

ORIGINAL ARTICLE

Perceived anabolic–androgenic steroid use is associated with perceived neuroticism

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Abstract

Ratings of the perceived personality (Five-Factor Model) of an anabolic–androgenic steroid(s) (AAS) user, an erythropoietin (EPO) user, a protein powder user and a nonuser of these ergogenic aids were investigated. The sample of 328 (236 females) non-substance use participants providing the ratings was students aged 18–52 years. They were drawn from three Norwegian higher education institutions and were randomized to four independent experimental conditions, each comprising a specific scenario/description [food ($n = 82$), protein powder ($n = 83$), EPO ($n = 83$), and AAS ($n = 80$)] similar in number, age and gender distribution. Participants in all conditions rated their protagonist on the NEO Five-Factor Inventory. Multivariate analysis of variance results indicated, consistent with our prediction, that the protagonist who consumed food was perceived as least neurotic whereas the AAS and EPO protagonists were rated similarly on neuroticism. The food and protein powder protagonists were rated similarly on openness albeit higher than the EPO protagonist. The food protagonist was regarded as more agreeable than protagonists of the ergogenic aids. Our findings indicate that perceived AAS use negatively impacts the construal of the perceived user's personality or social image. Implications of findings are discussed.

Keywords

Anabolic–androgenic steroids, doping, neuroticism, Five-Factor Model

History

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Introduction

Although use of anabolic–androgenic steroid(s)¹ (AAS) has been linked to improved sports performance, physical appearance, confidence and self-esteem (Evans, 2004; Sagoe et al., 2014a), long-term AAS use has been associated with criminality and violence as well as several debilitating physical and psychological syndromes and mortality (Bonetti et al., 2008; Dodge & Hoagland, 2011; Gårdevik et al., 2014; Kanayama et al., 2008; Pope & Kanayama, 2012; Urhausen et al., 2004) – in some users. Coupled with the above is the potential stigma or negative social perception AAS-using individuals may encounter (Chantal et al., 2013). In this regard, it has been argued that observer perspectives are important in understanding the construal of the personality or social image of persons who use substances such as heroin, cocaine, marijuana, and AAS (Chantal et al., 2009; Long 1991; Van Raalte et al., 1993).

Personality differences are central to human adaptation and evolution (Buss, 1991). The Five-Factor Model (FFM) is a reliable and well-validated classification of normal personality (Costa & McCrae, 1992a). It has five personality dimensions: neuroticism (proclivity towards negative emotion or feeling), extraversion (being sociable or outgoing), openness to experience (being creative and intelligent), agreeableness (caring and being cooperative) and conscientiousness (being efficient, well-organized, and reliable). Some merits of the FFM are the concise but adequate taxonomy of both normal and abnormal personality, the avoidance of the many problems associated with categorical diagnoses of personality, and the inclusion of scientific evidence on personality functioning into the categorization and understanding of personality and individual differences (Widiger, 2005).

Although some studies have investigated the social perceptions of the personality of AAS users and nonusers through experimental designs (Chantal et al., 2009, 2013; Schwerin & Corcoran, 1992, 1996; Van Raalte et al., 1993), to our knowledge, no study has investigated, through an experimental design, the social perceptions of the personality traits (FFM) of AAS-using individuals and nonusers as well as users of ergogenic aids such as erythropoietin (EPO)² and

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¹Anabolic-androgenic steroids: A group of hormones including testosterone and its synthetic forms used for treating several medical conditions but also used by healthy persons mainly to enhance muscle growth, improve sports performance, enhance strength, and improve appearance.

²Erythropoietin: Erythropoietin: A hormone that enhances the production of red blood cells and increases the consumption of oxygen. Some individuals, especially participants in endurance sports, use synthetic forms of erythropoietin mainly to enhance their aerobic performance.

protein powder³. Hence, there is the need for further investigations (Chantal et al., 2013).

Thus, we conducted an experiment to investigate people's perceptions of the personality of an AAS-using individual, a nonuser, and individuals who use other performance-enhancing methods. We specifically investigated observer ratings of the personality (FFM) of an AAS user, and users of EPO, and protein powder as well as an individual who uses none of these ergogenic aids.

The relationship between AAS use and aggression remains unclear (Lundholm et al., 2015). Indeed, it is not known whether aggression is a precursor or outcome of AAS use (Dunn, 2015). Nonetheless, given the association between perceived AAS use and perceived aggression (Chantal et al., 2009, 2013), as well as aggression and neuroticism (Egan, 2009), we hypothesized that the AAS user will be rated as significantly more neurotic compared to the nonuser. Moreover, we conducted pairwise comparisons to investigate differences in perceptions of personality (FFM) between users of these performance-enhancing methods as well as the nonuser. However, due to the paucity of evidence in this direction, it was not reasonable to make predictions regarding the results of this analysis. Furthermore, we investigated the influence of gender on personality ratings of the protagonist. In this direction, we hypothesized, based on previous work by Chantal et al. (2009, 2013), that gender will not have a significant effect on personality ratings of the protagonist.

Methods

Participants

The sample of non-substance use participants providing the ratings was 328 (236 female) students drawn from three institutions of higher education in Bergen, Norway. Participants were aged between 18 and 52 years ($M = 21.88$, $SD = 4.13$). They were randomized to four independent experimental conditions with each condition containing a similar number of participants: food ($n = 82$), protein powder ($n = 83$), EPO ($n = 83$), and AAS ($n = 80$).

Measures/instruments

Demographics: The scale contained items assessing respondents' ages and gender.

Scenarios: The following allegory was presented in all four conditions with differences only in what was consumed by N the protagonist: “*The alarm clock rang. N put it in a 5-minute snooze. He repeated this six times before getting up. He showered, ate breakfast and got ready to go to the reading hall. He met a fellow student at the bus stop. N said hello to his fellow student and began a lively conversation with him. The bus arrived and N entered. After a few stops, a man with a big dog got onto the bus. The sight of the big dog gave N some palpitations and discomfort. When the bus stopped at the reading hall, there was a lady with a pram next to N. N did not offer to help her off the bus with the pram, and hurried off instead. When N finally came to the reading hall, he sat down*

at his usual place. He had sorted textbooks and notes in a neat and tidy order on the shelf in front of him. At 12:00, N went for a lecture. The lecture was about various complicated theories, but N nevertheless followed closely. When N returned to the dormitory that afternoon, one of those he lived with started to clean the kitchen. Despite the fact that it actually was this person's turn to be in charge of the kitchen, N still helped to cleanup. N enjoyed training at the gym and later packed his gym bag with the items he would need for his training session at the gym. Prior to this, he took [food (1st condition), protein powder (2nd condition), EPO – a blood doping agent (3rd condition), anabolic steroid (4th condition)]. He chose the shortcut across the cemetery on the way to training, even though it was dark and the cemetery was poorly lit. This did not bother him. On his way into the gym, he noticed that posters were displayed advertising courses in creativity. N had no interest in this and did not read the posters further. He then entered the fitness center and exercised. After returning home from training, N went through his usual evening routine and went to bed”.

The allegory was presented to participants in Norwegian.

Personality: Participants in all four conditions were asked to rate their protagonist on the observer-rating version of the NEO Five-Factor Inventory (NEO FFI, Costa & McCrae, 1992a). The observer-rating version of the NEO FFI is a 60-item version of the NEO Personality Inventory (NEO PI, Costa & McCrae, 1985). It was designed for assessing the five personality dimensions: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. The observer-rating version of the NEO FFI includes descriptive statements that participants respond to on a 5-point scale ranging from 0 (very inaccurate) to 4 (very accurate). For each of the personality traits, an index score was calculated by summing participants' ratings of the protagonist on the 12 corresponding items. A total of 28 NEO FFI items are reverse-worded. Possible total scores on each personality trait ranged from 0 to 48. According to the NEO FFI population norms, mean *T*-scores for the NEO FFI is 50, and 10 points represents one standard deviation. Thus a *T*-score of 60 is one standard deviation above the mean. According to the United States general population norms (Costa & McCrae, 1992a; Rudow et al., 2014), *T*-scores equal to or higher than 56 are classified as “high”, *T*-scores ranging between 45 and 55 are regarded as “average”, while *T*-scores lower than or equal to 44 are considered “low”. Cronbach's alphas were 0.78, 0.74, 0.61, 0.76, and 0.83 for neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness, respectively.

Procedure

A questionnaire package containing an instruction (complete the questions about yourself, read the story and rate the person depicted on the 60 items listed on the following pages), one of four versions of the storyline and the observer-rating version of the NEO FFI were organized before the lecture in a consecutive order (one package containing story 1, 2, 3, and 4, and then repeated in the same order).

After acquiescing to the request to participate in the study, questionnaire packages were distributed among participants

³Protein powder: A powdered form of protein consumed as ordinary meals or as a food supplement. Protein powder is consumed to provide the body high amounts of protein thereby enhancing muscle building.

by sending several copies around. Participants were instructed to take one package (stapled together) of sheets each. Each package/copy had similar front page (instruction), preventing participants from discovering that the stories had slightly different content. In addition, participants were instructed not to talk to or consult each other during reading and completion of the questionnaires.

Participants read the above storyline which described a student's diurnal activity. However, in the story, there was one variation pertaining to what the protagonist consumed prior to training. This variation was in four forms: food (1st condition), protein powder (2nd condition), EPO (3rd condition), and AAS (4th condition). Each participant responded to only one of the four scenarios. These four conditions, therefore, yielded four independent groups of participants. Participants in all four independent groups provided their ages and gender and rated the protagonist on personality traits based on the NEO FFI.

Statistical analysis

Raw scores of the personality ratings were converted into T -scores. One-way between-groups ANOVA was used to investigate age (continuous variable) differences between participants in the four conditions. Additionally, Chi-square test for independence was used to investigate gender differences between participants in the four conditions. Multivariate analysis of variance (MANOVA) was used to investigate if personality ratings of the protagonist were influenced by: (a) the experimental condition [food (1st condition), protein powder (2nd condition), EPO (3rd condition) AAS (4th condition)], (b) gender, or (c) the interactive effect of the experimental condition and gender. Fisher's Least Significant Difference (LSD) test was used in the *post hoc* analysis to examine the differences between means. Due to the dearth of Norwegian general population norms for the NEO FFI, we compared the mean T -scores of NEO FFI personality ratings with United States general population norms (Costa & McCrae, 1992a; Rudow et al., 2014). The statistical analyses were conducted using SPSS version 20 (IBM Corp., 2011).

Results

There was no significant age difference [$F(3, 323) = 0.340$, $p = 0.797$] or gender difference [$\chi^2(3) = 0.58$, $p = 0.902$, Cramer's $V = 0.042$] between participants in the four conditions indicating that age and gender were evenly distributed across conditions.

Results of the multivariate analysis of variance revealed significant between-group differences for the experimental condition [$F(5, 322) = 6.65$, $p = 0.000$, Roy's largest root = 0.103, $\eta_p^2 = 0.094$]. Specifically, there was a statistically significant between-subjects effect on neuroticism [$F(3, 324) = 3.42$, $p = 0.018$, $\eta_p^2 = 0.031$]. Consistent with our prediction, results of the *post hoc* analysis revealed that the protagonist who consumed food was perceived as least neurotic ($M = 54.63$, $SD = 5.62$) whereas the AAS and EPO users were rated similarly on neuroticism: AAS ($M = 57.09$, $SD = 5.99$), EPO ($M = 57.55$, $SD = 7.74$). Compared with US

general population norms noted previously, mean T -scores for the protagonist who used AAS and EPO were "high" while the mean T -score of the food protagonist was "average".

Again, there was a statistically significant between-subjects effect on openness to experience [$F(3, 324) = 3.08$, $p = 0.028$, $\eta_p^2 = 0.028$]. From the *post hoc* analysis the EPO user was perceived as least open to experience ($M = 32.58$, $SD = 6.45$). On the other hand, the protein powder user and the protagonist who consumed food were rated similarly on openness to experience [protein powder ($M = 35.36$, $SD = 6.82$), food ($M = 35.23$, $SD = 7.22$)]. In comparison with general US population norms, these mean T -scores were "low".

Moreover, there was a statistically significant between-subjects effect on agreeableness [$F(3, 324) = 5.82$, $p = 0.001$, $\eta_p^2 = 0.051$]. The *post hoc* analysis revealed that the protagonist who consumed food was regarded as more agreeable ($M = 42.65$, $SD = 11.02$) than the protein powder user ($M = 39.27$, $SD = 9.11$), the AAS user ($M = 37.41$, $SD = 8.82$) and the EPO user ($M = 37.11$, $SD = 9.06$). With reference to norms from the US general population, these mean T -scores were "low".

Additionally, there were no significant differences between users of the various ergogenic aids and the nonuser on extraversion and conscientiousness. However, compared with US general population norms, mean T -scores on extraversion and conscientiousness were "low" and "average", respectively. Furthermore, in agreement with our hypothesis, there were no significant between-group differences for gender [$F(5, 315) = 0.82$, $p = 0.540$, Roy's largest root = 0.013; $\eta_p^2 = 0.013$] or the interaction of the experimental condition and gender [$F(5, 317) = 1.71$, $p = 0.131$, Roy's largest root = 0.027; $\eta_p^2 = 0.026$] (see Table 1).

Discussion

We conducted an experimental investigation of people's perceptions of the personality (FFM) of an AAS user, and users of EPO and protein powder as well as an individual who uses neither of these ergogenic aids. Consistent with our hypothesis, we found that the AAS user as well as the EPO user was perceived as more neurotic compared to the nonuser. In comparison with US general population norms (Costa & McCrae, 1992a; Rudow et al., 2014), the EPO and AAS users were rated "high" on neuroticism, while the food protagonist was rated as "average". This finding suggests that perceived AAS use is related to perceived neuroticism. Given the association of neuroticism with irritability, anxiety, distress, aggression and violence (Costa & McCrae, 1992b; Egan, 2009; Fridberg et al., 2011; Goldberg, 1993) as well as psychological syndromes such as antisocial personality disorder (Lahey, 2009), our finding corroborates evidence that perceived AAS use negatively impacts the construal of the perceived user's personality or social image (Chantal et al., 2009, 2013; Long, 1991; Schwerin & Corcoran, 1992; Van Raalte et al., 1993). With evidence of deep animosity towards AAS use and doping in Norwegian society (Skretting, 1993; Breivik et al., 2009), this finding is not surprising. Moreover, it is logical to expect people to perceive the personality of individuals who engage in illegal activities negatively. Hence,

Table 1. MANOVAs of personality trait ratings (*T*-scores) across experimental conditions.

Personality trait	Food (<i>n</i> = 82) Mean (SD)	Protein powder (<i>n</i> = 83) Mean (SD)	EPO (<i>n</i> = 82) Mean (SD)	AAS (<i>n</i> = 80) Mean (SD)	<i>F</i>	η_p^2	<i>p</i>
Neuroticism	54.63 (5.62)	56.17 (5.60)	57.55 (7.74)	57.09 (5.99)	3.42	0.031	0.018
Extraversion	38.42 (7.57)	37.75 (7.70)	37.88 (7.44)	39.06 (7.07)	0.53	0.005	0.665
Openness	35.23 (7.22)	35.36 (6.82)	32.58 (6.45)	34.46 (6.09)	3.08	0.028	0.028
Agreeableness	42.65 (11.02)	39.27 (9.11)	37.11 (9.06)	37.41 (8.82)	5.82	0.051	0.001
Conscientiousness	53.07 (9.25)	52.92 (9.48)	50.33 (8.97)	52.25 (7.70)	1.67	0.015	0.173

in the context of the recent illegalization of AAS use in Norway (Pallesen et al., 2014), this finding is not surprising.

In addition, although lower than the US general population norm (Costa & McCrae, 1992a; Rudow et al., 2014), the protein powder and food protagonists were regarded as similar on openness to experience albeit higher than the EPO user. Similarly, although the protagonist who used none of the performance-enhancing methods was perceived as most agreeable (compassionate and supportive), the AAS user like the EPO and protein powder users were also perceived as possessing agreeable traits albeit lower than the US general population norm (Costa & McCrae, 1992a; Rudow et al., 2014).

This study has notable strengths such as the use of an experimental design with an even distribution of participants on number, age and gender in experimental groups, the use of an implicit measure of prejudice in addition to a standardized measure of personality (NEO FFI), and the comparison of an AAS-using individual to a nonuser and users of other ergogenic aids (EPO and protein powder).

Nevertheless, some limitations ought to be noted. First, it is difficult to judge whether personality ratings are a function of the individual being rated or the one making the ratings (McCrae & Terracciano, 2005). Additionally, the effect sizes were relatively small. This is explainable by the experimental design (scenario) used in the present study. Differences in method (experimental scenario versus survey) and context (Norway versus United States) in the estimation of *T*-scores must also be taken into consideration when interpreting the comparison of personality *T*-scores in the present study to US norms. Moreover, different populations have different perceptions of AAS users (Van Raalte et al., 1993). Thus, like previous studies which also sampled university students (Chantal et al., 2009, 2013; Schwerin & Corcoran, 1992, 1996), it is possible that our sampling of university students might have influenced the external validity of our findings.

Future investigations should therefore sample different populations to elucidate this issue more thoroughly. We also recommend future studies with athlete participants investigating athletes' perceptions of the personalities (FFM) of AAS-using athletes. Additionally, despite the fact that we found no influence of gender on personality ratings of the protagonist, future studies using a female protagonist may contribute to the understanding of gender differences in the construal of the personality or social image of AAS users. Moreover, future studies are warranted to investigate how sources of ergogenic aids (e.g. the illicit market, coach, physician) influence the perception of the personality of users. Future studies investigating observer perceptions of the personality of

individuals who use licit performance-enhancing substances such as energy drinks, or patronize the services of clinicians such as sports psychologists in order to boost their sports performance may also elucidate this issue. Furthermore, AAS use is a global public health problem (Sagoe et al., 2014b) and there is the need for similar investigations in non-Western cultural contexts.

Declaration of interest

The authors report no conflicts of interest.

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