The Dangers of Anabolic Androgenic Steroids

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Writer's Statement

I discovered my passion for the gym during my senior year of high school. Resistance training has brought me to the best physical health in my life and strengthened my mental resolve. I was severely underweight for the majority of my life, but due to my efforts in the gym, I've gained significant lean muscle mass and I am now at a healthy body weight. My perception of self has also improved, my confidence has increased, and I am more capable of accomplishing difficult tasks, in and out of the gym.

Gym culture has a massive presence online. As a new lifter, I saw hundreds of Instagram Reels and Youtube videos, inundating me with vast quantities of information. This included different training styles, nutrition plans, as well as videos of users posting their physiques. Many of these physiques were utterly astonishing, being those of professional bodybuilders. These individuals possess incredibly muscular, unbelievably lean physiques. However, those physiques are rarely achieved without the use of steroids. Steroids, specifically androgenic anabolic steroids, amplify skeletal muscle growth and allow people to obtain "more ideal" physiques with less effort. These drugs are effective, but pose significant health risks.

As I consumed more gym related internet content, I noticed a concerning trend. Whether it was for bodybuilding or for "looksmaxxing" benefits, I witnessed many people my age openly admitting to the use of steroids on their social media platforms. This seriously concerned me, and motivated me to write this paper.

My objective with this paper is to spread scientifically backed information regarding these harmful substances to my readers. I want to show that despite the undeniable effectiveness of steroids, they carry an even greater health risk. Hopefully, the information I present can deter potential users, and prevent them from subjecting themselves to bodily harm.

Introduction

The use of androgenic anabolic steroids (AAS) is an under-discussed substance abuse issue, especially among college-aged men. AAS are a derivative group of the testosterone hormone, which stimulate muscle growth and fat loss and masculinize the user: increasing body hair and deepening the voice (Kanayama & Pope, 2018). As Kanayama and Pope note, testosterone and its effects were discovered in 1935, and methods to synthesize other AAS were developed throughout the 40′s and 50′s. Bodybuilders in these decades began to adopt androgens as a method to enhance their physiques, and saw great success in competition. During the 60′s, AAS began to spill over into other branches of athletics, especially sports requiring a high degree of muscular strength. Due to the effectiveness of steroids, the use of these compounds was banned by the Olympics in 1967. In the 1980′s, the use of AAS began to permeate into circles of casual gym-goers, as access to information about steroids and the substances themselves became much easier to obtain. Starting in the early 2000′s, the average user of steroids shifted from elite athletes and bodybuilders to the typical gym-goer (Kanayama & Pope, 2018). This shift is particularly problematic, as AAS come with a whole host of side effects, resulting in them being an unsustainable and unsafe way to build muscle for the average person.

Physical Side Effects

The side effects from supraphysiological doses of AAS pose significant health risks to the user. Scientific literature indicates six systems of the body are impacted the most by steroid use: the neurological system, cardiovascular system, liver, urinary tract, musculoskeletal system, and reproductive system (Albano et al. 2021). The effect of AAS on each of these systems can be incredibly detrimental to the user's health and quality of life. Additionally, there is evidence that many of these adverse effects are irreversible, leading to lifelong impairments (Kanayama et al. 2008). Ultimately, the lasting effects of these substances will stay with users for their entire lives, all to provide a shortcut to more muscle mass and strength.

Of the plethora of side effects caused by AAS use, the impacts on the cardiovascular system have the greatest propensity for lasting effects and mortality. In a literature review by Kanayama and colleagues, a longitudinal study that compares the mortality rates of powerlifters to a control group of males was highlighted as evidence for cardiovascular side effects. The study followed 62 powerlifters who at one point had placed in the top five of the Finnish championships, and 1,094 control males. The mortality rate of powerlifters during the study was significantly higher than that of the control, with a mortality rate of 12.9% (eight individuals), where only 3.1% of the control group (34 individuals) died. Specifically, three of the eight deaths were caused by a myocardial infarction (Kanayama et al. 2008). These deaths were more than likely due to the compromised cardiovascular systems of these athletes that had been damaged by steroid abuse. Moreover, a literature review conducted by Albano and colleagues supports this by identifying specific mechanisms linked to steroid use that increase the likelihood of cardiac failure. Specifically, prolonged use of AAS can cause cardiac hypertrophy, which reduces blood flow to the heart, and causes arrhythmias. Users of AAS also have a greater volume of atherosclerotic plaque, as compared to non-users, which restricts blood flow to the heart. The risk of a heart attack is significantly increased in steroid users due to these side effects (Albano et al. 2021). Therefore, using AAS puts the cardiovascular system at a significant risk of damage, to the point where it can endanger the life of the user.

Even though the cardiovascular damage is most life-threatening, AAS do not solely affect the cardiovascular system. Many other body systems are impacted by these substances, one of which being the reproductive system. In a 2008 literature review, researchers at Harvard Medical School concluded that the disruption to the body's natural testosterone production caused by AAS can lead males to become hypogonadal once they discontinue steroid use (Kanayama et al. 2008). This is a likely contributor to the psychological side effects of these substances. Steroid abuse is a primary cause of hypogonadism. As highlighted by a separate literature review, 20% of patients treated for hypogonadism were previous users of AAS (Albano et al. 2021). This statistic is likely lower than the actual number, due to AAS being illegal in the U.S. and patients not wanting to admit to a crime. Considering the magnitude of that number, it is evident that steroids are incredibly disruptive to natural hormone production, potentially the most disruptive of any external stimuli.

Hormonal disruption can also cause unintended physical changes in the bodies of users. As seen in the 2021 literature review by Albano and colleagues, AAS can physically alter reproductive systems of users of both sexes. As a result of hypogonadism, males can experience gynecomastia, a condition where they develop breasts, as well as testicular atrophy. Due to the supraphysiological testosterone in their bodies, females can experience breast and uterine atrophy, as well as menstrual irregularities (Albano et al. 2021). These effects can be incredibly dysphoric for users, as their physique can become mis-aligned with their gender identity, potentially resulting in physiological damage. Albano's findings are also supported by research regarding hypogonadism. In a literature review focused on long term impacts of AAS, researchers found that "dysphoric feelings associated with hypogonadism may prompt some

AAS users to resume taking AAS again and again…" (Kanayama et al. 2008, Neuroendocrine effects, p. 2). Essentially, dysphoria can lead users to prolong their cycles or develop a dependence on AAS, which magnifies the life-threatening side effects impacting other bodily systems. These studies indicate how dysphoria related to side effects of AAS can damage the psyche of users, exacerbating physical impact these substances have.

Psychological Impacts

Not only are the physiological side effects of steroids dangerous, but the psychological impacts can be equally disruptive to the user's quality of life. A literature review conducted by researchers at Harvard Medical School found high doses of AAS are linked to mood and behavioral changes, as well as depressive symptoms (Kanayama et al. 2008). Behavioral changes include hypomanic or manic episodes, irritability, aggression, and violent behavior. These side effects can put the user and the people around them at risk. The depressive symptoms are primarily reported after the user discontinues use of steroids. Post-cycle depression is one of the most dangerous psychological side effects, as several studies in this review have documented suicides, showing the psychological side effects can be just as deadly as the physical side effects. Furthermore, a literature review conducted by Albano and colleagues (2021) demonstrated that supraphysiological doses of AAS obstruct neurotransmitter activity, specifically those controlling stress response and inhibition (Albano et al. 2021). This research helps to explain the phenomenon of "roid rage," as AAS are incredibly disruptive to the neurological system. It can be concluded that the physiological disruptions from steroids are the driving force behind the psychological symptoms experienced by athletes.

The psychological side effects of AAS are dangerous enough on their own, but they can become magnified if the user develops a dependence on these substances. Illustrated by information found in a 2008 literature review by Kanayama and colleagues, users of AAS are likely to conflate their muscularity and self-esteem. This body image disturbance can lead to athletes developing a dependence on steroids in order to maintain their self-esteem (Kanayama et al. 2008). Once a person is dependent on steroids, this can have drastic consequences to their physical health. They will continue to use AAS for longer periods of time and at higher doses, magnifying the physical side effects and putting their life at risk. Moreover, users might progress to high forms of substance abuse to cope with the psychological side effects. A literature review conducted by researchers at the University of Catania in Italy shows that during periods where users discontinue steroids, they frequently self-medicate with drugs or alcohol to dull the depressive symptoms (Albano et al. 2021). This progression to other substances can be even more antagonistic, as unlike steroids, there are no redeeming physical effects of drugs or alcohol. By showing how dangerous a dependency on AAS is, these sources solidify the magnitude of psychological damage that steroids can inflict.

Motivations for Use

Despite the clear links between AAS and negative physical and psychological effects, some people still argue they are worth using. Users feel that the benefits provided by steroids in the short term are worth risking their health for. The motivations of steroid use fall into two categories: improvements to strength and improvement to physical appearance. This is highlighted by a survey conducted by researchers at the University of Connecticut. The survey aimed to understand the motivations behind using AAS and had 2,385 respondents. Of the respondents, 82.2% indicated that aesthetic improvements were a motivational factor in using steroids, and 50.0% said that increasing their physical strength was the reason (Bonnecaze et al. 2020). Users are so desperate for appearance and strength improvements that they willingly inject harmful substances into their body. This is further supported by another study conducted in the Netherlands, which sought to draw connections between body-image-centric social media

use and the use of steroids. Researchers found that there was both a negative correlation between body image and aesthetic social media content consumption, and a positive correlation between steroid use and aesthetic social media content consumption. They define aesthetic social media content as any fitness content with a focus on the subject's physique (Hilkens et al. 2021). Given these correlations, it can be concluded that negative body image increases likelihood of AAS use in individuals. This aligns with the findings of the 2020 study and reinforces the understanding that body image is a key driver in AAS users. Overall, it is evident that a negative body image may cause a person to use AAS in spite of the side effects.

The sheer effectiveness of steroids leads many users to believe the benefits justify the risks. In fact, AAS are the singular most effective method for muscle hypertrophy. To prove this, researchers tracked the fat free mass (FFM), a metric proportional to muscle mass, of men in four different groups: no exercise, testosterone with no exercise, placebo plus exercise, and testosterone plus exercise. The testosterone groups had the greatest increase, with an average percent increase to FFM of 9.1% in the exercise group and 6.1% in the no exercise group. The placebo groups grew significantly less, with a 2.1% increase in the exercise group and a decrease of 0.3% in the no exercise group (Bhasin et al. 1996). These numbers help contextualize the reason users believe steroids are worth the risk.

Steroid users, without stepping foot in a gym, will grow more muscle than someone on a rigorous resistance training program. This data indicates that if your primary goal is to build muscle and you don't care about the life-threatening side effects, you should take AAS. This is consistent with the beliefs held by users of AAS, where increasing muscle mass holds more value than their physical health. The study by Bonnecaze and colleagues (2020) demonstrated that 82.2% of AAS users indicated muscle hypertrophy as a primary reason for using AAS. Since users value muscle growth so greatly, it follows that they would risk their health for the hypertrophic effects of AAS.

AAS Awareness

There are undoubtedly people that choose to use AAS who are completely aware of the side effects, but shockingly, there are some users unaware of the harm AAS can cause. According to a literature review conducted by Kanayama and colleagues, some people believe low doses, cycling, or additional drugs like liver protectants can reduce risk. This claim is not supported by the pharmacological literature. Kanayama also indicates that the culture around AAS minimizes the side effects, resulting in users who are not making fully informed decisions (Kanayama et al. 2008). Because of misinformation regarding steroids, users are less likely to understand the breadth of risks, and may have a false sense of safety regarding these substances. Limited access to accurate information regarding AAS leads to a higher risk of abuse. The inverse is true as well; the more informed a person is about AAS, the less likely they are to abuse them.

The Adolescent Training and Learning to Avoid Steroids (ATLAS) program is an excellent example of this. ATLAS sought to measurably reduce the use of AAS among teenage athletes. Seven weekly sessions were delivered to over 1,500 high school football players, addressing AAS effects and dangers. The 9–12 month follow-up survey showed only 1.4% of participants of ATLAS used AAS, and 3.4% of the control group used AAS (Goldberg et al. 1996). What this demonstrates is people who thoroughly understand the harmful effects of AAS are significantly less likely to use these compounds. This finding corresponds to the conclusion that ill-informed people are more likely to abuse AAS. Ultimately, the scientifically proven side effects of AAS pose too much risk when thoroughly considered.

Conclusion

In summary, usage of AAS carries far too much risk to the users' health to justify the benefits. With potential to cause irreversible effects to multiple bodily systems, the use of steroids can lead to life-threatening consequences. Damage to the cardiovascular system caused by AAS is among the most life threatening, as atherosclerosis and cardiomyopathy present in long term users of AAS greatly increase the likelihood of cardiac death. Hormone imbalances caused by the surplus of exogenous testosterone have wide-reaching effects, impacting both the physical body and mental health of users. The psychological side effects are equally dangerous to the health of the user. Severe mood and personality disorders caused by the disruption to brain chemistry can cause users to transition to abusing other substances or in the worst cases, taking their own life. These side effects make it evident that AAS are far too hazardous to the user's health to justify the hypertrophy they stimulate. Spreading awareness of this fact will reduce the amount of deaths related to androgens.

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