

Withdrawal from Anabolic Androgenic Steroids Does Not Affect Personality Characteristics

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Abstract

Objectives: The aim of this study was to investigate the relationship between anabolic androgenic steroids (AAS) and personality characteristics with the following research questions: 1) Do personality characteristics differ between AAS-abusers and an AAS-naïve comparison group? 2) Do personality characteristics differ between active AAS-abusers and former AAS-abusers? 3) Does time of withdrawal from AAS affect personality characteristics?

Design: Retrospective observational study.

Methods: Sixty men (active n=20, former n=40) seeking medical consultation for their AAS abuse were included in the study. Personality characteristics were assessed by the Karolinska Scales of Personality (KSP) inventory. Comparisons were made with an age- and gender-matched group of AAS-naïve body-builders (n=30).

Results: AAS-abusers differed significantly in their personality characteristics from the AAS-naïve control group. No major differences were found between active and former AAS-abusers. No correlations were found between personality characteristics and time of withdrawal or duration of AAS abuse.

Conclusions: Individuals with AAS abuse differ in their personality characteristics from those who have never used AAS. Withdrawal from AAS does not, however, alter personality characteristic in AAS-abusers, although the causality of this relationship is unclear, indirectly stating that AAS do not seem to alter personality characteristics in a major fashion. On the other hand, it could be argued that AAS gives a more permanent change on personality that is not affected by time of withdrawal from AAS. Thus, the present results do not explain the causality of the relationship between AAS abuse and personality characteristics and further studies are needed in order to clarify this relationship.

Keywords: Anabolic androgenic steroids (AAS); Personality disorders; Psychopathology

Introduction

The literature is still unclear about the nature of the relationship between anabolic androgenic steroids (AAS) abuse and personality characteristics. Some studies do show a significant relationship between the use of AAS and a different personality profile when comparing AAS abusers with non-abusers. This profile includes increased verbal aggression [1-3], indirect aggression [1,3], passive aggression [4], feelings of hostility [1,3,4], feelings of irritability [1], violent acts or assaults [2,3], high risk sexual behaviours [5], increased frequency of suicidal thoughts and depressive symptoms [5-7], hypomania or symptoms of mania [6], anxiety [8], paranoid symptoms

[4,8], narcissistic symptoms [4,9], less feelings of empathy [9], less confidence about their body image [10] and eating disorders [11]. However, there are also some studies showing no significant differences between AAS abusers and an AAS-naïve control group on attention [12] and other personality characteristics [7,13].

Only a few randomized controlled studies, using healthy AAS naïve male as subjects, have measured mood changes associated with supraphysiological testosterone administration. Administration of testosterone enanthate [600 mg/week for 10 weeks; i.e., ~86 mg/day for 70 days] [14] and of testosterone cypionate [500 mg/week during 14 weeks; i.e., ~71 mg/day for 98 days] [15] appears to induce no adverse mood effects in the normal man. Neither administration of testosterone [40 mg/day for 7 days] produced any mood alterations [16]. However, administration of methyltestosterone [240 mg/day for 3

days] [17] or of methyltestosterone 40 mg/day for three days followed by 240 mg/day for another three days [total of 140 mg/day for 6 days] resulted in mood changes. Su et al. [17] found that the administration induced positive moods (euphoria, energy, sexual arousal) and negative moods (irritability, mood swings, violent feelings, hostility) but also cognitive impairment (distractibility, forgetfulness, confusion) when compared to the subjects baseline. When rating the effects during six weeks of testosterone cypionate administration [total dose of 2100 mg; 50 mg/day for 42 days] the results showed that mania and ratings of liking the drug were significantly increased after testosterone treatment [18]. A study by Daly et al. [19] observed increased irritability, sexual arousal, energy and distractibility when compared to baseline. The same treatment regime also yielded increased aggressive responses on the Point Subtraction Aggressive Paradigm [18,20]. It has also been found that treatment with testosterone enanthate or nandrolone decanoate [100 mg/week or 300 mg/week for 42 days; for both drugs] results in increased feelings of hostility, resentment and aggression [21]. Limitations concerning these types of studies may be that “normal healthy males” may not be representative of the typical AAS abuser.

In addition, subjects with pre-morbid psychiatric disorders or subjects with on-going substance abuse are carefully excluded from such studies, but it might be that these individuals are more prone to abuse AAS and therefore be the ones that are more susceptible to the psychiatric effects of AAS abuse. Studies, examining psychiatric and behavioural symptoms in AAS abusers, have found an association or a high incidence (above 50% of respondents) of symptoms like; depression [22,23], anxiety [23], irritability [13] and hypomania [7]. Other symptoms that have been observed in AAS abusers are general aggressiveness [13,24], attempted suicide [22], poor self-esteem [22] but also enthusiasm [13] and increased self-confidence [25]. Some of these above mentioned studies do report a simultaneous abuse of AAS and other drugs. Hence, it is difficult to conclude whether the reported symptoms derive from the AAS abuse alone, or are an effect of other abused drugs or the co-abuse. Nevertheless, illicit use of AAS has for the past decades spread from elite athletes to the general population and is today regarded as a major health problem [26]. It is important to gain more knowledge about the relationship between AAS and personality characteristics.

The aim of this study was to investigate the relationship between AAS and personality characteristics with the specific research questions:

1. Do personality characteristics differ between AAS-abusers and an AAS-naïve comparison group?
2. Do personality characteristics differ between active AAS-abusers and former AAS-abusers?
3. Does time of withdrawal from AAS affect personality characteristics?

Methods

Participants

Participants (n=60) were adult men seeking medical consultation at a clinic for AAS-abusers at the Sahlgrenska University Hospital, Sweden, between the years 2002-2011. 20 patients reported having an active AAS abuse (i.e., active AAS-abusers) and 40 patients reported being withdrawn from AAS for 30 ± 18 months (i.e., former AAS-

abusers). The patients' self-reported status of AAS abuse was verified by laboratory steroid tests. The former AAS-abusers were divided into two subgroups depending on time since last AAS-abuse (i.e., withdrawal <1 year [n=22] and withdrawal >1 year [n=18]).

Data collection

Upon the patients' first visit to the clinic, assessment of personality characteristics was performed by the Karolinska Scales of Personality (KSP) inventory. Patients were further asked about their AAS abuse; frequency, duration and debut of their AAS abuse, as well as sociodemographic background variables such as age, educational level, civil- and occupational status, training habits and criminal record (Table 1).

	AAS-abusers	AAS-naïves	p-value
Age (yrs)	27.4 ± 6.8	25.1 ± 5.8	NS
Highest educational level	(n=57)	(n=30)	<0.001
Elementary school	15 (26%)	0 (0%)	-
High school	40 (70%)	15 (50%)	-
University	2 (4%)	15 (50%)	-
Occupation	(n=59)	(n=30)	<0.01
Working	36 (61%)	12 (40%)	-
Studying	10 (17%)	15 (50%)	-
Job seeking	6 (10%)	3 (10%)	-
Sick leave	7 (12%)	0 (0%)	-
Criminal record	-	-	NS
Yes	26 (29%)	8 (26%)	-
Civil status	(n=59)	(n=30)	NS
Single	29 (49%)	16 (53%)	-
Married, attached, in relationship	30 (51%)	14 (47%)	-

NS: Non-significant (independent Student t-tests and χ^2 -test).

Table 1: Age (mean ± SD) and educational level, occupation, criminal record and civil status (frequency [%]) for AAS-abusers (n=60) vs. AAS-naïves (n=30).

The personality characteristics of AAS-abusers answering the KSP (n=60) were compared to an age- and gender-matched comparison group of body-builders recruited from a body-building gym in Gothenburg. They trained comparable hour per week, but reported no previous or current AAS-use (n=30) Sweden. There were no significant differences in age, civil status or criminal record between the AAS-abusers (past active and past abusers) and the AAS-naïve comparison group. However, the AAS-abusers had a significantly lower educational level (p<0.001) and fewer of them worked and/or studied and more were seeking job and on sick leave (p<0.01) than the comparison group (Table 1).

Dimension	Subscales
Anxiety proneness	Somatic anxiety=Autonomic disturbances, restless, panicky Psychic anxiety=Worrying, anticipating, lacking self-confidence Muscular tension=M.tense and stiff, not relaxed Psychasthenia=Easily fatigue, feeling uneasy when urged to speed up
Vulnerability to disinhibitory psychopathology	Impulsiveness=Acting on the spur of the moment, nonplanning, impulsive Monotony avoidance=Avoiding routine, need for change and action Socialisation=Positive childhood experiences, satisfied with present life
Aggressiveness and hostility	Verbal agg.=Getting into arguments, berating people when annoyed Indirect agg.=Sulking, slamming doors when angry Irritability=Irritability, lacking patience Suspicion=Suspicious, distrusting peoples' motives Guilt=Remorseful, ashamed of bad thoughts Inhibition of agg.=Lacks ability to speak up and to be self-assertive in social situations
Other scales	Detachment=Avoiding involvement in others, withdrawn, "schizoid" Social desirability=Socially conforming, friendly, helpful or "faking good"

Table 2: Karolinska scales of personality subscales.

Inventory

Assessment of personality characteristics was performed by using the full versions of the self-reported KSP [27-29]. The inventory is developed in order to identify personality characteristics related to psychopathology. The validity and reliability of KSP have been thoroughly investigated [30]. KSP comprises 135 items with a four-point response format, divided into 15 subscales, where 13 subscales can be comprised to three dimensions (Table 2).

Statistical analyses

All individual data from KSP was transformed into normative T-scores [mean=50; standard deviation=10]. Data are presented as mean \pm standard error of the mean or as frequencies (%). Differences in scores among pairs of groups were assessed using independent Student t-tests and differences in frequencies with Chi-square tests. Correlations were calculated by Pearson product-moment correlation coefficient. Effect size was assessed by Cohen's d. The alpha level was 0.01 due to multiple comparisons, and a two-tailed level of significance was used in all statistical analyses. SPSS 20.0 (IBM Corp., Armonk, NY) was used for the analyses.

Ethical considerations

The study was approved by the Regional Research Review Board in Gothenburg, Sweden. The ethical considerations are in accordance with the Declaration of Helsinki.

Results

AAS-abusers vs. AAS-naïves

In the dimension "Anxiety proneness", the AAS-abusers reported higher level of somatic anxiety ($t=4.75$, $p<0.001$) and muscular tension ($t=4.58$, $p<0.001$) compared to the AAS-naïve comparison group (Table 3).

	AAS-abusers	AAS-naïves	Cohen's d (p-value)
Anxiety proneness			
Somatic anxiety	69 \pm 14	55 \pm 12	1.07 (<0.001)
Psychic anxiety	57 \pm 13	55 \pm 11	0.17 (NS)
Muscular tension	67 \pm 15	52 \pm 11	1.14 (<0.001)
Psychasthenia	63 \pm 15	56 \pm 11	0.53 (NS)
Vulnerability to disinhibitory psychopathology			
Impulsivity	59 \pm 15	51 \pm 12	0.59 (NS)
Monotony avoidance	51 \pm 13	53 \pm 12	0.16 (NS)
Socialisation	32 \pm 13	44 \pm 12	0.96 (<0.001)
Aggressiveness and hostility			
Verbal aggression	57 \pm 11	50 \pm 10	0.67 (<0.01)
Indirect aggression	57 \pm 10	53 \pm 10	0.40 (NS)
Irritability	55 \pm 24	51 \pm 11	0.21 (NS)
Suspicion	57 \pm 10	51 \pm 8	0.66 (NS)
Guilt	52 \pm 11	48 \pm 10	0.38 (NS)
Inhibition of aggression	46 \pm 13	53 \pm 12	0.56 (NS)
Other scales			
Detachment	50 \pm 15	46 \pm 10	0.31 (NS)
Social desirability	42 \pm 13	46 \pm 10	0.35 (NS)
NS: Non-significant (independent Student t-tests)			

Table 3: Personality variables for AAS-abusers (n=58) vs. AAS-naïves (n=30) presented as t-scores (mean \pm SD).

In the dimension “Vulnerability to disinhibitory psychopathology”, the AAS-abusers reported significantly less socialisation ($t=4.25$, $p<0.001$) compared to the AAS-naïve comparison group. In the dimension “Aggressiveness and hostility”, the AAS-abusers exhibit significantly higher degree of verbal aggression ($t=2.95$, $p<0.01$) as compared to the comparison group (Table 3).

Active AAS-abusers vs. former AAS-abusers

There were no differences in age of AAS debut or in duration of AAS use when comparing active and former AAS-abusers. However,

there was a significant difference between active and former AAS-abusers in highest educational level ($\chi^2=3.70$, $p<0.001$) and occupational status ($\chi^2=2.52$, $p<0.01$) (Table 4). There were no significant differences in personality characteristics between active and former AAS-abusers (Table 5).

Withdrawal <1 year vs. withdrawal >1 year

There were no significant differences in sociodemographic factors or personality characteristics when comparing former AAS-abusers withdrawn from AAS for less or more than 1 year (Tables 4 and 5). Neither were there no significant correlations between time of withdrawal from AAS and personality characteristics or between duration of AAS abuse and personality characteristics.

	Active AAS-abusers	Former AAS-abusers	Cohen's d (p-value)	With-drawal <1 year	With-drawal >1 year	Cohen's d (p-value)
Age (yrs)	27 ± 7	27 ± 6	0 (NS)	26 ± 6	28 ± 5	0.36 (NS)
AAS-abuse						
Age AAS debut (yrs)	20 ± 2	21 ± 4	0.32 (NS)	20 ± 3	22 ± 5	0.49 (NS)
Duration AAS (yrs)	8 ± 7	5 ± 5	0.49 (NS)	6 ± 5	5 ± 4	0.22 (NS)
Withdrawal AAS (mth)	N/A	30 ± 18	N/A	5 ± 2	24 ± 13	N/A
Highest education			(<0.001)	-	-	(NS)
Elementary school	6 (27%)	9 (26%)	-	5 (38%)	3 (16%)	-
High school	16 (73%)	24 (69%)	-	8 (61%)	13 (72%)	-
University	0 (0%)	2 (6%)	-	0 (0%)	2 (11%)	-
Occupation			(<0.01)			(NS)
Working	14 (64%)	22 (59%)	-	6 (42%)	13 (68%)	-
Studying	2 (9%)	8 (22%)	-	5 (35%)	2 (10%)	-
Job seeking	4 (18%)	2 (5%)	-	1 (7%)	1 (5%)	-
Sick leave	2 (9%)	5 (14%)	-	2 (15%)	3 (15%)	-
Criminal record			(NS)	-	-	-
Yes	7 (41%)	16 (43%)	-	5 (36%)	6 (32%)	(NS)
Civil status			(NS)	-	-	(NS)
Single	9 (41%)	20 (54%)	-	8 (57%)	10 (53%)	-
Married, attached, in relationship	13 (59%)	17 (46%)	-	6 (43%)	9 (47%)	-

NS: Non-significant (independent Student t-tests and χ^2 -test).

Table 4: Age and debut-, duration- and withdrawal of AAS (mean ± SD) and educational level, occupation, criminal record and civil status (frequency [%]) for active AAS-abusers vs. former AAS-abusers and for former AAS-abusers-withdrawal <1 year vs. former AAS-abusers-withdrawal >1 year.

	active AAS-abusers	former AAS-abusers	Cohen's d (p-value)	With-drawal <1 year	With-drawal >1 year	Cohen's d (p-value)
Anxiety proneness						
Somatic anxiety	72 ± 12	68 ± 15	0.29 (NS)	71 ± 13	66 ± 17	0.33 (NS)
Psychic anxiety	56 ± 14	58 ± 13	0.15 (NS)	58 ± 10	60 ± 15	0.16 (NS)
Muscular tension	69 ± 15	66 ± 16	0.19 (NS)	73 ± 14	63 ± 17	0.64 (NS)
Psychasthenia	64 ± 16	62 ± 16	0.13 (NS)	66 ± 12	62 ± 18	0.26 (NS)
Vulnerability to disinhibitory psychopathology						
Impulsiveness	63 ± 16	55 ± 12	0.57 (NS)	58 ± 15	54 ± 8	0.33 (NS)
Monotony avoidance	52 ± 13	50 ± 12	0.16 (NS)	53 ± 13	49 ± 12	0.32 (NS)
Socialisation	30 ± 12	33 ± 14	0.23 (NS)	32 ± 12	34 ± 15	0.15 (NS)
Aggressiveness and hostility						
Verbal aggression	60 ± 10	55 ± 11	0.48 (NS)	54 ± 10	54 ± 13	0 (NS)
Indirect aggression	59 ± 8	55 ± 10	0.44 (NS)	55 ± 11	56 ± 11	0.09 (NS)
Irritability	61 ± 14	51 ± 28	0.45 (NS)	56 ± 11	49 ± 37	0.26 (NS)
Suspicion	60 ± 10	55 ± 11	0.48 (NS)	60 ± 10	54 ± 9	0.63 (NS)
Guilt	54 ± 10	52 ± 11	0.19 (NS)	53 ± 12	52 ± 12	0.08 (NS)
Inhibition of aggression	47 ± 15	46 ± 12	0.07 (NS)	44 ± 12	47 ± 14	0.23 (NS)
Other scales						
Detachment	55 ± 14	47 ± 15	0.55 (NS)	48 ± 9	47 ± 19	0.07 (NS)
Social desirability	38 ± 12	45 ± 11	0.62 (NS)	47 ± 10	42 ± 13	0.43 (NS)
NS: Non-significant (independent Student t-tests).						

Table 5: Personality variables (KSP) for active AAS-abusers vs. former AAS-abusers and for former AAS-abusers-withdrawal <1 year vs. former AAS-abusers-withdrawal >1 year. Presented as t-scores (mean ± SD).

Active AAS-abusers vs. withdrawal >1 year

There were no significant differences in sociodemographic factors or personality characteristics between active AAS-abusers and former AAS-abusers withdrawn for more than 1 year (Tables 4 and 5).

Discussion

The literature is still unclear about the nature of the relationship between AAS abuse and personality profiles. The first aim of this study was to investigate if there was a relationship between AAS and personality characteristics. The present results showed a difference in personality characteristics between AAS-abusers and those who have never used AAS; where the AAS-abusers reported higher level of somatic anxiety, muscular tension, verbal aggression and poor socialisation. These results are in line with previous studies showing that AAS-abusers score higher than a comparison group of AAS-naïves on anxiety [8], verbal aggression [1-3] and less feelings of empathy [9]. It is, however, difficult to assess whether AAS-abuse induces psychiatric symptoms or if AAS-abuse is a consequence of psychiatric symptoms or even personality disorders. Some clinical studies suggest

that AAS-abuse may be a function of certain personality disorders [3,9], while other studies suggest that AAS-abuse induce different types of psychiatric symptoms [4,17,31-34]. Yet another possibility is that abuse of AAS and psychiatric symptoms by turns reinforce each other in a negative manner.

When interpreting the present results, it should be noted that the results are based on a sample of AAS-abusers that might not be representative. The study participants were AAS-abusers who freely had sought medical consultation at a clinic for AAS-abusers for somatic problem they thought were connected to their AAS abuse. This indicates that the participants might view, at least some aspects of their abuse, as something potentially negative. Other aspects that might have influenced the results are the fact that the groups differed in educational level and occupational status compared to the AAS-naïve group. Furthermore, the present study has not controlled for the AAS-abusers' and AAS-naïves' substance co-abuse nor coexisting psychiatric illnesses. Several survey studies do indicate that AAS intake often is associated with intake of other drugs of abuse [5,11,35-38] and that abuse of AAS is, as previously stated, correlated with psychiatric symptoms. Thus, the observed difference in personality characteristics

among AAS-abusers and AAS-naïves could be due to other factors than solely AAS.

Though the present study has some limitations, the results support the hypothesis that there exists a relationship between the use of AAS and personality characteristics. A majority of comparative studies have shown a difference in personality [1-5,7,9-11] as well as the majority of correlational studies that have found an association with psychiatric and behavioural symptoms [7,13,22-24]. However, the causality of this relationship is still not fully understood. In order to investigate whether AAS might have an effect on personality characteristics, the present study investigated if personality characteristics were altered after the withdrawal from AAS. The present result concerning causality between AAS abuse and personality characteristics, showed that personality characteristics did not differ between active AAS-abusers and former AAS-abusers. The former AAS-abusers were divided into two groups depending on whether they had been withdrawn from AAS for less or more than a year in order to verify that the former AAS-abusers had no active effects of AAS that might affect personality characteristics. The present result showed that there was no difference in personality characteristics between active AAS-abusers compared to those who had been withdrawn from AAS for more than a year. The results further showed that the personality characteristics did not differ between former AAS-abusers who had been withdrawn from AAS for less than a year compared to those who had been withdrawn from AAS for more than a year. The results showed neither significant correlations between time of withdrawal from AAS and personality characteristics, nor significant correlations between duration of AAS use and personality characteristics. These results indicate that withdrawal of AAS does not affect personality characteristics.

Conclusion

Taken together, illicit use of AAS has for the past decades spread from elite athletes to the general population and is currently regarded as a major health problem [26]. It is important, due to the widespread abuse of AAS to understand if, and how, the abuse of AAS affects personality characteristics.

The present results support earlier results that there is a difference in personality characteristics between AAS-abusers as compared to AAS-naïves. The results further indicate that withdrawal from AAS does not alter personality characteristic in AAS-abusers, nor did the present results show correlations between personality and time of withdrawal or duration of AAS abuse. The present results could be interpreted as either that AAS-abusers have different personality characteristics before the AAS-abuse and that AAS do not alter personality characteristics or that AAS give a more permanent change on personality that is not affected by time of withdrawal from AAS. Thus, the present results do not explain the causality of the relationship between AAS abuse and personality characteristics and further studies are needed in order to clarify this relationship.

Practical Implications

- AAS abuse is associated with higher level of somatic anxiety, muscular tension, verbal aggression and poor socialisation, which is important knowledge when planning treatment intervention.
- Personality characteristic is not affected by time of withdrawal from AAS, or duration of previous AAS abuse, which is important knowledge that could act as a motivating factor in secondary prevention.

- The clinical importance is that these data give a better understanding of the effects of AAS on personality, an understanding that hopefully facilitates the preventive work- and treatment of AAS-abusers.

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