Original Article

Factors Associated With Anabolic Steroids Use in Bodybuilding Athletes Based on the Theory of Planned Behavior

Forouzan Rezapur-Shahkolai[1,2,3] , Babak Moeini[1,3], Javad Faradmal[4], Maryam Barati[1,5], Ehsan Vesali-Monfared[1,5]*

[1]Department of Public Health, School of Public Health, Hamadan University of Medical Sciences, Hamadan, Iran
[2]Research Center for Health Sciences, Hamadan University of Medical Sciences, Hamadan, Iran
[3]Social Determinants of Health Research Center, Hamadan University of Medical Sciences, Hamadan, Iran
[4]Modeling of Noncommunicable Diseases Research Center & Department of Biostatistics, School of Public Health, Hamadan University of Medical Sciences, Hamadan, Iran
[5]Student Research Committee, Hamadan University of Medical Sciences, Hamadan, Iran

Abstract

Background: Athletes' use of androgenic-anabolic steroids (AASs) is a significant health problem. This study aimed to determine factors associated with AAS in male bodybuilders by applying the theory of planned behavior (TPB).

Methods: Using a multistage random sampling procedure, this descriptive-analytical cross-sectional study was performed on 429 athletes participating in gyms in Qom, Iran, in 2019. The data collection tool was a questionnaire, including demographic information and questions related to TPB constructs. Data were analyzed by descriptive statistics, Chi-square test, logistic regression, and linear regression using SPSS software, version 16.

Results: The results demonstrated that 188 (48.2%) athletes had a history of AAS use. The attitude ($\beta=0.39$), subjective norm ($\beta=0.26$), and perceived behavioral control ($\beta=-0.36$) predicted 38% of the variance of intention to AAS use. Further, behavioral intention was the statistically significant predictor of AAS use among the studied athletes (OR=0.83, 95% CI: 0.78-0.87). Variables such as having friends (OR=2.06, 95% CI: 1.28-3.30) or a sports coach using AAS (OR=3.1, 95% CI: 1.58-6.42) and having a history of supplementation use (OR=5.8, 95% CI: 2.65-12.8), along with age (OR=4.3, 95% CI: 0.35-53.6) had a significantly predictive role in using AAS.

Conclusion: The findings revealed that nearly half of the studied athletes had a history of using AAS and supplements. TPB is applicable to identify the determinants of beliefs, intention, and behavior to use AAS among athletes. These findings can be useful in designing appropriate programs to prevent AAS use.

Keywords: Sports, Behavioral intention, Health promotion, Exercise psychology

Introduction

Anabolic steroids (anabolic-androgenic steroids, AASs) are among the most widely used drugs for athletes and adolescents to enhance performance and physical appearance (1). AASs are synthetic substances related to male sex hormones that affect skeletal muscle growth and male sexual development (2). The use of AAS has also been shown to cause side effects such as infertility, sexual dysfunction, edema, hair growth disorders, acne, liver problems, testicular shrinkage, myocardial infarction, left ventricular hypertrophy, cardiac dysentery, pulmonary embolism (3,4), and personality and behavioral disorders (5). Bijeh et al evaluated the knowledge, prevalence, and

side effects of AAS in athletes; they reported that lack of knowledge about the side effects of AAS, dissatisfaction with body type, the hope of winning competitions and receiving sports titles, pressure and emphasis of coaches, and attempts to attract the attention of others were the most critical factors related to drug use and AAS (6). The prevalence of using AAS and other prohibited substances among individuals and trained resistance athletes has been assessed by various studies for specific areas. It has been observed that the use of AAS in athletes is higher despite the increasing awareness of the harmful effects of AAS (7). Today, millions of athletes around the world use AAS. Surprisingly, many people who use AAS also use

other illicit drugs, including stimulants and somatotropins (growth hormones), to look bulkier or perform better. Numerous side effects, some of which are life-threatening, make AAS and illicit drugs a major public health concern. For decades, identifying predisposing risk factors for AAS and substance abuse has been the subject of numerous studies [8]. Studies indicated that athletes are either unaware of the effects of AAS or ignore the side effects and continue to use them for physical improvement, body shape, and function. This evidence suggests that the lack of awareness or negligence may be the main reason for the increased use of AAS [9]. Theoretically, psychosocial and demographic factors may influence AAS and substance abuse, and some studies have confirmed the influence of parameters such as age, level of education, frequency of exercise, mental health, and body image possibly on AAS or substance abuse. Substances have been linked to male bodybuilders [10]. Psychological factors such as attitude, subjective norm, and perceived behavioral control appear to be important in determining the likelihood of acceptance or rejection of healthy behavior [11]. The theory of planned behavior (TPB) is designed to predict and explain human behavior in specific topics. This theory, proposed by Ajzen, is based on the idea of reasoned action and indicates the occurrence of a particular behavior. Based on data in Figure 1, this theory includes attitudes toward the behavior, subjective norms, perceived behavioral control, and behavioral intention. According to TPB, the intention is the best predictor of behavior [12]. The evaluation of variables showed that the tendency to use drugs had a significant relationship with attitudes toward substance use and mental norms. Based on logistic regression analysis, attitudes and mental norms were the most influential predictors of substance use tendency [13]. Due to differences in the findings of the studies and the provided statistics, in general, the prevalence of AAS among Iranian bodybuilders has been higher than in studies abroad [5,14], highlighting the importance of more attention and studies in this field. Therefore, this study sought to determine factors related to using AAS in male athletes in the field of bodybuilding in Qom based on the TPB.

Materials and Methods

This analytical-descriptive cross-sectional study was conducted on 429 athletes participating in gyms in Qom, Iran, in August-September 2019. Considering that the prevalence of AAS use in athletes was 27% [5], at least 390 samples were required by determining the accuracy of the confidence interval as one-fifth of the prevalence rate via the sampling formula for prevalence and taking into account the design effect of 1.5. Then, 10% (39 athletes) was considered the probability of attrition; therefore, the final sample size was calculated as 429.

For sampling, the city of Qom was divided into three regions with high-, medium-, and low-economic levels based on socio-economic status and the number of clubs in each region. Then, seven, five, and four clubs from zones one, two, and three were randomly selected, respectively. Next, 24 athletes from each of the clubs (a total of 429 people) were randomly chosen, which was in line with the criteria for entering the study. This research was performed after obtaining informed consent from participants. The inclusion criteria included being an athlete who is a member of one of the men's fitness clubs under investigation in Qom and having more than six months of experience in bodybuilding. On the other hand, the exclusion criterion was the unwillingness to participate in the study.

The data collection tool was a questionnaire designed by Jalilian et al [14], and its content validity and reliability were examined in their study. Furthermore, the validity and reliability of the questionnaire have been investigated and reported by Saati Asr et al [5] and Jalilian et al [14]. The first part of the questionnaire includes demographic information such as age, weight, height, marital status, level of education, employment status, experience in sports, and championship history. The second part of the questionnaire contains questions about the constructs of the TPB. Given that knowledge and awareness about the side effects of using AAS can be practical as an essential factor in the intention or non-use of AAS, the knowledge section of the questionnaire has 18 questions and a score between 0 and 18, and a higher knowledge score represents more knowledge in this regard. Each question
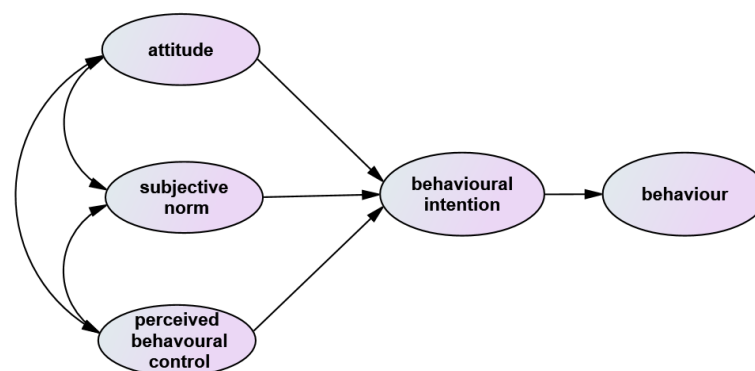

Figure 1. Theory of Planned Behavior. Source: Ajzen [12]

is given a correct score, and a score of zero is considered for each incorrect or unanswered question. In the TPB construct section, four, six, and four items were allocated to the behavioral intention, the subjective norm, and the perceived behavioral control (e.g., *I intend to recommend the use of AAS to my friends*, *if I use AAS, my coach will confirm this*, and *if I want I can quickly stop taking AAS*), respectively. In addition, the attitude construct included items (e.g., *using AAS helps me to have a stronger body*). The behavior of using AAS was assessed by asking two questions (e.g., did you have a history of using AAS? Are you currently using AAS?). It was identified as a self-report with a two-choice answer of yes and no. All inquiries related to theoretical constructs were designed with a 5-level Likert-type scale. The participating athletes completed self-administered questionnaires in the presence of the principal researcher. Out of 429 distributed questionnaires, 390 questionnaires with a response rate of 91% were filled out by the participants. Data were analyzed using SPSS software (version 16) by descriptive statistics and the chi-square test, logistic regression, and linear regression at a significance level of $P < 0.05$.

Results

In this study, 188 (48.2%) and 202 (51.8%) out of 390 individuals were AAS users and nonusers, respectively.

Table 1 presents the demographic characteristics of the participants, indicating that the mean age of participants was 25.21 ± 3.6 years, with an age range of 17-50 years. In terms of the type of the consumed substance, vitamins (64.1%) and creatine (62.2%), testosterone (41.8%), and Winstrol (26.7%) were the most abundant ones. Fitness (64.8%) and growing stronger (28.9%) were the most important reasons for using AAS.

Among AAS users, 126 (67.2%) individuals reported that their friends had a history of using AAS. Moreover, 175 (93%) participants indicated that their sports coaches had a history of using steroids. At the same time, these amounts were 86 (42.6%) and 144 (71.2%) for non-users of AAS, respectively. Based on the results (Table 1), a statistically significant relationship was found between the AAS use by friends or sports coaches and the use of AAS in the athletes in the present study ($P < 0.001$). A significant relationship was also observed between the education level and AAS use ($P < 0.007$).

Table 2 provides the mean (±standard deviation) and score range of TPB constructs. Accordingly, the behavioral intention construct had the highest mean percentage (61%), while the perceived behavioral control construct (29.5%) represented the lowest mean percentage.

Table 3 presents the logistic regression model for predicting AAS use behavior by demographic variables. Based on the findings, the probability of using AAS in participants who used supplements (OR=5.84, 95% CI: 2.56-12.8) was higher than in participants who did not use supplements significantly. Additionally, the probability of using AAS in the participants of the age group of 28-

Table 1. Demographic Characteristics of AAS Users and Nonusers (N=390)

Demographic Characteristics		AAS User (n=188)	AAS Nonuser (n=202)	P Value
Age (y)	17-27	77 (41%)	98 (48.5%)	0.35
	28-38	94 (50%)	84 (41.5%)	
	39-49	17 (9%)	20 (10 %)	
Educational level	Elementary	39 (20.7%)	29 (14.3%)	0.007
	Diploma	85 (45.3%)	73 (36.2%)	
	Academic	64 (34%)	100 (49.5%)	
Occupation	Private	140 (74.5%)	128 (63.3%)	0.005
	University student	14 (7.5%)	24 (11.8%)	
	Employee	34 (18%)	50 (24.9%)	
Marital status	Single	98 (52.1%)	122 (60.4%)	<0.001
	Married	90 (47.9%)	80 (39.6%)	
Smoking	Yes	75 (39.9%)	43 (21.3%)	<0.001
	No	113 (60.1%)	159 (78.7%)	
Alcohol use	Yes	30 (16%)	31 (15.3%)	0.86
	No	158 (84%)	171 (84.7%)	
Supplements use	Yes	179 (95.2%)	148 (73.2%)	<0.001
	No	9 (4.8%)	54 (26.8%)	
Having an AAS user friend	Yes	126 (67.2%)	86 (42.6%)	<0.001
	No	62 (32.8%)	116 (57.4%)	
Having an AAS user coach	Yes	175 (93%)	144 (71.2%)	<0.001
	No	13 (7%)	58 (28.8%)	

Note. AAS: Anabolic-androgenic steroids.

Table 2. Mean, Standard Deviation, and Score Range of the TPB Constructs (N=390)

Variables	Mean	Standard Deviation	Score Range	Mean Percentage (%)
Knowledge	9.17	3.91	0-18	50.9
Attitude towards the behavior	15.64	3.96	6-30	40.16
Subjective norms	15.90	3.86	5-25	54.5
Perceived behavioral control	8.72	2.54	4-20	29.5
Intention	13.76	4.11	4-20	61

Note. TPB: Theory of planned behavior.

38 years (OR=4.37, 95% CI: 0.356-53.6) was higher than in other age groups (as reference). Based on the results, the probability of using AAS in athletes whose friends (OR=2.06, 95% CI: 1.28-3.30) or coaches (OR=3.18, 95% CI: 1.58-6.42) used AAS was higher in comparison to participants whose friends or coaches did not use AAS (as reference). In addition to these results, participants with a history of alcohol use (OR=0.714, 95% CI: 0.394-1.29) were less likely to use AAS compared to participants without a history of alcohol use (as reference). The tendency to use AAS was higher in married participants (OR=1.55, 95% CI: 0.910-2.63) compared with single participants (as reference).

Based on the multiple linear regression analysis (Table 4), with a one-unit increase in the attitude construct, the likelihood of using AAS increased by 0.39.

Table 3. Logistic Regression Analysis to Predict the Use of Steroids Through Demographic Variables in Athletes Participating in the Study (N=390)

Demographic Characteristics		B	SE	OR	95% CI	P Value
Age (year)	17-27[a]	1.47				
	28-38	1.60	1.26	5	0.421- 59.4	>0.05
	39-49	0.945	1.30	2.57	0.198 - 33.4	>0.05
Educational level	Elementary[a]					
	Diploma	0.594	0.368	1.81	0.880 – 3.72	>0.05
	Academic	0.580	0.281	1.78	1.03 - 3.09	0.03
Occupation	Unemployed[a]					
	Worker	0.055	0.326	1.05	0.557 – 2.02	>0.05
	Employee	0.144	0.489	1.11	0.429 - 2.91	>0.05
Marital status	Single[a]					
	Married	0.438	0.271	1.55	0.910 - 2.63	>0.05
Smoking	No[a]					
	Yes	0.982	0.241	2.68	1.66 - 4.28	<0.001
Alcohol use	No[a]					
	Yes	0.337	0.303	0.714	0.394 -1.29	>0.05
Supplement use	No[a]					
	Yes	1.76	0.424	5.84	2.65 -12.8	<0.001
Having an AAS user friends	No[a]					
	Yes	0.723	0.242	2.06	1.28 -3.30	<0.003
Having an AAS user coach	No[a]					
	Yes	1.16	0.358	3.18	1.58 -6.42	<0.001

Note. AAS: Anabolic-androgenic steroids; SE: Standard error; OR: Odds ratio; CI: Confidence interval.
[a] Indicates referent B: Standardized regression coefficient.

Table 4. Predictors of the Intention to Use AAS Based on the Multiple Linear Regression (N=390)

Variables	B	SE	P Value	95% CI
Knowledge	0.486	0.24	0.53	(-0.006–0.970)
Attitude	0.39	0.04	<0.001	(0.301–0.491)
Subjective norms	0.26	0.04	<0.002	(0.170–0.362)
Perceived behavioral control	- 0.36	0.06	<0.001	(- 0.490 – - 0.233)

Adjusted R^2 = 0.38, R = 0.62, $P < 0.05$.
Note. B: Unstandardized regression coefficient; SE: Standard error; CI: Confidence interval; AAS: Anabolic-androgenic steroids.

Table 5. Predictors of the Behavior to Use AAS Based on the Logistic Regression (N=390)

Variables	SE	P Value	OR	95% CI
Perceived behavioral control	0.045	0.079	1.083	(0.991–1.184)
Intention	0.029	<0.001	0.830	(0.784–0.879)

Note. SE: Standard error; OR: Odds ratio; CI: Confidence interval; AAS: Anabolic-androgenic steroids.

At the same time, the probability of intention to use AAS with an increase of one unit in the construct of subjective norms was equal to 0.26. On the other hand, an increase of one unit in the perceived behavioral control reduced the probability of intention to use AAS by 0.36 (β = 0.36). According to the obtained data (Table 4), the attitude, subjective norms, and perceived behavioral control as the TPB constructs could predict 38% of the variance of the intention to use AAS ($P < 0.002$). The results demonstrated no statistically significant relationship between knowledge and intention to use ASS (β = 0.48, $P = 0.53$).

Table 5 summarizes the binary logistic regression results to predict AAS usage behavior. Considering perceived behavioral control and behavioral intention, the behavioral intention was the statistically significant predictor of AAS use among the studied athletes (OR = 0.83 95% CI: 0.78-0.87). It means that the likelihood of AAS use behavior was related to the intention to use AAS ($P < 0.001$).

Discussion

Overall, nearly half of the participants used AAS and supplements during their sports activities. The findings revealed that testosterone and Winstrol were the most consumed substances. Most AAS users reported that their friends or coaches had a history of using AAS and supplements. It is also important to note that the desire of athletes to grow stronger and fitness have been among the most important reasons for using AAS. Based on the findings of this study, athletes' attitudes, subjective norms, and perceived behavioral control were the three main predictive factors of the intention to use AAS, and the intention was the predictor of the behavior of AAS use.

In the present study, 48.2% of participants reported a history of AAS use, which is consistent with the result of Alidoust Ghahfarokhi (15). The use of AAS in the current study was higher than the results reported by Saati Asr et al (5), Shoshtarizadeh et al (16), and Al Ghobain et al in

Saudi Arabia (17). The study findings suggested that the prevalence of AAS use among athletes was associated with AAS use by their friends or coaches and supplements. These results are in line with those of Al Bishi & Afify (18) and MacKinnon et al (19), Razavi et al (20), and Saati Asr et al (5). Further, the presence of athletes in clubs where coaches are the consumers of AAS will increase the motivation to use steroids in athletes, suggesting that the athlete will be affected by peer pressure and a more robust behavioral pattern for using AAS.

In the current study, there was no statistically significant relationship between knowledge and the intention to use AAS, which corroborates with the findings of Razavi et al (20) and Saati Asr et al (5). Contrarily, Motaghi et al (21) investigated the prevalence of energy-enhancing drug use, awareness of its side effects, and related factors in bodybuilders and reported a significant association between knowledge about the side effects of ASS and their use. The field of AAS use showed that increasing knowledge was an effective factor that would be effective in preventive programs for AAS use in athletes.

According to TPB, one of the reasons for performing a behavior is the individual's intention to engage in that behavior. Behavioral intention, in turn, is determined by a person's attitude toward the desired behavior. Attitudes reflect a person's general beliefs and feelings about whether or not many things and behaviors are desirable. For example, "AAS increases muscle mass and strength". The findings confirmed a significant and positive relationship between attitude and intention to use AAS. According to the frequency and average of background factors such as education status, and age, as well as having friends and coaches who use AAS, it seems that demographic factors are effective in the attitude and intention to use AAS. Accordingly, attitude was reported as one of the predictive factors of behavioral intention. This is consistent with the findings of Jalilian et al (14), implying that before the educational intervention, the average intention to use AAS was 8.38, but the average intention to use AAS decreased to 6.75 after the intervention and improvement of the level of knowledge. Allahverdipour et al (22) and Arazi & Hosseini (23) found that the intention to use AAS was correlated with the attitude toward AAS use. Investigating factors affecting the intention to perform physical activities in high school female students, Baji et al (24) concluded that attitude is the strongest predictor of physical activity. The results of the current study represented that the desire of athletes to grow stronger and fitness has been among the most important reasons for using AAS and supplements. Additionally, the misconception that bodybuilders are immune to the effects of these energizers reduces the likelihood of successful preventative measures (14).

According to TPB, behavioral intention is determined by the individual's subjective norm. A subjective norm involves a person's beliefs about whether significant others think he or she should perform that behavior. For example, "a person may think that his coach and fellow gyms would like him to use AAS while exercising; however, he may expect that others will find this action dangerous and harmful". Based on the findings of the present study, a significant relationship was observed between subjective norms and the intention to use AAS. The relationship between the history of using AAS and having a peer group and friends using AAS was statistically significant. This result is in line with that of a study by Bashirian et al (25). A similar result was reported on applying TPB in predicting factors affecting adolescent drug abuse. The results are consistent with those of Aghamolaei et al (26), Allahverdipour et al (22), and Barati et al (27).

As the third predictor of behavioral intention, perceived behavioral control refers to a person's understanding of easiness or difficulty of performing a behavior. Perceived behavioral control has both a direct and a mediated effect (through behavioral intention) on behavior in the TPB. Athletes' confidence in perceived behavioral control is affected by a high level of self-control and their perceived ability to abuse substances, supplements, and AAS. Compatible with various studies that consider perceived behavioral control to be effective in consuming various illicit substances, the present study reported a significant relationship between perceived behavioral control and intention to use AAS. A high level of perceived behavioral control was identified as a strong predictor of behavioral intention among athletes. These findings corroborate with the results of Saati Asr et al (5), van Amsterdam et al (1), Allahverdipour et al (22), and Bashirian et al (25). In other words, confidence in controlling behavior through self-control protects individuals from substance abuse, as evidenced by the behavioral control understood in the present study.

The mean score of the behavioral intention was 13.76 ± 4.11 in this study, which, taking into account that it is 61% of the possible score for this construct, it can be argued that athletes had a high level of intention to use AAS. Behavioral intent indicates a person's motivation to use AAS. More precisely, a person tends to develop AAS use behavior shortly. The result of this study indicated that the athletes' attitude, subjective norms, and perceived behavioral control are the three main predictive factors of the intention to use AAS, and the intention could also predict the behavior of AAS use. Several studies identified the influence of behavioral intention on the behavior of using different types of AAS and predicted a positive and strong relationship between behavioral intention and the behavior of AAS use. In line with our results, the findings of Bashirian et al (25), Aghamolaei et al (26), and Althobiti et al (28) confirmed the effect of behavioral intention on AAS use and high-risk behavior.

The results of the current study showed that behavioral intention and perceived behavioral control have a positive and significant direct relationship with the behavior of using AAS. Intention to use AAS under the influence of constructs (attitude, subjective norms, and perceived behavioral control) can predict AAS use behavior in the

target population. Furthermore, the findings indicated that perceived behavioral control can (directly and indirectly) affect the behavior of using AAS in athletes.

One of the limitations of this study was the use of the self-report method to collect information. Considering that some athletes were likely reluctant or less confident in providing complete and accurate information, efforts were made to reassure participants that the data and personal information would remain confidential. Another limitation of this study was that many sports clubs and clubs initially prevented the entrance and interview with athletes obtained with the Sports and Youth City Organization to eliminate this barrier. Finally, to interview more athletes, we needed to spend a long time in the club, which was not pleasant for many clubs despite being licensed.

Conclusion
In general, nearly half of the studied athletes used AAS and supplements during their sports activities. TPB is applicable to identify the determinants of beliefs, behavior, and especially the intention to use AAS in athletes. It can provide the necessary information to improve athletes' preventive behaviors regarding using AAS. The findings of the current study can be employed in designing appropriate programs to prevent AAS use.

Author Contributions
Conceptualization: Forouzan Rezapur-Shahkolai, Ehsan Vesali-Monfared.
Data curation: Ehsan Vesali-Monfared.
Formal analysis: Javad Faradmal, Ehsan Vesali-Monfared.
Funding acquisition: Forouzan Rezapur-Shahkolai, Ehsan Vesali-Monfared.
Investigation: Ehsan Vesali-Monfared, Maryam Barati.
Methodology: Forouzan Rezapur-Shahkolai, Babak Moeini.
Project administration: Forouzan Rezapur-Shahkolai, Ehsan Vesali-Monfared.
Supervision: Forouzan Rezapur-Shahkolai, Ehsan Vesali-Monfared.
Visualization: Forouzan Rezapur-Shahkolai, Ehsan Vesali-Monfared.
Writing – original draft: Forouzan Rezapur-Shahkolai, Ehsan Vesali-Monfared.
Writing – review & editing: Forouzan Rezapur-Shahkolai, Babak Moeini, Javad Faradmal.

Conflict of Interests
The authors have reported no conflict of interest.

Ethical Permissions
This study was conducted with approval from the institutional review board and ethical committee (ID Number: IR.UMSHA.REC.1398.391) of the Hamadan University of Medical Sciences. Informed assent and consent were obtained from participants.

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