feel worthless	-0.43	-0.11
Factor 2: perceived peer relations		
I often feel left out	-0.25	-0.66
I often feel lonely	-0.25	-0.64
Most of the time I have friends around to be with	0.12	0.58
Most of the time I have someone to talk to about my personal problems	0.14	0.54
I often wish I had more friends	-0.13	-0.52
When I need help I always have someone to turn to	0.14	0.47

training, heavy alcohol consumption and truancy were included model 2 in *table 3*.

The social, personality and health factors were analysed in two models for importance in psychotropic use, both alone and in comparison with strength training, tobacco use, heavy alcohol consumption, truancy and living alone. The first multivariate model – which included age as a variable (OR=1.31 and CI: 0.93–1.83) – revealed that high immigrant status (OR=2.08 and CI: 1.05–4.12), perceived high peer relations (average/low peer relations) (OR=0.51 and CI: 0.34–0.76), average/low self-esteem (OR=2.08 and CI: 1.43–3.04) and use of prescription tranquillisers or sedatives (OR=4.19 and CI: 2.24–7.85) were related to psychotropic substance use. In the second model, which also controlled for age (OR=1.18 and CI: 0.82–1.70), perceived high peer relations (average/low peer relations) (OR=0.63 and CI: 0.41–0.97), average/low self-esteem (OR=1.54 and CI: 1.01–2.33), truancy (OR=2.64 and CI: 1.67–4.15), use of prescription tranquillisers or sedatives (OR=3.00 and CI: 1.51–5.98), tobacco use (OR=4.01 and CI: 2.74–5.86) and heavy alcohol consumption (OR=5.76 and CI: 2.71–12.23) were independently significant contributors to psychotropic substance use.

## DISCUSSION

The findings of this study show that immigrant status, average/low self-esteem, perceived average/low school achievement and use of prescription tranquillisers or sedatives on doctor's prescription are significantly and independently associated with lifetime use of AAS in male adolescents. The results also show that these health-, social- and personality-related factors are significant contributors to male AAS use when previously known factors in doping perspectives – strength training, heavy alcohol consumption and truancy<sup>39</sup> – are included in the model. The models of AAS use had all factors except school achievement and strength training in common with those of psychotropic substance use. The variable high perceived peer relations was only linked to psychotropic substance use.

Of the personality aspects measured, only average/low self-esteem was relevant in models for both AAS and psychotropic substance use. These results enable us to at least refute that high self-esteem should lead to AAS use and instead conclude that the protective value of having a high self-esteem<sup>30,36</sup> seems to extend to the use of AAS. In contrast, low perceived peer relations were associated with AAS use in the descriptive analyses, but this aspect was not an independent contributor in the multivariate model. However, in the final multiple regression model for psychotropic substance use, perceived peer relations not only appeared to be an important factor but also showed an inverse relation, as compared to the model for AAS use. Thus, perceived peer relations do not seem to be as important for AAS use as they do for use of other substances.<sup>29,32,33,36–38</sup> Perhaps the majority of AAS users, i.e. those with the desire of enhancing their sports performance and appearance,<sup>39</sup> are more individualistic

**Table 2** Numbers of senior high school males and percentage of proportions reporting lifetime use of AAS with regard to immigrant status, perceived peer relations, self-esteem, perceived school achievement, use of tranquillisers or sedatives and perceived health

	N	Proportion of AAS users %	p-value
<b>Immigrant status</b>			
High	66	6.1	
Low	1,202	1.8	
Missing values	85	3.5	
Total	1,353	2.1	*
<b>Perceived peer relations</b>			
Low	36	2.8	
Average	461	3.3	
High	856	1.5	
Missing values	0	0.0	
Total	1,353	2.1	*
<b>Self-esteem</b>			
Low	10	0.0	
Average	394	4.1	
High	949	1.4	
Missing values	0	0.0	
Total	1,353	2.1	**
<b>Perceived school achievement</b>			
Bad/much below average/ below average/average	731	2.9	
Better than average/ much better than average/ excellent	606	1.3	
Missing values	16	0.0	
Total	1,353	2.1	ns
<b>Use of prescription tranquillisers or sedatives</b>			
Yes	52	15.4	
No	1,119	1.3	
Missing values	182	3.3	
Total	1,353	2.1	***
<b>Use of tranquillisers or sedatives without doctor's prescription</b>			
Yes	74	6.8	
No	1,081	1.6	
Missing values	198	3.5	
Total	1,353	2.1	**
<b>Perceived health</b>			
Good/tolerable/poor	631	2.7	
Very good/excellent	714	1.7	
Missing values	8	0.0	
Total	1,353	2.1	ns

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05, ns: not significant

and independent than users of psychotropic substances. In addition, AAS – at least for some users – are perhaps not ‘social drugs’. This make us wonder in which direction this association runs, i.e. whether drug users are more social and, therefore, more susceptible to peer pressure or whether the use of drugs bonds them with other drug users and makes them feel more connected with their drug-using friends.

Another difference between users of the two types of substances was that perceived school achievement, average or low, did not seem to be as important for psychotropic use as for AAS use, although academic skills have been posited as protective competence factors preventing substance use.<sup>30</sup>

Both the use of AAS and the use of psychotropic substances were associated with use of prescription tranquillisers/sedatives. Sometimes, when adolescent males have seen a doctor primarily due to their mental health problems these symptoms have turned out to have a basis in AAS use (K. Skårberg and S. Engdahl, personal communication). This use of tranquillisers/sedatives might be regarded as serving a coping function in the case of mental problems<sup>30</sup> and, accordingly, as a predictor of other drugs or as a result of psychiatric treatment of adverse effects of the use of AAS, or psychotropic substances, thus being an outcome of such use.

The results of the immigration factor indicated that male adolescents who had come to Sweden relatively late, i.e. aged 9 years or older, were more prone to using AAS although the numbers were low.

Like a recent Australian study,<sup>41</sup> this study also found truancy to be an important factor in AAS use. Thus, AAS use prevalence might be an underestimation.

Truancy could be regarded as

an indicator of personal problems, but multiple absences might also signal high participation rates in extracurricular activities such as sports.

The number of AAS users in the present study was too low to be subdivided. Otherwise, it would have been of interest to assess whether subgroups of users differed with respect to any of the health, social and personality factors investigated in this study. Male adolescents using doping

**Table 3** Multiple logistic regression analyses for first- and third-year senior high school males relating some social, personality and health factors to the use of AAS

	OR	95% CI		p-value
		Low	High	
<b>Model 1</b>				
<b>Age</b>				
Third senior high school year	0.52	0.19	1.38	0.1861
First senior high school year <sup>a</sup>				
<b>Immigrant status</b>				
High	7.73	2.30	25.96	0.0009
Low <sup>a</sup>				
<b>Self-esteem</b>				
Average/low	2.97	1.23	7.19	0.0158
High <sup>a</sup>				
<b>Perceived school achievement</b>				
Average–Bad	3.03	1.07	8.62	0.0373
Better than average–Excellent <sup>a</sup>				
<b>Use of prescription tranquillisers or sedatives</b>				
Yes	18.66	6.84	50.93	0.0001
No <sup>a</sup>				
<b>Model 2</b>				
<b>Age</b>				
Third senior high school year	0.58	0.18	1.89	0.3644
First senior high school year <sup>a</sup>				
<b>Immigrant status</b>				
High	9.11	2.35	35.31	0.0014
Low <sup>a</sup>				
<b>Self-esteem</b>				
Average/low	4.39	1.51	12.80	0.0067
High <sup>a</sup>				
<b>Perceived school achievement</b>				
Average–Bad	3.77	1.07	13.25	0.0383
Better than average–Excellent <sup>a</sup>				
<b>Truancy</b>				
At least once a week	3.54	1.21	10.38	0.0211
2–3 times per month–Never <sup>a</sup>				
<b>Strength training</b>				
Yes	16.34	4.33	61.72	0.0001
No <sup>a</sup>				
<b>Heavy alcohol consumption</b>				
Yes, a couple of times per week	9.13	2.19	38.09	0.0024
Once a week–Never <sup>a</sup>				
<b>Use of prescription tranquillisers or sedatives</b>				
Yes	18.41	5.17	65.51	0.0001
No <sup>a</sup>				

a: Reference group  
OR: odds ratio, CI: confidence interval

agents have been subdivided previously according to reasons for use<sup>39,42</sup> A subgroup was characterised as using these substances primarily for motives such as to become intoxicated, to become brave, because friends do so and because it was fun to try.<sup>39</sup>

The findings reflect the importance of social, personality and health factors in the use of AAS as well as in psychotropic substance use. With regard to social aspects, this study did not examine the impact of family factors other than those connected with immigrant status. Although our study investigated perceived peer relations, it is of interest to note that some studies have indicated that peer influences are more closely associated with substance use than are family and parental relationships.<sup>37,43</sup> The impact of dysfunctional families must not be overlooked though.<sup>31-33</sup> Parents may play a major role in their children's initiation to drug use, while peers become the predominant influence on late initiation.<sup>44</sup> Detachment from the family and investment in friends might be more striking for adolescents with troubled family environments.<sup>43</sup> Further, adolescents with average/low self-esteem may have greater reluctance to break peer relations than do subjects with high self-esteem. The influence of dysfunctional families may also be relevant when dealing with substance use among immigrants,<sup>45</sup> although, as noted, our findings with respect to immigrant status were based on only a few individuals.

Self-confidence and self-esteem are only two of many potentially important personality characteristics. Personality traits such as self-confidence, vulnerability, impulsiveness, aggression and sensation seeking have bases in social interaction<sup>30</sup> as well as in biological neurochemical mechanisms.<sup>46</sup> Teenage boys with mixed drug abuse have been shown to have significantly lower MAO activity and higher scores on sensation seeking than non-abusers.<sup>47</sup> The MAO activity level has also been suggested to be of importance in AAS use.<sup>28</sup> It is of considerable interest that low MAO subjects with a high intellectual level have been found to express their sensation-seeking behaviour in socially acceptable ways, while low MAO subjects with low intellectual levels were shown to express their need for stimulation by means of alcohol and drugs.<sup>46</sup>

Despite the finding that AAS use has some factors in common with the use of psychotropic substances, other aspects such as the desire for improving appearance and enhancing sports performance are obviously restricted to the model of AAS use.<sup>39</sup> Perhaps reaching particular goals such as improved body appearance and sports performance are important ways of obtaining positive responses, which might be more important for individuals with average/low self-esteem than for others. Thus, subjects without high self-esteem might be more likely to use AAS if they fail to reach their goals.

Because this inquiry was cross-sectional, the results do not disclose whether the factors evaluated are predictors or consequences of AAS use. The variables high immigrant status and strength training could be proposed as predictors of use, whereas truancy, average/bad perceived

school achievement, average/low self-esteem, heavy alcohol consumption and use of tranquillisers/sedatives could either be causal factors or outcomes of use. However, in order to analyse these relationships further there is a need for longitudinal studies. Longitudinal studies are also of importance in following aspects of AAS use over time with regard to the development of long-term use, as well as dependence and the consequences of chronic AAS use. Further, in order to gain a better understanding of the processes behind AAS use there is also a strong need for qualitative research. This is of particular interest when considering the finding that there is an over-representation among boys with certain backgrounds. For instance, we have insufficient information on the social situation of boys from families with immigrant backgrounds.

Finally, the findings of this study indicate that variables such as high self-esteem and high perceived school achievement may act protectively with regard to AAS use. High immigrant status and use of prescription tranquillisers/sedatives play roles in the patterns of AAS use. Thus, factors associated with AAS use may extend to include more than strength training, truancy and alcohol consumption. Similarities between models of AAS and psychotropic substance use are mirrored in the shared variables, i.e. average/low self-esteem, use of tranquillisers/sedatives, truancy and alcohol consumption. Not surprisingly, strength training and associated aspects such as the desire to enhance body image and sports performance seem to be restricted to models of AAS use. Further research is needed in order to disclose more of the social, personality and health aspects probably involved in AAS use.

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