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Anabolic-androgenic steroid use among women – A qualitative study on experiences of masculinizing, gonadal and sexual effects

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A B S T R A C T

Background: Female users of anabolic-androgenic steroids (AAS) are at risk of developing masculinizing side effects. This study explores how the development of masculinizing effects has been experienced and processed by women with current or previous AAS use.

Methods: Individual, semi-structured interviews were undertaken among 16 current or previous AAS-using women. The interviews were recorded, transcribed verbatim and thematically analyzed.

Results: Almost all of the women were introduced to AAS and advised about what substance(s) to use, how much to use and how to use it by a trusted male partner, friend or coach. For some, AAS initiation was an impulsive choice, while others wanted to overcome stagnation and/or prepare for fitness competitions. Many were unprepared for the unwanted masculinizing effects, but some experienced these to be outweighed by the desired effects. Masculinizing effects that could be mediated by hair removal or breast implants were easier to process than a deepened voice. As very few women were open with others about their AAS use, the voice change could disclose use and was often accompanied by feelings of shame and regret. Absence of menstruation and its return following cessation were used to monitor effect, normal function and safety when deciding when to start a new cycle. Clitoral enlargement gave rise to shame and reduced self-esteem, but negative emotions could be reduced by a positive partner response. Increased libido was common and gave rise to positive and negative experiences, depending on life situation, partner status, whether the partner used AAS simultaneously and whether genital changes had also been experienced.

Conclusion: Women who use AAS are at risk of developing irreversible masculinizing effects that are difficult to process and that may negatively influence self-esteem, social life and sexual function, both during and after use. More gender-specific information about women and AAS use is needed.

Background

Anabolic-androgenic steroids (AAS) are synthetic variations of the male sex hormone testosterone, with a capacity to increase muscle volume, strength and male sex characteristics (Kicman, 2008). Due to the masculinizing effects of these substances, they are foremost used by men (Sagoe, Molde, Andreassen, Torsheim & Pallesen, 2014), as well as by some female bodybuilders striving for muscle that is difficult for women to achieve without hormonal preparations (Andreasson & Johansson, 2019). During recent decades, we have seen the female body ideal changing from slim to muscular and strong (Tiggemann & Zaccardo, 2018; Van Hout & Hearne, 2016), which has propagated AAS use in other fitness disciplines and the 'gym culture' in general (Andreasson & Johansson, 2019).

As for men, the most common motivations to use AAS among women are to increase muscle mass and strength, and to reduce body fat (Abrahin, Félix Souza, de Sousa, Santos & Bahrke, 2017; Ip et al., 2010). In addition, some women have reported that AAS use was motivated by a wish to increase self-protection abilities following an experience of sexual trauma (Gruber & Pope Jr, 1999). Nonetheless, use of AAS in supraphysiological doses comes with a risk of developing mental (Gruber & Pope Jr, 2000; Piacentino et al., 2015) and physical side effects (Horwitz, Andersen & Dalhoff, 2019; Pope et al., 2014). In addition, women are at risk of developing undesired masculine traits, such as increased facial and body hair, deeper voice, reduced breast volume, enlarged clitoris and gonadal dysfunction resulting in irregular or absent menstruation and reduced fertility (Eklöf, Thurelius, Garle, Rane & Sjöqvist, 2003; Franke & Berendonk, 1997; Gruber & Pope Jr, 2000; Nieschlag & Vorona, 2015; Strauss, Liggett & Lanese, 1985).

AAS use among women is an under-researched area, and most studies that explore aspects of such use are based on small samples of women who compete in fitness, body building and strength sports (Abrahin et al., 2017; Börjesson, Gårevik, Dahl, Rane & Ekström, 2016; Grogan, Shepherd, Evans, Wright & Hunter, 2006; Gruber & Pope Jr, 1999; Ip et al., 2010; Strauss et al., 1985; Thiblin, Mobini-Far &

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Frisk, 2009). Recently, some studies have looked at AAS use in unselected samples of female users (Henning & Andreasson, 2019; Zahnow, McVeigh, Ferris & Winstock, 2017) and among women with substance use disorders (Havnes, Jørstad, McVeigh, Van Hout & Bjørnebekk, 2020; Skårberg, Nyberg & Engström, 2008), including some who were in prison (Havnes, Bukten, Rognli & Muller, 2020).

Women typically take AAS as cycles, administered orally or as injections, and women tend to use less androgen substances, lower doses and fewer substances than male AAS users. The most commonly used substances among women include stanozolol (Winstrol), oxandrolone (Anavar), methandrostenolone (Dianabol), methenolone enanthate (Primobolan) and nandrolone (Deca-Durabolin) (Abrahin et al., 2017; Börjesson et al., 2016; Ip et al., 2010; Korkia, Lenehan & McVeigh, 1996; Skårberg et al., 2008). Although women typically use lower doses of AAS than men, they are still at risk of developing side effects. Research suggests that females who use AAS are commonly concerned about masculinizing side effects, such as a more masculine appearance, a deeper voice (Grogan et al., 2006) and infertility (Abrahin et al., 2017). However, finding information about gender-specific side effects is perceived as difficult (Grogan et al., 2006; Henning & Andreasson, 2019).

The masculinizing effects of female AAS use have been thoroughly documented in classified records from the former German Democratic Republic. The administration of AAS to athletes was in that case highly organized, as part of the political strive for success. The result was that thousands of women received long-term, high-dose AAS to improve sport performance. However, this documentation is not easily accessed. Many of the women did not know what they were given or that the substances involved health risks, and how these women dealt with the reported side effects was not object of attention (Franke & Berendonk, 1997).

To date, little focus has been directed to the psychological aspects of female AAS use or to women's experiences of masculinizing side effects. This study has explored how the development of masculinizing, gonadal and sexual effects have been experienced and processed by women with current or previous AAS use, in arenas outside of elite sports.

Methods

This inductive qualitative study has explored the phenomenon of developing masculinizing side effects related to AAS use. The findings presented in this paper are derived from the qualitative part of a mixed methods study focusing on cognition, mental health and behavior among women with and without current or previous AAS use.

Context

Use and possession of AAS became illegal in Norway in 2013 through a legislation change, at which time non-prescribed use of AAS and other performance enhancing agents were incorporated into the politics of substance use. AAS users have since been entitled to outpatient substance use disorder (SUD) treatment, and national detoxification guidelines states that clinicians should provide supportive psychotherapy together with treatment of mental health symptoms and other symptoms during the AAS withdrawal phase. Outpatient treatment entails examination of physical health status, psychosocial and psychopharmacological treatment and cooperation with relevant health services and other service providers. However, male AAS users have experienced organization within the SUD treatment system to be alienating (Havnes & Skogheim, 2019), and criminalization of AAS use is seen as a barrier to contact health services. An information service was created to inform AAS users about health risks, treatment, and that reporting obligations do not include the police or employer. This service may facilitate SUD treatment seeking among male and female AAS users with health problems, but few women seek information about SUD treatment for AAS-related health problems (Havnes, Jørstad & Wisløff, 2019).

Data collection

Females who were 18 years of age and above, who reported current or past AAS use and who had completed at least one cycle of AAS were included. Participants were recruited through social media, including hidden and open user forums, posters, flyers and snowball sampling. A semi-structured interview guide was developed, focusing on motivations for using AAS, gathering of AAS-related knowledge, experiences of AAS initiation, development of mental and physical side effects, motivations for continuing or ceasing AAS use, understandings and experiences of steroid illegalization and information sharing about AAS use. The first eight interviews were conducted by author II and the last eight interviews were conducted by authors AB (2), MLJ (1) and IAH (5). The latter interviews had a more flexible design, allowing the findings from the previous interviews to be taken in account and explored further. Altogether, 16 one-hour-long, semi-structured interviews were conducted. Fifteen were audio recorded and transcribed verbatim; notes were taken during the interview that was not audio recorded.

Participants

Sixteen women participated in the study, of whom six were current AAS users and ten were previous users at the time of the interview. Mean age at participation was 30.9 (range 19–46) and mean age at AAS initiation was 23.1 years (19–32). Mean time from being introduced to AAS for the first time until AAS initiation was 15.4 months (1–48 months) and mean time from AAS initiation to cessation or interview was 7.9 years (1 month −26 years). Seven of the participants were students or worked in health and other care services, three were coaches/personal trainers, three worked in service/creative professions and three were students/worked within education. At the time of the interview, three participants had children. A few had used AAS continuously for one to a few years, but most had used cycles with breaks in between. Ten of the participants had experiences with fitness or bodybuilding competitions at the regional, national and/or international level.

Analysis

This study entailed a two-phase process of data collection and exploratory analysis, see Fig. 1. The first eight interviews were analyzed by use of systematic text condensation (Malterud, 2012) as part of a master's thesis (Innerdal, 2015). The method is considered suitable for descriptive and thematic cross-case analysis. The second phase of the data collection and analysis engaged a biopsychosocial framework (Borrell-Carrió, Suchman & Epstein, 2004) and involved 1) a thematic reanalysis of the first eight interviews with particular focus on masculinizing, gonadal and sexual effects, and 2) ongoing thematic analysis of the last eight interviews (Braun & Clarke, 2006; Pope, Ziebland & Mays, 2000). This framework proved useful for exploring biological, psychological and social factors involved in AAS use, and subjective experiences of how the effects were understood and processed by the participants. For example; in cases where voice change (biological) following AAS use was described, it was explored whether and how the change was experienced to influence mental health (psychological) and relations (social).

The ongoing analysis enabled the findings from the previous interviews to be engaged in the later interviews, for purposes of both member-checking and comparison of inter-subjective experiences (Pope, Ziebland & Mays, 2000). All authors read the interviews, IAH conducted the coding and development of subthemes, and the emerging themes were jointly discussed among the authors (IAH, AB, MLJ) (Braun & Clarke, 2006). For an overview of the emerging themes and

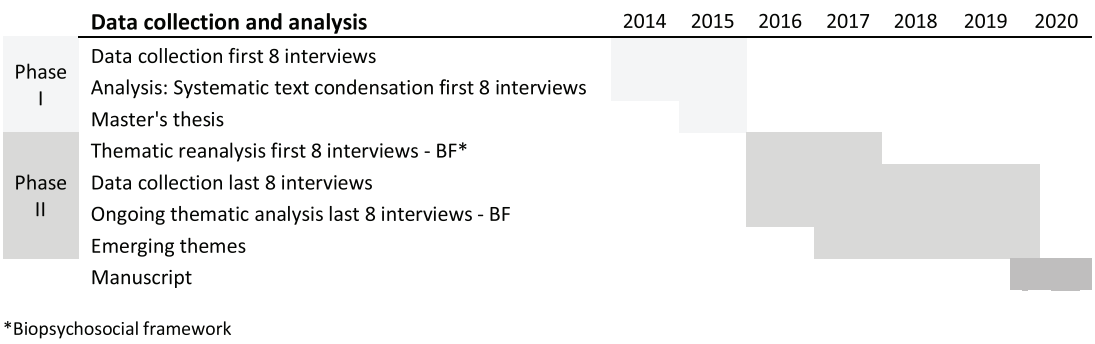

Fig. 1. Overview of timeline for phase I and II of data collection and analysis.

Table 1
Subthemes and emerging themes developed during the thematic analysis.

Emerging themes	Subthemes
Secondary motivations	Belonging
	Healthier body ideal
	Stabilize mental health
	Self-protection
	Emotional flattening - reduced empathy
Trusting male AAS users as knowledge sources	Trustworthy males
	Seller as gatekeeper of knowledge about female steroid use
	Indirect knowledge sharing between women through seller
	Online female-female sharing
	Online female-male-female sharing
	Male overruling of planned dosage
	Male overruling of desired steroid
Voice change and disclosed AAS use	Voice change as social stigma
	AAS use hidden in and outside of the gym environment
	Deeper voice mistaken for male gender
	Voice change not recognized by user
	Wellbeing and body satisfaction as acceptance of voice change
	Daily reminder of previous AAS use in family setting
Gonadal function to monitor effect and safety	Absent menstruation viewed as positive and a relief
	Absent menstruation as sign of effect
	Absent menstruation as sign of low body fat
	Return of menstruation as sign of normal gonadal function
	Return of menstruation as sign of safety before new AAS cycle
Experiences of genital change	Clitoral enlargement reduced after cycle/AAS use
	Clitoral enlargement and shame
	Clitoral enlargement and reduced self esteem
	Fear to share AAS use when consulting physician
	Atrophy of vulva/vagina understood as vaginism by physician
	Atrophy of vulva/vagina - implications for sexual activity
Experiences of increased libido depending on partner situation and genital change	Increased libido perceived as positive
	Particularly positive with partner on simultaneous cycle
	Negative without partner
	Negative with anatomic change

sub-themes, see Table 1.

Ethics

Ethical approval and research permission were obtained from the Norwegian Regional Committee for Medical Research Ethics (2013/601) and the Norwegian Centre for Research Data (39668). Verbal and written consent procedures were carried out with all participants. Emphasis has been placed on ensuring anonymity in the publication process and all names have been replaced with pseudonyms. The participants were compensated with 1000 NOK (approx. 90 Euro) for their contribution in the mixed methods study.

Results

This exploratory study among women with current or previous AAS use generated rich empirical material on phenomena related to motivations for use, process of initiation and development of desired and undesired effects related to AAS use. This article focuses on the participants' experiences with and understandings of the development of masculinizing, gonadal and sexual effects related to AAS use. Particular attention is leant to how the participants process these changes and how this may be related to motivation for use, knowledge about side effects and process of initiation.

Belonging, self-protection and emotional flattening as secondary motivations for AAS use

The primary motivations to use AAS among the women were to improve appearance by reducing body fat, to increase muscle volume and to improve strength. For some, AAS initiation was an impulsive decision that was motivated by a desire for fast results shortly after starting to exercise in a gym environment, while others initiated AAS to overcome stagnation after years of training and/or to prepare for fitness competitions.

In addition to the primary motivations, use of AAS was related to

secondary motivations that had significance beyond appearance and strength. Some of the women had eating disorders and perceived the muscular and lean body that they hoped to achieve by using AAS as healthier than their previous anorectic body ideals. Several of the women also described troubled backgrounds and mental health problems, and they reported that using AAS together with regular exercising helped them to manage their mental health and to experience belonging in a social environment.

The experiences that Maya shared exemplified this. In her early teenage years, she had suffered from anxiety and obsessive-compulsive symptoms. She had been active in various sports before she started bodybuilding in her late teens, and she initiated AAS use after two years of bodybuilding. She did well in competitions, but after more than two decades of use, a medical condition forced her to cease AAS use. When looking back, she explained how AAS use and bodybuilding improved her self-esteem, supported her mental health and gave her a sense of belonging within a social environment:

It probably was a mixture of … It was that body I wanted. But it also came from other things, like confidence, self-esteem and those things – I think those played a part. Things weren't feeling right and I sort of wanted … you know, if you become like this or that you might not be accepted or recognized, or maybe it will boost my confidence and such. Yes, I did have a lot of problems when I was younger. Suffering from anxiety among others. [..] and so I think that bodybuilding and working out was what saved me from going down that road.

When asked whether she had most of her social contact in the gym, she responded:

Yes, after a while I guess I had. Mm. You know, it was not so much the environment, but it was where I felt okay, accepted maybe. I didn't feel down like I always had.

Another participant who described a difficult background was Nora. She explained how a sexual trauma had given rise to a perceived need for self-protection and an interest in emotional flattening:

I was raped some years ago. And a lot of the reason for me starting to work out, not going out with my friends and so on, was me trying to take care of myself and be strong – and no one should ever touch me again. Of course, that also helped … strengthening my confidence and self-esteem taking steroids.

I remember telling my psychologist that I wished I was a robot, because I didn't want to have any feelings, […] …I believe a lot of it also was to run away from thoughts and feelings and … you know. That's also what I wanted at the time. Not to think or have feelings.

Reduced empathy and emotional flattening were described as undesired AAS side effects by several of the participants who had experienced them, but for Nora, feeling less was experienced as a positive and desired effect, enabling her to focus on education, work, diet, exercise and preparation for competition.

Trusting male AAS users as sources of knowledge

Almost all of the participants were introduced to AAS by a trusted male person within the gym environment; nine reported this person to be their previous or current partner, five reported a coach or friend, whereas two reported self-initiation or AAS use under other circumstances. They relied on the knowledge of these men and they trusted their decisions regarding substance type, dose and modes of administration. The majority of the women had not acquired sufficient or any knowledge about these substances and their potential side-effects, and several were unprepared for the unwanted masculinizing and gonadal effects. Nora was asked how she knew what to take and how much to take when she initiated steroid use; she responded:

I didn't have a clue. I found it to be really scary, and I saw myself as [a criminal] …that day I asked him [male friend at gym] about it [starting steroid use], I said: Is it safe…I don't want needles and things like that, right, is it something I can take that gives me a little boost, right. He knew the names of all those things, right, and then he kind of took it to his contact right, who had 'helped' many other girls, then.

Trust plays a central role in letting male AAS users decide upon what steroids to take, how much and how. The participants trusted men who used AAS themselves, who knew other women who used AAS and who provided steroids to other women.

Maya had used steroids for two decades and competed internationally. Throughout this time, she let male friends or coaches decide what she used and how. She explained who she trusted:

You trust those you know, just like … And I ask them: is this good stuff – is it any risk for me or for any other girl to … you know.

Sofie had attempted but failed to locate research literature about women and AAS use prior to initiating steroid use together with her male partner. Sofie did not discuss AAS use openly with other women at the gym, but she instead trusted the seller, who had several women on his customer list:

The man we got it from also had … he had several girls as clients, and he sort of gave a little feedback about what others said was right for them. But girls are different and have different…

The seller who claimed to have many female customers was seen as a reliable source of information about other women's experiences with AAS, and he acted as a male gatekeeper of knowledge, distributing other female users' experiences through indirect contact. This was an experience shared by other participants. One participant, however, described the opposite. In her late teens, Laura was introduced to the idea of using steroids by an ex-partner. In the wake of this, she started a targeted search for information about AAS use among women. She collected information for years before she started to implement this knowledge on herself, prior to a fitness competition:

I read about it on different scientific pages and tried to find different forums about girls who might have tried it before, but it was not easy to find. I just gathered what I found and read through and came to a conclusion. Research among men is easier to find. I ended up trying to implement the same for myself.

Her usage started with what she understood as a mild androgenic substance, Anavar, with gradually increasing doses. Eventually, she switched to injecting the steroids. She spent up to 25 h per week seeking out information and reading about others' experiences on the web. She also shared information about her own experiences during AAS cycles:

I have a cure log *on [online user forum] to kind of share my experiences with other girls if they are interested. I do spend some time on those [female* log *readers], so it is quite a bit. There aren't so many girls in there, but they have a lot of boyfriends.*

She had noticed that there were few females searching information for themselves; rather, the partners of many female AAS users searched for information about women and steroid use.

Vilde planned to participate in a fitness competition and she acquired steroids for a cycle as suggested by a male acquaintance. As she did not dare to inject herself, she asked a male friend to assist, and she described his reaction to the planned cycle:

"What the hell, that's way too little, you can't inject such small amount. That won't work for you" and I would reply "but NN said that's what I should do" "Sure, but fuck NN. Let's add some more!" So, he added more. The day after my voice cracked and has been deep ever since. And that sucks, it really sucks. Doing that he could, you know…if he had been more aware, then…so after this I started reading more about it.

Vilde found it hard to deal with the voice change. She blamed her

friend, but she took control herself and thereafter designed her own steroid cycles. Another participant, Kathrine, was in a difficult life situation, in which she had gained weight, which affected her emotional wellbeing. Earlier, she had experienced that using clenbuterol [a broncodilator approved for veterinary use and with capacity to enhance lipolysis and reduce protein degradation], compelled her to exercise. When thinking about this, she impulsively decided to try steroids for the first time. She wanted to try Winstrol, as she knew many women who had used it. However, she fully trusted the knowledge of her partner at that time, who instead gave her a different steroid with a stronger androgen effect:

The worst was that I was supposed to get Winstrol, but instead he gave me Omnadren, which is testo, so I got a little… It was not good at all. [..] Looking back, I realize that he had no clue. [..] As I didn't get Winstrol, I figured that Omnadren was probably safe for me to take, but it wasn't.

After only one cycle of unknown doses of injected Omnadren [a substance that contains four testosterone subtypes/esters], Kathrine developed severe facial acne, as well as a hoarse, deepened voice and external genital changes. To her, it was difficult to process the latter two side effects and they impacted her trust in her ex-partners' knowledge.

Voice changes and disclosed AAS use

Most of the participants hid their AAS use from friends, family members and when at the gym. However, it was common to experience various degrees of voice deepening, which could disclose AAS use. This could be difficult to process and accept, in particular among those who had trusted the knowledge of the person who had decided upon what to use and how much (see the previous examples of Vilde and Kathrine).

Anita, however, provided a contrasting perspective; she regarded a potential deepening of her voice as irrelevant, as she openly discussed her steroid use with people who were interested. She competed and started to use AAS when she experienced stagnation after several years of training. She had used six to seven AAS cycles and was content; she liked being more muscular than the other women at the gym. In a way, she regarded her own body as a signal to others that she was using steroids:

…. The word spreads. [..] …. But, in my case, it is obvious due to my size, so everybody knows.

Nora, on the other hand, did not initially realize how her voice had changed during AAS use, although she was often mistaken for a man when calling someone she did not know. She was surprised and felt bad when she heard her voice recorded:

It was very rough. But you don't hear your own voice. I remember hearing my own voice on Snapchat and thought: Oh Lord, is that me? There had been several times that I had called around, for instance for doctor appointments or ordering something, when the person on the other line thought that I was a man.

Pia felt so mentally strong when enjoying the desired effects of AAS on her body that the voice change she noticed was regarded as less important. Pia had lived with an eating disorder since her early teenage years, and fitness gave her a new body ideal, but she did not compete. She aimed to achieve a muscular body and she used various steroids (Deca-durabolin, Winstrol, Primobolan, Dianabol Primoteston/testosterone enanthate, Androxon/testosterone undecanoate), together with clenbuterol and ephedrine, and without a break for a year. Her testosterone level was higher than the normal range for men, and she developed symptoms of virilization, such as acne, a deeper voice and an enlarged clitoris. However, as she explained, none of these effects affected her, as she felt a strong sense of wellbeing during AAS use and finally felt good about her body:

I remember when my voice cracked, I had taken testo and watched myself in the mirror. I had no breakdown when I really should've had a major breakdown. It [steroids] does so much with your mentality, you get so strong. I mean – if you've been troubled with shame over your body, that you're not good enough and so on. I had actually never felt as well as I did that year when I took steroids [laughing].

Despite this, she stopped using steroids and other enhancement drugs when her mental health worsened. Pia and several of the participants who ceased use found that their voice improved after some time, but that it did not completely normalize. This served as a daily reminder of previous steroid use. For Kathrine, this reminder was especially evident every time she sang for her child:

Yes, it (the voice) has improved, but I can still notice it if I sing to my child and such, that I still have problems with it and I am not able to carry a tune…

Gonadal function to monitor AAS effect and safety

Loss of menstruation during and after an AAS cycle was common among the participants. This was often experienced as positive and some also interpreted it as a sign of low body fat:

Fantastic! [..] One can also lose the period when one has very low body fat too, so that [*absent period*] *is kind of also [a measure] of more …. (Maya)*

…I do lose my period [when using steroids]. But for me that's a big plus (Maria)…

However, menstruation was also used to monitor safety and the effect of an AAS cycle. Laura, for example, explained how she related to the reappearance of her period as an indicator for when to start a new steroid cycle:

I normally have a rule of waiting for my period plus two months, to normalize or to have a regular menstrual cycle. It's gone really well so far, maybe 2.5 months [after stopping steroid use] before it [the hormone system] has slightly stabilized.

Sofie was advised by the seller to use her first steroid cycle for three months, followed by a break of six to nine months. She and her partner initiated steroid use with the same preparations, but she used less than him and was unsure if it would provide any affect. However, her period stopped while she was using steroids and then reappeared one or two months after the steroid cycle. When asked whether she used her period to decide when to start a new cycle, she was clear that she saw it as a sign that her first cycle of steroids had worked:

Now I know that it works…

Nora, on the other hand, searched for other explanations for lost menstruation, as she was not ready to come to terms with the potentially unhealthy effects of steroid use. She had started using steroids after her first fitness competition, during a time in which she had lost considerable weight and body fat, looked rather anorectic and lost her period. After gaining some weight, her period reappeared. She started new cycles with Anavar, Winstrol and testosterone, after which she lost her period again.

Although Nora was a health worker, she did not want to attribute her lack of menstruation to her steroid use, so she found other explanations, like a low amount of body fat, hard exercise and stress:

… You don't actually want to realize that what you are putting in your mouth or injecting really is: Hello, it's actually those [steroids] doing it [disappeared menstruation], right, that it has that power over you.

She had ceased steroid use nearly two years prior to the interview, and her regular menstruation cycle had returned a few months prior to

the interview. She interpreted this as a sign that her hormone system had finally normalized.

The participants also reported that AAS influenced female body characteristics. Some experienced increased body and facial hair, but this was not challenging for them to process as it could be removed. Reduced breast volume was a commonly reported side effect and breast implants were common, in particular among those who competed; hence, they did not find this side effect difficult to process. Maya, who had used steroids for several years before she competed for the first time, explained this as follows:

It was nothing, almost like two beaver-tails [*laughter*]. *So when I competed the first time, it was kind of like this: "you have to do something about it, I need to have some kind of breasts when I'm on stage, be more female". So I did it [got breast implants].*

Experiences of genital change

Clitoral enlargement was commonly reported among the participants, particularly among those who used AAS for extended periods of time. Some explained that the clitoris change partly reversed after a cycle or over time after cessation. Even though this genital side effect was known and feared among the participants, several thought that the trusted male AAS provider had knowledge that protected them from such masculinizing side effects.

Beate provided an example of this. She was in her early twenties when she first used steroids, after having discussed it over the course of two years with several male friends and her partner, who was a bodybuilder. She had read a lot about steroid-related side effects, but she had heard about only positive effects among her male acquaintances. Before she started up with Anavar and a growth hormone, she was reassured that she would not experience masculinizing side effects. Still, it took her two years before she initiated steroid use and she explained that the fear of undesired, irreversible masculinizing side effects had dissuaded her from starting right away:

…to have a proper male voice or…the worst fear is the enlarged clit everyone is talking about. That was the worst fear.

Maya used steroids for over two decades and had developed an enlarged clitoris, about which she felt ashamed. However, when she became involved with a partner who was positive to this change, she no longer perceived it as negative. Nora also developed an enlarged clitoris. But, she had first experienced another genital change when she used Anavar, which her seller had informed her about:

The first time I used it [Anavar] I remember the guy I bought it from said: you'll feel an itch down there. I didn't think much of it, but after two-three weeks, approximately, I started feeling a little … well, it wasn't an annoying itch, but more like … well you felt that type of itch on the clitoris, but it didn't grow using Anavar, but so it did using Winstrol and testosterone. Yes. I do feel that it is slightly smaller again, but … well yes. It's still considerably enlarged.

When asked whether clitoral growth caused any problems, she responded:

No, I have sometimes had a slight pain while urinating. Yes. But not for the last months. But I do see that it has become more normalized, however it is bigger. It feels like you kind of develop some sort of a foreskin on it.

She also explained how this change, which she realized was most likely irreversible, was a daily reminder that made her feel ashamed even two years after she ceased AAS use:

… It is almost painful and disgusting to talk about because … you sort of have to, while showering and washing down there, pull it back to get a proper cleaning. For me it's almost like it has developed more skin or flesh over the … But it's not as round, bumpy or oval as it used to. That I feel that it was … but there's also something – which I've read – that you might never get it back.

Kathrine experienced irreversible change of her external genitalia after one single cycle and explained that the visible part of her clitoris had more than doubled in size by the end of that cycle:

Yes, if not even more than that [double size], plus [enlarged] labia which gave me huge complications… Well, not complications but rather poor self-confidence and I felt that I was very different down there.

When asked whether this had implications for her sexual life, she explained that it was difficult to process, and she described this as independent of her partner's experience:

Well, no, my partner is really happy. But it is more about what I'm feeling, having gone from being happy with how things were down there to…

Anita was informed by the seller that she might experience clitoral enlargement when starting to use steroids. To her, initiating steroid use was a well-considered decision based on risk taking:

No, if it comes it comes. Now there is no going back.

However, she did not experience clitoral enlargement, but she did experience other genital changes:

… It's sort of getting more sensitive and tighter. It's like it is growing together and closing up, if you're talking about the side effects down there, making it harder to do…yes, to do those things [intercourse], because it has become tighter.

When asked whether she had a partner the last years, she responded that she had tried to have a sexual relationship:

Anita: …I have tried, yes but… well. It is not any good. It's too tight.

Interviewer: So having intercourse is too painful, so it's not possible?

Anita: Yes. At least that's the side effect I have noticed. Not the enlargement of it [clitoris] but rather more sensitivity and tightness, really.

Interviewer: Is this something you would consider having checked by a gynecologist or something?

Anita: …I've tried to mention it. They just keep talking about vaginism.

She did not tell the general practitioner or gynecologist that she used AAS, because she was at that time receiving a form of sick leave benefits, which she feared might be compromised upon steroid-use disclosure. She knew that by receiving such benefits there is a duty to complete so-called agreed activities and if this is not done, the authorities could reduce or stop her benefits. She had no desire to quit using AAS if advised to do so, and she feared that a potential outcome was no income.

Experiences of increased libido

Almost all of the participants experienced that their libido increased markedly while using AAS. Most experienced a return to normal after ending a cycle, but a few experienced that their libido was temporarily reduced. However, this had different significance for the participants, depending on whether they had a partner or not, whether the partner used AAS and whether they had experienced genital changes.

Anita experienced increased sexual desire when using AAS, but, for her, this was difficult to deal with, as the anatomical change of her genitals had made intercourse impossible:

Yes, you do want to, but at the same time, as I've said, it isn't possible.

Despite this, the fitness lifestyle, the competitions and the physical improvements that she experienced while using AAS outweighed the

genital change. At the time of the interview, she had no intention of ceasing AAS use. Nora wanted to remain single when using AAS, which she explained was partly due to the previous trauma. She experienced increased libido, but she did not have a partner:

> *It [sexual desire] increased a lot when I started to use testosterone, it increased but I didn't have a partner at the time, so yeah, but it did increase. It really felt like being a man. [laughs] In puberty!*

Sofie, who used AAS in cycles together with her partner, experienced increased sexual desire as a positive, bonus effect of AAS:

> *Yes, you do get kind of a little boost and get high on yourself, increased sexual desire and such. [I used steroids] Mostly for working out, those other effects [self-esteem and sexual desire] was more like a bonus. So, it's not like I thought: I want to start using it again because of that .. [..]..when you are a couple and both of you are taking it, it matches pretty well, I can see it being a bigger problem if the partner didn't do it [use steroids]…*

Discussion

The sixteen females who participated in this study had all experienced several masculinizing side effects while using AAS and subsequently. The masculinizing effects that could be improved or reversed were easier to process than irreversible ones, such as deepening of the voice and external genital changes. It was common among the women to have been introduced to AAS by a male partner, friend or coach who they trusted. Many had not gained knowledge about AAS themselves, but had instead relied on the knowledge of these men and entrusted them with decisions about substance type, dose and mode of administration. Thus, many were unprepared for the unwanted masculinizing effects. Unexpected, irreversible masculinizing side effects resulted in feelings of shame and reduced self-esteem after cessation. However, among those still using AAS, the desired effects were experienced as outweighing the unwanted effects.

Although there were different reasons for the AAS use, primary motivations for nearly all of the participants were to achieve a fit, lean body and, for several, to increase muscle volume and strength, and for some also to compete in fitness disciplines. They were willing to use AAS and other enhancement drugs to reach their goals, as is well described in other studies (Grogan et al., 2006; Henning & Andreasson, 2019; Van Hout & Hearne, 2016). A few of the women who competed or had competed, deliberately risked or accepted masculinizing side effects to fulfill their ambitions, and may be seen as similar to the Athlete subtype of male AAS users (Christiansen, Vinther & Liokaftos, 2017; Zahnow et al., 2018). However, several of the participants in the current study described troubled backgrounds and mental health problems, with respect to which an experience of belonging and acceptance in a social group, self-protection and improved mental health were secondary motivations for using AAS. Whereas few studies have explored women's motivations for AAS use beyond body image and muscular enhancement, troubled backgrounds, mental health problems and previous sexual trauma have been described (Gruber & Pope Jr, 1999, 2000; Ip et al., 2010; Skårberg et al., 2008).

Almost all of the participants were introduced to AAS by a trusted male partner, friend, acquaintance or coach. Having an AAS-using male partner was experienced by several participants as important when starting to use AAS, as has been described in other studies (Börjesson et al., 2016; Skårberg et al., 2008). The women in the current study rarely exchanged AAS experiences openly with other women, as AAS use among women was experienced as stigmatizing. However, there were examples of participants who, as an altruistic act, shared their AAS experiences with women online and found that partners of female AAS users were more active on these forums than the women themselves. This phenomenon is described in a recent netnography that has revealed that online forum discussions about female use of AAS and other enhancement drugs are often dominated by men's voices. The authors conclude that “women seeking out advice or the experiences of other women must navigate through and around men's contributions” (Henning & Andreasson, 2019).

We also found that men who sell AAS to women may act as gatekeepers of knowledge that originates from other female AAS buyers. They can therefore indirectly distribute information between women about AAS use, related masculinizing and other side effects and how to avoid these side effects. The participants therefore perceived their level of knowledge as trustworthy, as was also the case regarding the knowledge of their AAS-using partner or friends who were active bodybuilders. This is consistent with previous research that has suggested that male bodybuilders are perceived as having knowledge about performance and image enhancing drugs, including AAS (Kraska, Bussard & Brent, 2010). Participants in the current study reported that they had acquired AAS through male providers. It is also found that few women order AAS online (Weber, Kamber, Lentillon-Kaestner, Krug & Thevis, 2015), and AAS and other enhancement drug-dealing networks are described as being based on social relations and as consisting of friends or ‘friends of friends’ within the bodybuilding subculture (Maycock & Howat, 2007; Van de Ven & Mulrooney, 2017). Such practices have been described as providing a sense of risk-reduction (Maycock & Howat, 2007), and this may also come into play for female AAS users in Norway, where selling, possession *and* use of AAS is illegal.

The trust relations between many of the female participants and their male AAS providers can be understood as similar to the trust that characterizes a patient-physician relationship (Grimen, 2009); as it is difficult to acquire information about use and effects of AAS among females, women might instead trust male AAS providers and leave decisions regarding AAS in their custody. Furthermore, based on the trust model, these women may not take precautions themselves, expecting instead that male providers have the necessary knowledge to appropriately account for and ensure female interests. However, in the current study, there were several cases in which this trust resulted in unexpected and unwanted masculinizing side effects and regret for having trusted male AAS providers to make these decisions. Therefore, it is important to make scientifically-sound information regarding the side effects of AAS use among women more available (Franke & Berendonk, 1997; Nieschlag & Vorona, 2015), so that women have enough information to make informed choices about whether they want to risk masculinizing side effects in pursuit of their ideal body.

Most of the women were secretive about their AAS use, and the voice change was therefore a mode of disclosure that led to feelings of shame and regret. These feelings were particularly pronounced among those who in somewhat impulsive decisions to initiate AAS had trusted male providers to decide over the substance(s) and amount, and who shortly thereafter experienced a voice change. We also found examples where participants did not realize that their voice had changed, as has been previously described among women contacting a hotline service (Börjesson et al., 2016) and among women who were administered testosterone medically (Huang et al., 2015). Medical or non-medical AAS use can thicken the female vocal cord, due to a high number of androgen receptors (Franke & Berendonk, 1997; Nieschlag & Vorona, 2015), leading to voice change with hoarseness and lowered pitch, with implications for talking and singing (Baker, 1999). Several of the participants in the current study reported having partly recovered their voice several years after AAS cessation, and this has also been described in a case study (Bensoussan & Anderson, 2019). Nevertheless, the voice is central for identity and, in many cases, also for work and family life. Voice change due to AAS may therefore have negative implications for perceptions of self and for social and work life.

Clitoral enlargement was commonly reported, as previously described in the literature (Franke & Berendonk, 1997; Nieschlag & Vorona, 2015), and this at times led to reduced self-esteem and/or negatively impacted sexual activity. Increased sexual drive was in

general seen as a positive side effect, which was commonly reported during AAS use. Here, it gave rise to both positive and negative experiences depending on life situation, whether the partner used AAS simultaneously and whether other masculinizing gonadal changes had been experienced. With respect to the politically motivated AAS use among female athletes in the previous German Democratic Republic, the side effect of increased libido was reported as “nymphomania” (Franke & Berendonk, 1997). However, testosterone use is also found to increase libido among women with low levels of testosterone and is sometimes used medically (Weiss et al., 2019). Sexual drive in women is more complex than the direct effect of testosterone level alone (Reed, Nemer & Carr, 2016), and this should be explored further among female AAS users.

In the current study, the reported gonadal effects of AAS use, resulting in the AAS-induced absence of menstruation and its return following cessation, were used to monitor effect, normal function and safety when deciding when to start a new cycle of AAS. Some might also have regarded a normal sex hormone function as a sign of having a healthy body, including healthy internal organs. However, women who use AAS are also at risk of developing general medical side effects (Nieschlag & Vorona, 2015; Weiss et al., 2019; Franke & Berendonk, 1997) and mental health problems (Piacentino et al., 2015). For instance, oral AAS that are often used by women, such as Anavar and Winstrol, may have liver toxic effects and may influence the regulation of cholesterol and other lipoproteins that may increase cardiovascular risk (Niedfeldt, 2018). Although female AAS users are found to be more likely than male AAS users to contact their general practitioner with concerns about side effects (Zahnow et al., 2017), few women seek information about AAS-related side effects (Havnes, Jørstad & Wisløff, 2019) and several health risks do not give symptoms.

Our findings show an unmet need for more accurate information about health risks among women who use AAS. As most of the research on effects of AAS use is based on men, there is a need for further research about physical and mental health among female AAS users. Additionally, already existing knowledge generated from such studies should become more easily accessible, especially among women. Fear appeals are shown to have positive effects on attitudes, intentions, and behaviors and effectiveness of fear appeals increased when the targeted audiences included mostly women (Tannenbaum et al., 2015). Information about masculinizing effects and how these may influence mental health and social function may therefore prevent use or delay start for some women. It may also contribute to changed behavior for some women who are using AAS, and male AAS providers. Moreover, although women may trust their male AAS provider, they should be informed that contaminated (Frude, McKay & Dunn, 2020) or counterfeit products are common (Smit et al. 2019). Women may therefore risk using more potent substances or higher doses than intended and developing more severe masculinizing effects (Franke & Berendonk, 1997) and other side effects (Frude et al., 2020).

However, the target audience may not trust focus on severe or rare side effects (López, 2014; Walker & Joubert, 2011) and the standpoint of the disseminator matters (Møller, 2016). If female AAS users are to be respected as an important user group of clinical research into AAS, then it is vital that such research is disseminated by people who users will trust. Women with AAS using experiences may therefore together with clinicians and researchers, contribute to develop trustworthy and non-stigmatizing health information. A method to reach certain groups is to use targeted ads on social media platforms leading to online public health information developed in close collaboration with previous AAS users. Currently, this has been done in Norway, with a public health campaign taking the gender dimension into account, and including informative animation videos, short clips of research findings and videos of male and female previous users describing their motivations to use AAS and experiences of desired and undesired effects (Oslo University Hospital, n.d.).

When informing clinical practice and providing education and recommendations for health professionals, it is desirable that generated knowledge about primary and secondary motivations to use AAS and related health risks among female and male users is included. This may enable treatment providers in community medical practice, or in specialized health treatment, to provide non-stigmatizing and tailored treatment, including harm reduction interventions.

Strengths and limitations

Compared to other qualitative studies among female AAS users, the current study engaged a reasonably high number of participants, among a hard-to-reach group of women. The participants had a wide range of experiences with AAS use, as they were recruited through different arenas. They also had varied backgrounds with respect to how short- or long-term their AAS use was and regarding their experiences with competition in various fitness disciplines. Some study limitations should be recognized. The study comprised both current and previous users, and it could be that some were motivated to participate as a way of sharing information about their experienced side effects so as to warn others. Most had ceased AAS use recently or were still using AAS, but a few had used AAS several years prior, so the findings may have been affected by memory bias. The interviews addressed sensitive topics and were conducted by four researchers with different backgrounds. This may have influenced the participants' reflections and their decisions to share particular experiences. The findings cannot be generalized to all women who use AAS, but should be considered as contributing to a more nuanced understanding of how some female users of AAS have experienced the masculinizing side effects, and as generating insight into some of the potential clinical implications.

Conclusion

In conclusion, this study has shown that entrusting male partners or acquaintances with decisions about AAS and regarding them as reliable sources of information about AAS use and potential side effects may increase the risk of unexpected and potentially irreversible masculinizing side effects, both because male experiences of AAS are not transferrable to women and because male providers may not themselves possess adequate knowledge. Women who use AAS are often experiencing irreversible masculinizing effects, which may have negative implications for self-esteem, social life and sexual function, both during and after use. Health professionals should be aware that these practices exist, and they should be knowledgeable about AAS use among women, especially because female patients may raise concerns about undesired effects but without disclosing AAS use. Gender-specific information about general and masculinizing side effects related to AAS use among women should be developed and made easily available for potential and current female users. Future prevention, treatment and harm reduction programs need tailored content for women.

Authors’ contribution

AB was the project manager, and AB conceived the qualitative project and developed the initial interview guide with II. II conducted the first eight interviews and analyzed them with AB. AB conducted two and MLJ conducted one interview. IAH conducted five interviews, reanalyzed the first eight and analyzed the last eight. IAH wrote the first draft of the paper, and AB and MLJ critically revised the manuscript. All authors have approved the final manuscript.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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