

Anabolic-androgenic steroid users in treatment:
Social background, drug use patterns, and criminality.

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Kurt Skårberg

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ABSTRACT

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This dissertation is based on interviews with 36 users of anabolic androgenic steroids (AAS) seeking help at an addiction centre. A comparison group of 277 gym clients were asked to answer a questionnaire. The dissertation consists of four studies.

Histories of a troubled childhood as well as current social disadvantage were both more frequent among the AAS users. Users also reported poor relationships with their parents and almost half of them had experienced physical or mental abuse. The AAS user's experiences from school were mostly negative, and included concentration problems, boredom and learning difficulties. Their current circumstances included abuse of other drugs, battering of spouses and other crimes such as assault, illegal possession of weapons and theft.

There was significant variation in the development of drug use in relation to social background, onset of drug use, relationship to AAS use and experience of AAS effects. All patients had initially experienced positive effects from AAS but, over time, the negative experiences had outweighed the positive effects. All patients were dedicated to excess training and took AAS in combination with gym training, indicating that the use of these drugs is closely related to this form of training.

The results indicated that a history of polysubstance use among the patients was frequent. Over half were using drugs of abuse and also taking various other pharmaceuticals. Almost half of the patients also used human growth hormones. Moreover, almost half of the interviewed persons were drinking alcohol to a hazardous or harmful extent. The most common reason given for using AAS and other hormones was to increase muscle mass and strength, but some participants also used insulin as a mean of losing fat. Cannabis was used to improve sleep, heroin to decrease pain and amphetamine to increase endurance and burn fat. Our data suggest that most of the current AAS users who have been admitted to a treatment programme are multiple drug users with polysubstance dependence.

The criminal activity level increased significantly for the majority of the participants after they began using drugs. This was particularly obvious in the two subgroups who started their involvement with drugs by using AAS. Crimes of violence and weapon offences showed the greatest increases in incidence after drug use was initiated. The study also showed a significant decrease in criminality after treatment, particularly among participants who started their drug use with AAS. The results suggest that there is an association between the use of AAS and criminality, in particular with respect to crimes of violence and weapon offences, and that this criminality is enhanced when AAS are combined with other drugs of abuse.

This dissertation shows that AAS users often have a history of and a current problematic social situation, that AAS use is often combined with a polysubstance drug use, that AAS use is connected to criminal activities including crimes of violence and weapon crimes, and that AAS use can be a gateway to the use of other drugs of abuse.

Keywords: Anabolic androgenic steroids, narcotics, drugs of abuse, alcohol, pharmaceuticals, dietary supplements, social background, criminality

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LIST OF PUBLICATIONS

This dissertation is based on the following original papers, which will be referred in the text by their Roman numerals:

- I. Skarberg, K. & Engstrom, I. (2007) Troubled social background of male anabolic-androgenic steroid abusers in treatment. *Substance Abuse Treatment, Prevention, and Policy*, 2, 20.
- II. Skårberg, K., Nyberg, F. & Engström, I. (2008) The development of multiple drug use among anabolic-androgenic steroid users: six subjective case reports. *Substance Abuse Treatment, Prevention, and Policy*, 3, 24.
- III. Skarberg, K., Nyberg, F. & Engstrom, I. (2009) Multisubstance Use as a Feature of Addiction to Anabolic-Androgenic Steroids. *European Addiction Research*, 15: 99–106.
- IV. Skarberg, K., Nyberg, F. & Engstrom, I. Is there an association between use of anabolic-androgenic steroids and criminality? *Submitted*.

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LIST OF ABBREVIATIONS

AAS	Anabolic androgenic steroids
AC	Addiction clinic
ANOVA	Analysis of variance
AUDIT	The alcohol use disorders identification test
BRÅ	The Swedish national council for crime prevention
CLA	Conjugated linoleic acid
DHT	5 α -dihydrotestosterone
DSM IV	Diagnostic and statistical manual of mental disorder, 4 th edition
FASS	The Swedish drug catalogue
FSH	Follicle stimulating hormone
GDR	German Democratic Republic
GHB	Gamma-hydroxybutyric acid
GRH	Gonadotropin-releasing hormone
HCG	Human chorionic gonadotropin
HDL	High-density lipoprotein
hGH	Human growth hormone
HMB	Beta-hydroxy-beta-methylbutyrate
HPG-axis	Hypothalamic-pituitary-gonadal axis
IGF-1	Insulin like growth factor-1
LDL	Low-density lipoprotein
LH	Luteinizing hormone
LSD	Lysergic acid diethylamide
SASB	Structural analysis of social behavior
SCL-90	Symptom checklist-90
SHBG	Sex hormone binding globulin
SPSS	Statistical package for the social sciences
TCI	Temperament and character inventory
THC	Tetrahydrocannabinol (cannabis)
THG	Tetrahydrogestrone

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PREFACE

Let me start off by giving a background to this dissertation. At the end of the 1980s, I damaged my back and after a number of medical examinations I was advised to undergo arthrodesis surgery, since the injury was regarded as incurable. I did not follow this advice, instead I went to a chiropractor and it was in conjunction with that and upon his advice that I started training at a gym.

For about a year, I trained at a gym although I still suffered from constant back pains and took high doses of the painkillers I had been prescribed. One morning during the Christmas break, after one year of intensive training, I woke up and felt that something strange had happened - the pain had disappeared. I continued training at a gym where a couple of competitive bodybuilders also trained. In the café they used to talk about something they called methandrostenolone but at the point in time I did not have a clue what type of substance they were talking about. Another person who trained at the same gym was a neighbour of mine and he physically abused his wife. It emerged that he was using something called anabolic steroids. At this time I was training to become a gym instructor with back problems as my particular area of interest. It was in this context that my interest in doping substances grew and I quite quickly learnt that they were called anabolic-androgenic steroids (AAS) and that there were many substances included under this term.

Later when I was studying to become a social worker I decided at an early stage that my Bachelor Dissertation would be about the treatment of AAS users. At the end of my course, we all did a six-month traineeship and I was given the opportunity to do mine at the Addiction Centre (AC) in Örebro. There I met AAS users who often suffered from severe mental problems. At the same time I tried to read any literature I could find on the subject, which was not very much. Towards the end, I told one of my patients that my traineeship would come to an end six weeks later. He said that this was all right but then failed to turn up to the sessions we had planned after that. However, it did not take long before his father called and told me that they had found him in a hotel room sleeping in a bath where he had tried to take his own life after having drunk alcohol mixed with different medicines. His suicide attempt failed because he was so big that he got stuck in the bath instead of sinking down under the water as he had planned. When I met him again he told me that when he had found out that I would not be working at the clinic for much longer, he had become very upset and felt that I, just like everybody else in his life, had let him down which is why he had given up on life. This taught me to never break off contact with an AAS user before the user has started talking about terminating the course of treatment him/herself.

I wrote my Bachelor Thesis on AAS and after I had completed my course I started studying psychiatry because I understood that this was something I had to do if I wanted

to work with AAS users. During my course I got a temporary job at AC since they lacked knowledge on steroid users. My employment contract at the clinic was extended and I began to realise that there really was insufficient knowledge about AAS. This led me to start collecting information on the problem hoping that this would improve my and other's knowledge on the treatment of AAS users. Ingemar Engström at the Psychiatric Research Centre in Örebro became interested in our work and the thoughts we had regarding the collection of data on AAS users. He helped us to put our ambitions in some order so that they became scientifically useable. This work subsequently led me to this dissertation.

1. INTRODUCTION

1.1 Definition and characterisation of AAS

Anabolic-androgenic steroids (AAS) are synthetic derivatives of the male sex steroid testosterone (Brower 2002). Testosterone is synthesized in the body from cholesterol and the biosynthesis takes place in the Leydig cells of the testicles and in the adrenal glands in males (Mottram & George 2000) and in the adrenal glands and the ovaries in females (Talih, Fattal & Malone 2007). Production is governed by a negative feedback mechanism of the gonadotropins, luteinizing hormone (LH) and follicle-stimulating hormone (FSH), which are formed in the frontal lobe of the pituitary gland (Ganrot, Grubb & Stenflo 1997).

The term AAS includes both testosterone and other androgenic hormones whose structure is similar to that of testosterone (Marshall 1988). Testosterone has mainly two effects on the body. Firstly, the anabolic effect which mainly promotes protein synthesis, decreased nitrogen excretion, muscle growth (Pope & Katz 2003), erythropoiesis, the stimulation and inhibition of skeletal growth in the young. Secondly, the androgenic effect which is responsible for the development and maintaining of the secondary sex characteristics, for example changes in hair distribution, physical changes, genital size, and sperm production (Mottram & George 2000). No AAS are purely anabolic. Instead steroids of this type nearly always have a certain androgenic effect which leads to undesired side effects of different types (Kochakian 1993; Marshall 1988).

Hence, the correct term is anabolic-androgenic steroids (AAS), which is the term that will be used in this dissertation.

1.1.1 Different classes of AAS

A classic AAS substance is testosterone that has metabolised in the body into dihydrotestosterone, androstanolone, estradiol, androsterone or androstenedione (Lukas 1993). Testosterone has a short free-circulating half-life and in order to counteract the rapid rate of metabolism, a number of synthetic AAS have been designed to have a longer half-life. Over 1.000 testosterone derivatives have been produced (Hall 2005). Just like testosterone AAS have a four-ringed structure with 19 carbon atoms (Talih et al. 2007). AAS differ from testosterone through the addition of ethyl, methyl, hydroxyl, or benzyl groups at one or more sites along the synthetic steroid structure (Graham, Evans, Davies & Baker 2008).

AAS substances are sometimes divided into the following categories; C-17 β -ester derivatives, C-19-nortestosterone derivatives and C-17 α -alkyl derivatives (Clark & Henderson 2003).

1. C-17 β -ester derivatives, which usually include injectable variations, are AAS with a rapid effect that are hydrolysed in to free testosterone and which can subsequently be metabolised into 5 α -dihydrotestosterone (DHT) or aromitised into oestrogen. An esterification of the substance gives a thicker solution which postpones the breakdown and prolongs the effect of the testosterone when taken as an intramuscular injection. This group, which is easily aromatised in to 17 β -estradiol, includes substances like testosterone propionate, cypionate, enanthate and undecanoate. AAS from this group are less toxic for the liver and cholesterol levels than the third group.
2. 19-nortestosterone derivatives are AAS with a greater long-term effect. To this group belong for instance nandrolone decanoate, methenolone enanthate and nandrolone phenylpropionate. This mixture has less androgenous activity in relation to the androgenic receptor than 5 α -dihydrotestosterone. Nandrolone decanoate can be aromatised into estradiol to a lesser extent than the substances in the first group. AAS from this group are also relatively harmless for the liver and in relation to the cholesterol turnover.
3. 17 α -alkyl derivatives, which are taken orally since alkylation diminishes the first passage in the liver, are more toxic for the liver and cholesterol levels. Substances like methandrostenolone, stanozolol, oxymetholone, methyltestosterone, norethandrolone, flouxymesterone, danazol, oxandrolone and ethylestrenol belong to this group. It is not known whether substances in this group are converted into 5 α -dihydrotestosterone or oestradiol (Clark & Henderson 2003; Kuhn 2002).

1.1.2 Veterinary AAS and other veterinarian drugs

It is a well-known fact that AAS users also use substances meant for animals. Veterinarian drugs that are also used by humans are drugs like boldenone and trenbolone (Bahrke, Yesalis & Wright 1990b; Hall 2005; Parkinson & Evans 2006). Other AAS widely used in veterinary medicine are testosterone propionate, stanozolol, oxymetholone, testosterone enantate and mibolerone (Kochakian & Yesalis 2000b). Another veterinarian drug that is often used is clenbuterol (Eklof, Thurelius, Garle,

Rane & Sjoqvist 2003). Little is known about what impact these substances have on the side effects of AAS.

1.2 The history of AAS

It has been known for centuries that the castration of men does not only lead to a decline in fertility but also to the loss of secondary male sex characteristics (Spencer 1946). The latter was later used as a reason to castrate young choirboys so that they would keep their light soprano voices as well as to produce eunuchs who guarded the harems where women lived (Kochakian 1988).

Numerous attempts were made in the 19th century to show that the testicles could produce substances that increased both physical and mental wellbeing. The first piece of the puzzle of how this is regulated was laid in 1849 when Arnold Adolf Berthold through a series of experiments with transplanted testicles from castrated roosters found that the testicles contained a substance that was transported via the bloodstream and had an impact on both behavioural and sexual characteristics. His findings were, however, questioned for over sixty years (Freeman, Bloom & McGuire 2001; Kochakian 1988). In 1889, a respected French physician, Charles Edouard Brown-Sequard announced that he had increased his physical strength, mental ability and appetite by injecting under his own skin a liquid containing some water mixed with blood from a testicle vein, sperm and juice pressed out of crushed testicles immediately after removing them from a dog or guinea pig (Brown-Sequard 1889). This substance became very popular and at the end of 1889 over 12,000 physicians had administered Brown Sequard's liquid, and chemists who manufactured and sold the substance became very wealthy from selling the new "Elixir of life" (Freeman et al. 2001).

The physiologist Oskar Zoth was the first to suggest injecting athletes with a hormonal substance since it had been proved that the substance increased muscle strength. He and his partner Fritz Pregl injected themselves with extract from bull testicles and then measured the increase in strength in a middle finger in 1896. They were later awarded the Nobel Prize in Chemistry in 1923 (Dotson & Brown 2007).

In the 1890's Lode succeeded in redoing and confirming Bertholdt's results but this was ignored at the time (Lode 1891, 1895). It was not until Pezard succeeded in redoing the experiment with castrated roosters and when he transplanted a small piece of rooster testicle and put this piece in the abdomen of the same rooster that Bertholdt gained recognition (Pezard 1911, 1912). He concluded, just as Bertholdt had done, that the testicles contained a substance that was transported through the bloodstream (Kochakian 1988). These blood-borne factors were named hormones (which means to excite or arouse) (Starling 1905).

Based on the above conclusion, Casimir Funk and colleagues presumed in 1929 that the active substance (the hormone) must be cleared in the kidneys for it to be subsequently seen in the urine. The experiment that followed was carried out on roosters that had been castrated at two months of age. After a couple of days, the roosters showed clear signs of gender transition, their combs were lying to one side and the colour had changed from red to a pale pink. After injecting the roosters with urine extract, their combs grew and became red again already after a couple of days, and after a period of treatment the roosters behaved as if they had never been castrated (Funk, Harrow & Lejwa 1930).

The pharmaceutical industry was interested in developing this substance and a competition was started where three researchers tried to isolate the hormone from the testicles. In 1931, Adolf Butenandt became the first to isolate 15 mg of pure substance (Butenandt & Tscherning 1934b) which was called androsterone (andro="male", ster="sterol", one="ketone") (Freeman et al. 2001). He obtained its effects using 15.000–25.000 litres of urine that he took from a group of policemen (Butenandt 1931; Butenandt & Tscherning 1934a; Kochakian 1988).

Freeman, et al. 2001, describe in their article "A brief history of testosterone" how several researchers who were independent of each other determined that the testicles had a greater androgenous factor than urine and in 1935 Karoly Gyula David and colleagues published their classic article "On Chrystalline Male Hormone from Testicles" where the term testosterone was coined for this new hormone (testo="testes", ster="sterol", one="ketone") (David, Dingermanse, Freud & Laqueur 1935). The synthesis of testosterone came later that year when Butenandt and Hanish published their article "A Method for Preparing Testosterone from Cholesterol" (Butenandt & Hanisch 1935). A week later Ruzicka and Wettstein published their article "On the Artificial Preparation of the Testicular Hormone Testosterone" (Andro-sten-3-one-17-ol) (Ruzicka & Wettstein 1935). Ruzicka and Butenandt were awarded the Nobel Prize in Chemistry in 1939 for their work (Freeman et al. 2001).

It was through the intensive research that followed that it became increasingly clear that the male body produced more than one substance with male hormonal activity. The testosterone molecule can give rise to approximately 540 different substances that together were given the name androgens (andro="male", gen="to produce") (Kochakian 1988).

Androsterone, androstendienone and testosterone became characterized and synthesized from cholesterol in 1935 (Kochakian & Yesalis 2000a), at the same time that Kochakian reported that androgens stimulated the protein anabolic process which could be used as an androgenous therapy to facilitate the building up of tissue and stimulate growth after illness (Kochakian 1988). This was then used in medical treatment both on people and animals (Bahrke et al. 1990b). Clinical trials were already

underway in 1937 where people were injected with testosterone propionate, a slow release derivative of testosterone, and also given oral doses of methyltestosterone (Kochakian & Yesalis 2000a).

During the 1940s, there was a lot of discussion in clinical literature on the possible link between androgens and muscle growth and the possible use in sports. A well known book “The Male Hormone” was published in 1945 (De Kruif 1945), and also translated and published in Swedish called [“Hormonerna för mannen”] (De Kruif 1947). In this book, Paul de Kruif included information that made it easier for athletes to understand the latest findings on these substances (Hoberman & Yesalis 1995). During the Second World War, AAS were developed further by the German state to be used on soldiers in action. The idea was to build up an army of supermen (Marshall 1988).

At the end of the 1940s and at the beginning of the 1950s, bodybuilders started experimenting with testosterone substances and news about the effectiveness of these substances spread quickly among athletes (Hoberman & Yesalis 1995). Different testosterone substances were tried in medical treatment and used for the treatment of severe psychoses, melancholy and depression with varying results (Bahrke et al. 1990b). Athletes from the Soviet Union and East Germany started using AAS in the 1950s. This paved the way for the use of AAS in the Olympic Games. AAS were subsequently used a great deal by athletes and during the next decades the hormone was modified into derivatives that possessed more anabolic qualities (Dotson & Brown 2007).

It seems that during the 1950s and 1960s, the illegal use of AAS was primarily to be found among athletes, both men and women (Kashkin & Kleber 1989). During the 1960s, one of the biggest pharmaceutical experiments in history started in the German Democratic Republic (GDR), where the government promoted the use of drugs in sports, especially the use of different types of AAS substances. Previously confidential documents describe how physicians and scientists in the GDR administered different drugs to several thousand athletes, including teenagers of both sexes, for more than three decades. There were especially many young girls and women who participated in this programme since they obtained the best athletic effect from AAS and similar substances (Franke & Berendonk 1997). The documents give an account of the various side effects of the AAS therapies, which have required surgical or medical treatment for virilisation and gynaecological damage. Stasi reports even describe the risk of pregnancy since the foetus might be damaged from such drug use and in such a situation an abortion would have been recommended (Franke & Berendonk 1997). In Sweden, Arne Ljungqvist carried out a study of the best Swedish athletes in different sports in 1973. Of 144 athletes he found that a third had used AAS (Ljungqvist 1975).

In the 1980s it became increasingly clear that the illegal use of AAS had also spread outside competitive sports to groups whose aim was to create a better body or to feel better mentally (Kashkin & Kleber 1989). At the beginning of the 1990s, several

pharmaceutical companies stopped manufacturing AAS because of the abuse risk and the serious side effects. Instead black market sales of both genuine and fake AAS increased. This increase in sales can be explained by an increase in Internet trade and the fact that the substances became more readily available (Dotson & Brown 2007). An important black market developed which includes not only AAS for humans but also veterinarian versions (Marshall 1988). The growing black market sometimes provides bad quality AAS, which may not contain what has been promised or which have not been manufactured in a sterile environment (Parkinson & Evans 2006). Thus, in more recent years the use of AAS has spread among men and women who take AAS without the aim of performing better in a sport (Mottram & George 2000).

Today, the use of AAS is not only linked to the use of another illegal hormone substance but also to the use of other drugs of abuse, for example amphetamine (Brower 2002) as well as alcohol (Eklof et al. 2003) and other medicines (Brower 2002). In recent years researchers have also produced various “designer drugs”, for instance epitestosterone propionate in order to get round doping tests in sports (Franke & Berendonk 1997), a transdermal preparation (testosterone and epitestosterone) coded as “The Cream” (Kicman 2008) and a new AAS called tetrahydrogestrinone (THG) (Malvey & Armsey 2005). Users often take several AAS at the same time, known as “stacking”, or they gradually increase the dose until they reach a top level after which they reduce the dose, this is known as “pyramiding”. AAS are often taken in “drug cycles” often between six and twelve weeks, which are then followed by an equally long drug-free period when the users try to restore the body’s hormone levels (Dotson & Brown 2007). Some users admit to using AAS continuously, which increases the risk of serious side effects (Parkinson & Evans 2006).

When AAS are taken for medical use, i.e. as part of the medical treatment of different diseases, the therapeutic doses normally lie between 25 and 50 mg every third to fourth week for osteoporosis and between 100 and 200 mg per week for different types of anaemia. An injection of 1.000 mg of testosterone undecanoate is given every 10th to 14th week for hypogonadism in men (FASS 2009). For non-medical use, supraphysiological doses of substances that exceed the therapeutic dose by 40 to 100 times are common (Hall 2005). Typical doses lie between 250 and 3.200 mg per week (Blue & Lombardo 1999), but doses of up to 6.000 mg per week have been reported (Parkinson & Evans 2006). Evans describes a saying which goes “the bigger the dose, the bigger the muscle” (Evans 2004). AAS are normally injected (oil or water-based), taken in tablet form, as a transdermal patch or as a skin cream (Kuhn 2002) and most users inject themselves (Korkia & Stimson 1997).

After long-term use, AAS affect the hypothalamus-pituitary-testicle (HPT) axis negatively meaning that the user becomes hypogonadal for a time (Kanayama, Hudson & Pope 2008). Furthermore, the long-term use of high doses of AAS may give rise to

irreversible cardiovascular damage like for instance arteriosclerosis and cardiomyopathy (Kanayama et al. 2008) or concentric left ventricular hypertrophy (Urhausen, Albers & Kindermann 2004). AAS use may also give rise to other physical problems like acne, gynecomastia and psychic side effects, for example aggressiveness or depression with an increased suicide risk. In women there is also an increased risk of side effects like virilization and an enlarged clitoris (Dotson & Brown 2007). Despite the fact that knowledge of the side effects of AAS use has increased, it is sometimes difficult to assess which mental problems stem from the use of AAS (Kanayama et al. 2008). However, it is worth pointing out that due to the hidden use of the substance, there is a risk that side effects linked to AAS use are not reported sufficiently (Sjoqvist, Garle & Rane 2008).

In general, it can be said that the problem of AAS use has changed from having been a problem limited to competitive sports to being a growing public health issue today since people who train at a gym and who have body image as their prioritised goal are increasingly becoming AAS users.

1.3 Prevalence of AAS

Life-time prevalence of AAS in Western countries among males ranges from 1 to 5 % and among females (teenage girls) the prevalence is estimated to 0.1 % (Kanayama, Boynes, Hudson, Field & Pope 2007). An American study found that 3 million Americans may have used illegal AAS at some time in their lives and that the average age of an AAS user is 25 (range 14–68) (Cohen, Collins, Darkes & Gwartney 2007). Current figures indicate that between 2.7 and 2.9 % of adolescents in the USA have used AAS while studies of people training at a gym in the USA indicate figures between 15 and 39 % (Parkinson & Evans 2006). In the last fifteen years, different studies have indicated that between 0.4 and 6.7 % have used AAS in the USA. One reason for the huge spread in the figures may to a certain extent be due to major differences in the response rate, another reason may be the attitude to AAS of those replying to questions on AAS (Thiblin & Petersson 2005).

Estimates in Sweden indicate that between 50.000 and 100.000 people have used AAS, which corresponds to about 1 % of the Swedish population (Sjoqvist et al. 2008). Today, the use of AAS is still growing (Hall 2005; Thiblin, Mobini-Far & Frisk 2009).

1.4 Three types of AAS users

The interest of the media has previously focused on AAS use in competitive sports. However, in recent years this has changed to also include the general public's use of AAS (Cohen et al. 2007). Corcoran and Longo describe three different types of AAS

users; athletes, aesthetes and a fighting elite (Corcoran & Longo 1992). The athletes' main reason for using AAS is to enhance their athletic performance by increasing their strength, speed, size, or aggressiveness. This applies to most athletes who compete in some form of sport at different levels. The aesthete, on the other hand, takes AAS to gain advantages through his or her looks. An aesthete might be an actor, model, bodybuilder, or anyone who is dissatisfied with his or her looks. The third group consists of criminals whose aim is to improve their chances in a fight, carry out a crime in a safer way, look "harder", or become more aggressive by using AAS. This group includes gangmembers, police officers, bouncers and service men (Corcoran & Longo 1992).

1.5 Physical side effects of AAS use

According to reviews, clinical studies and case reports, the use of AAS may give rise to numerous physical side effects, listed in sections 1.5.1 to 1.5.7 (Blue & Lombardo 1999; Bonetti, Tirelli, Catapano, Dazzi, Dei Cas, Solito, Ceda, Reverberi, Monica, Pipitone, Elia, Spattini & Magnati 2008; Boyadjiev, Georgieva, Massaldjieva & Gueorguiev 2000; Burnett & Kleiman 1994; Casavant, Blake, Griffith, Yates & Copley 2007; D'Andrea, Caso, Salerno, Scarafilo, De Corato, Mita, Di Salvo, Severino, Cuomo, Liccardo, Esposito & Calabro 2007; Haupt & Rovere 1984; Hickson, Ball & Falduto 1989; Kicman & Gower 2003; Korkia, Lenehan & McVeigh 1996; Kutscher, Lund & Perry 2002; O'Sullivan, Kennedy, Casey, Day, Corrigan & Wodak 2000; Parkinson & Evans 2006; Parssinen & Seppala 2002; Sader, Griffiths, McCredie, Handelsman & Celermajer 2001; Sjoqvist et al. 2008; Talih et al. 2007; Thiblin et al. 2009; Urhausen et al. 2004).

The side effects can be short term and last only as long as AAS are used or for a short time thereafter, or permanently. They may develop rapidly within several weeks or less or up to several years of intake. For the most part, the side effects of AAS use are of short duration and regress upon cessation of use (Blue & Lombardo 1999). The risk for these side effects increases with dose and duration of use (Evans 2004) and they are more dramatic in women (Clark, Costine, Jones, Kelton-Rehkopf, Meerts, Nutbrown-Greene, Penatti, Porter, Yang & Henderson 2006) and may be irreversible (Kutscher et al. 2002). However, it is difficult to assess some of the side effects described since many users do not just stick to AAS. Normally they mix AAS with other accessory medicines (e.g. to enhance the anabolic effect, as a stimulant or to induce fat loss) and muscle-shaping drugs (e.g. insulin, ephedra and amphetamine) which may also have an impact on the side effects (Parkinson & Evans 2006).

It is possible to divide side effects into seven general categories; effects on the liver, effects on the cardiovascular system, effects on the reproductive and endocrine system,

effects on the skin, effects on the musculoskeletal system, special effects in males and special effects in females.

1.5.1 Effects on the liver

Abnormal liver function

Hepatomegaly (a condition of an enlarged liver)

Jaundice, skin or eye (with liver disease)

Liver tumours, both malignant and benign

Hepatocellular carcinomas (primary malignancy (cancer) of the liver)

Hepacellular or hepatocellular adenoma (benign liver tumours)

Hepatic cholestasis (bile canal obstruction)

Peliosis hepatis (blood-filled sacs develop in the liver)

Effects on the liver are common side effects and in the literature there is a documented link between increasing liver values and AAS use (Haupt & Rovere 1984). Studies have shown that bodybuilders are usually aware of the liver problem risk, particularly with the use of oral C-17-alkylated AAS, e.g. methyltestosterone, metandienone, oxymetholone, oxandrolone and stanozolol (Kutscher et al. 2002).

1.5.2 Effects on the cardiovascular system

Abnormal cholesterol profiles with decreased levels of high-density lipoprotein (HDL) and increased low-density protein (LDL)

Cardiac arrhythmias

Cardiac hypertrophy (“athletes heart”), can lead to decreased maximal oxygen uptake, remodelling of the heart, myocardial ischaemia and cardiomyopathy

Decreased triglyceride level

Depressed amplitude of cardiac contraction or increased heart rate

Elevated blood pressure (can be a result from blood volume increases and fluid retention)

Fluid retention/Oedema (due to water retention)

Impaired diastolic function, could contribute to decreased maximum oxygen consumption ($VO_2\max$; an index of metabolic and cardiovascular endurance ability)

Increased risk of thrombosis (the formation or presence of a blood clot in a vein or artery)

Left ventricular hypertrophy (concentric increase in left ventricular wall thickness)

Myocardial hypertrophy

Myocardial infarction (heart attack)

Risk of sudden death

Stimulate platelet aggregation; increase coagulation enzyme activity and cause coronary artery vasospasm

If AAS are combined with hGH, the enlargement is greater and the link between AAS and myocardial hypertrophy has proved to be dose-related (Karila, Karjalainen, Mantysaari, Viitasalo & Seppala 2003). Studies have also shown that an enlarged left ventricular mass and even a reduced diastolic function may be established several years after a user has stopped using AAS (Urhausen et al. 2004) and case of myocardial injury and even sudden cardiac death have also been reported (Fineschi, Riezzo, Centini, Silingardi, Licata, Beduschi & Karch 2007).

AAS may also have an impact on cholesterol levels by reducing HDL (Sader et al. 2001) and enhancing LDL (Blue & Lombardo 1999) and since total cholesterol is generally unchanged, it is easy to miss the change in HDL and LDL if not all the cholesterol levels are tested (Glazer 1991). Triglyceride levels are also reduced through the exogenous administration of androgens and enhanced even when the user takes oral AAS (Blue & Lombardo 1999).

1.5.3 Effects on the reproductive and endocrine system

Disturbance of the hypothalamic-pituitary-gonadal axis (HPG-axis)

Decreased levels of luteinizing hormone (LH), follicle-stimulating hormone (FSH), testosterone and sex hormone binding globulin (SHBG) via the negative feedback loop of the HPG-axis

Deteriorated spermatogenesis (decreased sperm production)

Decreased thyroid function

Elevation of serum testosterone

Enlargement of the prostate volume

Hyperinsulinism and diabetes mellitus with type II symptoms due to decreased glucose tolerance and increased insulin resistance

Hypogonadotropic hypogonadism (a result from absent or decreased function of male testes or the female ovaries)

1.5.4 Effects on the skin

Alopecia (loss of hair from the head or body)

Higher levels of bloating (an abnormal general swelling)

Injection site pain

Hypertrophy of the sebaceous glands

Increase in the secretion of sebum

Sebaceous cysts (a common cyst of the skin; filled with fatty matter (sebum) that is secreted by a sebaceous gland that has been blocked)

Acne as a result of androgenic stimulation of sebaceous glands

Cystic acne (caused by an excess buildup of sebum in the pores)

Oily skin

Oily hair

Striae (stretch marks)

1.5.5 Effects on the musculoskeletal system

Muscle hypertrophy (especially neck, shoulders, arms and chest)

Tendon ruptures

It is also a well-known fact that AAS may also lead to muscle spasm during the administration of AAS (Haupt & Rovere 1984) and stunting of linear growth in adolescents (Kicman & Gower 2003).

1.5.6 Special effects in males

Acceleration of baldness (in men who are genetically predisposed)

Decreased endogenous testosterone production and hypogonadotropic hypogonadism associated with decreased size of testes (testicular atrophy)

Decreased spermatogenesis depending on decreased LH and FSH

Azoospermia (no measurable level of sperm in the semen)

Oligospermia (low semen volume, oligozoospermia, low count of sperm)

Erectile difficulties

Impotence, often after cessation of an AAS cycle

Infertility

Increased libido

Decreased libido

Priapism (a persistent, usually painful, erection that lasts for more than four hours and occurs without sexual stimulation)

Feminizing effects in males as gynecomastia, enlarged nipples and increase in voice pitch due to an alteration in the hormone balance between androgens and oestrogens from AAS that can undergo aromatization.

1.5.7 Special effects in females

Clitoral enlargement

Decreased body fat and breast mass

Elevation of serum testosterone

Hirsutism, excessive growth of hair in women in areas of the body where hair is normally absent or minimal

Alteration in pubic hair

Increased facial hair

Increased libido

Male pattern baldness

Menstrual irregularities as decreased menstruation or amenorrhea due to suppression of the hypothalamic-pituitary-gonadal axis

Voice deepening as a result of laryngeal hypertrophy

Problem with reproductive function and infertility.

1.6 Psychic side effects of AAS use

There are much fewer studies describing the psychic side effects of AAS use compared to the number describing the physical problems that may develop. This is perhaps because many studies are observational studies and therefore it is difficult to verify the exact substance abuse (Talih et al. 2007). Another difficulty that is often stressed is the question of whether the AAS user already suffered from mental problems before he or she started taking drugs, i.e. whether the user was predisposed to the development of mental disorders (Talih et al. 2007). The following examples are mentioned in the literature: antisocial personality disorder, low self-esteem and body dysmorphia (Kanayama, Pope, Cohane & Hudson 2003b).

Attempts have been made in animal studies, case reports and controlled clinical trials to link AAS with aggressive behaviour and mood swings (Pope & Katz 1988). In a review of animal studies, Clark and Henderson found that in several experiments aggression increased when rats were administered testosterone propionate (17 β -esters). There was no change in animals that were given nandrolone decanoate (19-nortestosterone derivatives) and the aggression in rats that were given stanozolol (17 α -alkylated) decreased. The study indicates that the effect of AAS on aggression is both dependent on gender and the type of substance used (Clark & Henderson 2003).

Even if animal experiments indicate a link between aggressiveness and AAS use, it is more difficult to obtain equally clear results from studies on humans (Bahrke, Wright, O'Connor, Strauss & Catlin 1990a). Although Kouri et al. found that aggression increased significantly after the administration of testosterone cypionate (17 β -ester) (Kouri, Lukas, Pope & Oliva 1995).

Other studies have reached more ambiguous results, for example Malone et al. who carried out psychological tests on 164 AAS users and non-users, and who did not find any significant differences when they measured hostility, and aggression (Malone,

Dimeff, Lombardo & Sample 1995). In a further study, 240 mg of methyltestosterone (17 β -hydroxy) was administered to twenty volunteers for fourteen days. The result of different psychiatric tests was a small but significant increase in negative moods like mood swings, irritability, violent feelings and hostility (Su, Pagliaro, Schmidt, Pickar, Wolkowitz & Rubinow 1993).

Depressive symptoms as a result of AAS use (Burnett & Kleiman 1994), particularly in the abstinence phase or after the end of a course of AAS, have been documented in many studies which can be linked to the down-regulation of the HPT axis (Brower 2002; Kashkin & Kleber 1989; Pope & Katz 1994). These studies have also observed several cases of suicide (Kanayama et al. 2008). In one Swedish study, the eight suicides of AAS users were investigated. Five had died of poisoning, one had hanged himself, one had shot himself and one had died through a violent act. Only one of these eight had talked about suicide prior to taking AAS (Thiblin, Runeson & Rajs 1999).

There are also reports claiming that supraphysiological doses of AAS are the direct cause of hypomanic or manic symptoms that may be linked to aggressiveness and violent behaviour (Pagonis, Angelopoulos, Koukoulis, Hadjichristodoulou & Toli 2006b; Wilson-Fearon & Parrott 1999). However, not all studies have indicated such a link (Bahrke, Wright, Strauss & Catlin 1992; Tricker, Casaburi, Storer, Clevenger, Berman, Shirazi & Bhasin 1996). Other psychic side effects that have been reported are; hypomania (Pope & Katz 1994), anxiety (Clark & Henderson 2003), paranoid delusions (Sjoqvist et al. 2008), anorexia (Medras & Tworowska 2001), anxiousness, sleeping problems, body obsession, self-fixation (Eklof et al. 2003), suspiciousness and negativism (Parrott, Choi & Davies 1994), mood alterations (Burnett & Kleiman 1994; Parkinson & Evans 2006) hostility (Perry, Yates & Andersen 1990) and aggression, aggression towards objects, verbal aggression, and aggression during training (Parrott et al. 1994). AAS use can also cause rage and lead to criminal behaviour including homicide and assault (Hall, Hall & Chapman 2005).

An AAS user can be characterised as someone with prominent body-image disorders such as muscle dysmorphia where the individual is entirely preoccupied with his/her conviction that he/she is not big and muscular enough despite a marked muscle mass from an objective point of view (Olivardia, Pope & Hudson 2000). Muscle growth becomes the most important factor for their self-confidence and if there is no growth this triggers an anxiety that can be said to stem from a dependence on AAS (Brower 2002).

Pagonis et al. studied a cohort of 320 amateur and recreational bodybuilding athletes, where 160 used AAS, 80 received a placebo and 80 were completely clean (Pagonis, Angelopoulos, Koukoulis & Hadjichristodoulou 2006a). The result shows that the mental problems that AAS users may suffer correlate with increased use and that these problems increase when use continues. Some of the psychic side effects of AAS use

may remain for a long time after a user has stopped taking AAS but they may not be discovered until the user tries to get psychiatric help many years later (Kanayama et al. 2008).

1.7 Positive effects of AAS use

There is no doubt that many AAS users experience a number of positive effects from the substances, particularly when they start using them. AAS are extremely anticatabolic and turn a negative nitrogen balance into a positive one by improving the uptake of dietary protein and by speeding up protein synthesis (Haupt & Rovere 1984). This is why AAS users grow more when they take protein supplements at the same time (Kutscher et al. 2002).

The anabolic effect of AAS is related to how high the dose is. A dose that exceeds 300 mg per week leads to a significant increase in muscular volume (Parkinson & Evans 2006). There are several reasons why testosterone affects the body; testosterone entails an increase in protein synthesis (Ferrando, Tipton, Doyle, Phillips, Cortiella & Wolfe 1998), enhances collagen synthesis (Parssinen, Karila, Kovanen & Seppala 2000), and creates an increased bone mineral density (Bagatell & Bremner 1996). Apart from the purely anabolic effects on the body, AAS also lead to feelings of euphoria, to increased energy and sexual arousal (Sjoqvist et al. 2008).

1.8 Other hormones in combination with AAS

Insulin growth factor-1 (IGF-1) is sometimes used as a complement to AAS but the prevalence is not well documented in previous research (Parkinson & Evans 2006). Human growth hormones (hGH) are also used combined with AAS. The anabolic effect of hGH is primarily indirect as a result of an increased production of IGF-1 in the liver and peripheral tissues (Rennie 2003). hGH and IGF-1 both increase the glucose uptake and stimulate protein synthesis, especially in the musculature (Tentori & Graziani 2007).

It is, however, a well-known fact that long-term use of hGH can lead to cardiac instability, hypertension, the development of insulin resistance and possibly also type 2 diabetes (Rennie 2003). AAS users take hGH and insulin with the aim of increasing their muscle mass and enhancing their performance (Jenkins 2001). Insulin is also used as a doping substance (Graham et al. 2008). Taking insulin in this way is clearly regarded as risky since it may induce severe hypoglycemia and potentially even be fatal (Evans & Lynch 2003). Also the use of thyroid medications with the aim of inducing fat loss has increased in recent years among AAS users (Parkinson & Evans 2006).

1.9 Other drugs of abuse in combination with AAS

It was previously believed that AAS users were not prone to a mixed addiction (Malone et al. 1995) but in recent years a number of studies have indicated that users take both AAS and other drugs at the same time (Brower 2002; Parkinson & Evans 2006; Thiblin & Parlklo 2002). Amphetamine can for instance be used as a stimulant (to enhance the ability to train and burn fat) (Brower 2002) or to reduce appetite (Parkinson & Evans 2006).

GHB is used to be able to sleep better and to enhance the release of growth hormones in order to increase muscle mass as well as strength (Brower 2002; Parkinson & Evans 2006). Other substances that have been noted in conjunction with AAS are ecstasy, marijuana, LSD (Nilsson, Baigi, Marklund & Fridlund 2001) and cocaine (Morrison 1996).

This is why it is important to ask a patient at the beginning of the treatment for AAS use whether he or she takes other drugs, for example other drugs of abuse which might on their own give rise to an increase in aggressiveness and violent behaviour (Sjoqvist et al. 2008). Unfortunately it seems to be unusual for therapists in their everyday clinical life to put questions regarding the concurrent use of other drugs (Celerier, Yazdi, Castane, Ghosland, Nyberg & Maldonado 2003; Hall 2005).

Several studies have discussed whether AAS might be a gateway to other drug use (Arvary & Pope 2000; Kanayama, Cohane, Weiss & Pope 2003a; Thiblin, Lindquist & Rajs 2000) without reaching any safe conclusions.

1.10 Alcohol in combination with AAS

Various studies have looked into the link between alcohol and AAS use (Ambrose 2004; Kindlundh, Isacson, Berglund & Nyberg 1999; Middleman, Faulkner, Woods, Emans & DuRant 1995; Sjoqvist et al. 2008). Bahrke et al. warned that it was very possible that AAS users also took other illegal substances as well as alcohol (Bahrke, Yesalis & Brower 1998). It is also a known fact that alcohol is used in sports as a sedative (Ambrose 2004).

According to one Swedish study, AAS users consumed a lot of alcohol at least once a week and this was interpreted as being a consequence of the AAS use (Kindlundh et al. 1999). A study of criminals indicated that many AAS users also drink a lot of alcohol (Klotz, Petersson, Isacson & Thiblin 2007) and a recent Swedish study has confirmed the link between AAS and alcohol (Sjoqvist et al. 2008).

1.11 Pharmaceuticals in combination with AAS

Several different types of medicines are used as a complement together with AAS or to minimise the side effects from AAS use. One example is asthma medicine enabling an individual to train harder and longer thanks to the adrenergic effect (Ambrose 2004).

A Swedish study investigating the cause of death of 34 male AAS users noted that most of the men had taken different medicines, for instance benzodiazepines, antidepressive medicines, opioids, painkillers, and stimulants (Thiblin et al. 2000). Opioids are often used to relieve pain that comes from training (Brower, Blow, Beresford & Fuelling 1989). Different forms of diuretica (Parkinson & Evans 2006) which are used to reduce AAS-related water retention and to dilute the urine (Brower et al. 1989) are taken by AAS users, as is ephedrine. Ephedrine, which is a sympathomimetic drug, is structurally similar to amphetamine. This very common substance is used to enhance performance (Pipe & Ayotte 2002). Numerous problems have been linked to ephedrine, for example cardiovascular problems such as arrhythmias, myocardial infarction, sudden death, seizures, and stroke (Pipe & Ayotte 2002). Other pharmaceuticals that are combined with AAS are tranquillizers and sedatives (Kindlundh, Hagekull, Isacson & Nyberg 2001).

Oestrogen blockers such as tamoxifen are used in order to counteract the development of gynecomastia and human chorionic gonadotropin (HCG) and to restore the downward pressure on the HPT axis and counteract testicle reduction (Parkinson & Evans 2006).

1.12 Dietary supplements in combination with AAS

It is very common for people who train to take dietary supplements either as a supplement to or sometimes instead of other food. The reason is that it is believed that dietary supplements promote better training results, for example by facilitating recovery between training sessions or by reducing interruptions in training that are caused by illness or injury (Maughan, King & Lea 2004).

One of the most popular dietary supplements is creatine which is an amino acid mixture which can be found in fish and meat products (DesJardins 2002). Creatine has been shown to enhance the users chance at increasing body mass, the fat-free index and maximal strength (Terjung, Clarkson, Eichner, Greenhaff, Hespel, Israel, Kraemer, Meyer, Spriet, Tarnopolsky, Wagenmakers & Williams 2000). Unless there is an overdose, it would seem that creatine is harmless for healthy users (Lattavo, Kopperud & Rogers 2007) but side effects that are mentioned are weight gain, muscle cramps, diarrhoea, abdominal pain, and nausea (Terjung et al. 2000).

Another common dietary supplement is protein that helps to increase body mass, strength, and recovery after training (Lattavo et al. 2007). According to Lattavo, people who train need more protein than they can get through their ordinary diet in order to obtain a positive nitrogen balance. Twice the recommended intake of 0.8 to 1.7 grams per kilo body weight and 24-hour period might be required (Ciocca 2005). Other supplements that are used are, for instance HMBs (Beta-hydroxy-beta-methylbutyrate) which are regarded as anticatabolic, caffeine and ephedra for their reviving effects as well as bicarbonate which reduces fatigue and makes it easier to burn fat during training (Lattavo et al. 2007; Maughan et al. 2004), moreover, ephedra has also been associated with acute myocardial infarction (Haller & Benowitz 2000; Lindsay 2002) and arrhythmia (Haller & Benowitz 2000).

Furthermore, some also use carnitine as a fuel for the working muscles as well as antioxidants and other vitamins (Maughan et al. 2004). One major problem with certain supplements that has emerged is that some may be mixed with AAS (such as testosterone, nandrolone and prohormones) or with ephedrine or caffeine (Maughan 2005). The following substances have been found to be mixed substances: protein powder, creatine, carnitine, ribose, guarana, zinc, pyruvate, HMB, tribulus terrestris, vitamins, minerals, and herbal extracts (Maughan 2005).

1.13 Social background and current social situation of AAS users

There is very little research on the current social situation of AAS users. However, there are studies that focus on the social risk factors of AAS use. It is much more common for men to use AAS compared to women and it is more common in major cities (Kindlundh et al. 1999; Nilsson 1995). AAS users often have a history of difficult relationships, for example a bad relationship with the father (Kanayama et al. 2003b) or difficult relationships with friends (Kindlundh et al. 1999).

Another risk factor for AAS users is that they played truant at school and suffered from school fatigue (Kindlundh et al. 1999). Brown summarises the most common risk factors in the following way: the person is wealthy, white, grew up with one parent in a major town or city and did some form of sport, trained in a gym, for example (Brown 2005). It is clear that the risk factors are very general and it has proved difficult to observe more precise factors than that.

An AAS user can also be described in terms of risk behaviours which includes driving under the influence of alcohol, carrying a firearm and having several brief sexual relations (Middleman et al. 1995).

When the AAS user become older, people close to him/her can suffer which may lead to marriage problems (Parkinson & Evans 2006) or the AAS user abusing, verbally

threatening or being violent in some other way against their partner (Choi & Pope 1994). It has also emerged in other studies that AAS may lead to violent behaviour (Thiblin, Kristiansson & Rajs 1997) which may turn into serious criminal behaviour and result in violent death including murder (Thiblin et al. 2000).

Today the use of AAS is more widespread among the general public (Sjoqvist et al. 2008) and this may lead to more social problems in the future. Studies on the long-term effects of AAS use are now emerging (Kanayama et al. 2008; Sjoqvist et al. 2008). Kanayama et al. warn that the problems we see today in long-term users may be small compared to what we will see in the future because the doses used today are much higher than they were in the 1960s and 1970s (Kanayama et al. 2008). If this will lead to increased social problems for AAS users in the future that will also have an impact on relatives, society and the healthcare sector, remains to be seen.

1.14 AAS and crimes

High levels of testosterone have long been understood to increase aggressive behaviour and violent crimes. Dabbs et al. described in a study the relationship between the testosterone levels of young interns and the type of crime they had been convicted for (Dabbs, Frady, Carr & Besch 1987). Interns with a high level of testosterone had for the most part committed violent crimes while those with lower levels of testosterone had been convicted for other types of crime. At the same time, the results showed that the higher the testosterone levels in the latter group, the longer the prison term and their prison term was also more likely to be extended due to bad conduct (Dabbs et al. 1987).

Another study carried out by Brooks and Reddon in 1996 reached a similar result. In this study they compared young violent male criminals with two groups, where one group had committed sexual offences and the other had committed non-violent crimes. The result indicated that the group that had committed violent crimes had the significantly highest level of testosterone of all the groups (Brooks & Reddon 1996). Beaver et al. analysed data from the National Longitudinal Study of Adolescent Health (n=6.823) and found that there was a significant difference in the number involved in a violent act between those who had recently taken AAS and those who had never used AAS at all (Beaver, Vaughn, Delisi & Wright 2008).

The first case report of a violent crime linked to AAS use was published over twenty years ago by Baker, when he looked into the link between oxymetholone and aggression (Barker 1987). Another study found that male current users of AAS more often than non-users subjected their significant others to violence (Choi & Pope 1994).

Two epidemiological studies, have tried to prove that AAS use can unleash violence without quite succeeding (Isacsson, Garle, Ljung, Asgard & Bergman 1998; Pope, Kouri, Powell, Campbell & Katz 1996). Both studies encountered major methodological

problems with the participants because many decided not to take part in the studies (Thiblin & Petersson 2005). In a study from 2007, Klötz et al. found that AAS use probably leads to an increase in violent crime, particularly if the AAS user also uses other illegal substances (Klotz et al. 2007). In a further study by Klötz et al., the authors found that there was a link between AAS use and being convicted of different crimes, e.g. a crime involving a firearm or fraud (Klotz, Garle, Granath & Thiblin 2006).

It has also been found that AAS users carry a firearm or end up in fights more often than non-users (Middleman & DuRant 1996) and several studies have also found a link between AAS use and an increased risk of premature death (Petersson, Garle, Granath & Thiblin 2006), of being a victim of violent death because of impulsive, aggressive behaviour or symptoms of depression (Thiblin et al. 2000), as well as of murder (Pope et al. 1996). Thiblin and colleagues described psychiatric symptoms, aggression and violent behaviour in AAS users and the result was that AAS is an indicator of violent behaviour (Thiblin et al. 1997). At the same time Pagonis and colleagues warned that there is a risk that the psychiatric problems that arise from AAS use will in all probability become worse as the use of AAS continues and increases (Pagonis et al. 2006a).

1.15 Treatment of AAS users

Relatively little research has been conducted on the issue of what a successful course of treatment is for a person using high doses of AAS (Brower 1997). One of the first articles that presented a proposed course of treatment of AAS users was written by (Corcoran & Longo 1992). They based the programme on treatments for eating disorders, other drug abuse and narcissistic personality disorder. According to Brower, an AAS user who has different physical and psychic side effects may seek help without revealing that he or she uses AAS (Brower 2000).

AAS can act as a gateway to other substance abuse (Kanayama et al. 2003a) which entails further complications for the treatment of AAS. Therefore it is important to look into the use of other types of drugs before commencing treatment of an AAS user. After having established AAS use in a patient, it is vital to carry out a medical and psychiatric examination (Brower 2000) looking for specific physical and psychic side effects that occur in AAS users (Corcoran & Longo 1992). Furthermore, it is recommended to take urine and blood tests, for example liver tests, cholesterol tests, endocrine tests of LH, FSH and testosterone (Brower 2000).

The aim of the treatment should be (1) to relieve symptoms of abstinence and prevent complications, (2) to start and relieve abstinence from illegal AAS, (3) to reduce the risk of relapsing and continuing to take AAS and (4) to restore the function of the hypothalamic-pituitary-gonadal (HPG) axis (Brower 1997). Treating AAS use can

primarily be regarded as detoxification which is why counselling is always needed with or without pharmacological treatment (Brower 1997). One study promotes the use of a testosterone substance that is then gradually phased out (Talih et al. 2007).

Symptoms of AAS abstinence include depression, fatigue, body aches, restlessness, eating disorders, sleeping problems, reduced sexual ability/desire, and a craving for drugs (Brower 2000). Further psychic problems include the risk of a psychotic break, of a suicide attempt, of extreme selfishness, and mood swings (Corcoran & Longo 1992). The therapist should initially not challenge or confront the patient's sensitive self-image because there is a risk that the patient will become more aggressive or depressed. Instead it is important to support the build up of the low level of self-esteem (Corcoran & Longo 1992) which requires a good therapeutic alliance (Brower 1997).

Advice as regards both diet and training given by a knowledgeable person might contribute to a positive treatment relationship (Brower 1997). There are also ideas about a revised twelve-step model where some steps could treat egocentrism, severed relationships, compromised values, and grandiosity (Corcoran & Longo 1992). A discussion on body image must be initiated at an early stage. Finally, they recommend group therapy after a certain period of individual therapy. Group therapy can include sessions on cognitive thinking, lifestyle values, peer pressure and discussions on motivation to stop using AAS.

Pharmacological treatment alternatives might include the use of HCG substances if LH and FSH have been down-regulated, as well as tamoxifen if high levels of oestrogen have been measured in a blood test. Also antidepressive, anti-inflammatory medicines and neuroleptics may come into question (Brower 2000). Finally, the therapist should keep a wary eye on the patient to see whether he/she is suicidal, whether he/she is aggressive towards others during the abstinence phase or whether he/she is unable to remain drug free. In such cases, it might be necessary to hospitalise the patient (Brower 2000). Several studies have shown that it is possible to cure AAS dependency both in men and women (Bahrke et al. 1990b; Brower 2002; Copeland, Peters & Dillon 1998; Kanayama et al. 2008).

2. AIMS

2.1 Overall

The aim of this dissertation was to gain knowledge about users of anabolic-androgenic steroids (AAS) who have sought treatment at an addiction clinic within the healthcare system. Particular interest has been paid to the following areas: social background, current social situation, the development of AAS abuse over time, connection to other drugs, connection to criminality as well as psychic and physical side effects.

2.2 Study I

The aim of this study was to describe the social background and current social situation of AAS abusers who were seeking treatment at an addiction clinic and to compare the findings with findings on gym clients with and without a history of AAS abuse.

2.3 Study II

The aim of this study was to let AAS users' own stories serve as a point of departure for examining the various consequences of the development of drug abuse among a group of people seeking help at an addiction clinic.

2.4 Study III

The aim of this study was to explore and describe the lifetime and current use of drugs by AAS users recruited from an addiction clinic in Sweden.

2.5 Study IV

The aim of this study was to enhance the understanding of the association between criminality and the use of AAS with or without the use of other drugs of abuse.

3. METHODS AND SUBJECTS

3.1 Study design

The aim of the dissertation was to gain knowledge about AAS users who have sought help at an addiction clinic. The main research group, the AC group from now on, consists of a consecutively included group of patients from the addiction care system that have been followed prospectively on repeated occasions. Every individual participating in the different studies of the dissertation is a gym client which makes for reasonable opportunities to compare AAS users with non-users (Tashakkori & Teddlie 2003).

The dissertation is based on quantitative as well as qualitative methods. The purpose of this complex design was to combine more general knowledge (quantitative) with more detailed understanding (qualitative). Using more than one method was regarded as advantageous bearing the aim of the dissertation in mind (Schneider 2007).

Experience of previous research conducted on AAS users shows that it is extremely difficult to get hold of AAS users who are willing to participate because of the suspicion against professionals working in the field, making such research very difficult (Pope & Kanayama 2004). Furthermore, experience shows that it is equally difficult to get people to stay in such studies (Pope & Kanayama 2004). Hence, this dissertation was designed in such a way that the research was carried out in an environment which these people had chosen of their own accord, enhancing their motivation to participate in the project. It was also deemed vital that someone who was at home in an AAS user environment carried out the interviews. There were two reasons for this; firstly, to create a sense of legitimacy in the interview situation, and secondly, to be able to have a more initiated dialogue with the interviewees making it easier to gain access to the knowledge sought after.

This meant that the interviewer had an understanding of the problem area, which had to be taken into consideration, and which might have led both problems and possibilities in the scientific work. However, based on the experience of other researchers, an understanding of the area was regarded as a prerequisite in order to gain knowledge on the life situation of the interviewee, pattern of abuse, and any medical and social difficulties (Corcoran & Longo 1992). Any problems that might be caused by this prior knowledge will be brought up later in the discussion chapter.

3.2 Participants

3.2.1 Addiction Centre group (AC group)

All four studies were based on a group of 36 AAS users (34 male and 2 female), who were consecutively included from a psychiatric addiction clinic in Örebro County, central Sweden, a county of 275.000 inhabitants. The patients were attending the addiction clinic to get help for what they believed to be AAS-related side effects. The inclusion criteria for patients were that they must: a) be over 16 years of age, b) be fluent in Swedish, c) be misusing non-prescribed AAS, alone or in combination with other doping agents, d) have been using AAS for at least four months and e) be under the care of the addiction clinic where a decision to commence treatment for their AAS use had been agreed upon following an initial clinical assessment. The lower limit of four months was chosen to include more than one AAS cycle, thus indicating regular use.

The mean age for the AAS users was 27.6 years (range 19.0–42.0). The mean duration of AAS use was 4.7 years (range 0.5–16.0).

3.2.2 Comparison groups (gym groups)

The comparison groups consisted of clients recruited from a gym in Örebro County. These groups were chosen because all of the AAS users in the AC group were gym clients. Participants for the study were recruited by putting up posters at the gym. A total of 289 males responded anonymously to the questionnaire. Twelve participants, who did not answer the questions about hormones, were excluded from the study. The remaining 277 were divided into two comparison groups: 18 male gym clients who had used AAS at some time and 259 male gym clients who had not used AAS at any time. Both of these groups fell into the same age range as the AAS group (18–45 years).

The participants in the different studies and the data collection used are summarized in the following table:

Table 1. Summary of data collection among participants

Study	Participants	Data collection
I	n=34: AAS users from Addiction Clinic	Social interview

	n=18: AAS users from gym n=259: Non users from gym	Questionnaire Questionnaire
II	n=6: AAS users from Addiction Clinic	Narratives generated from the social interview
III	n=32: AAS users from Addiction Clinic	Patients written report of drug use Substance interview
IV	n=32: AAS users from Addiction Clinic	Social interview Criminal records

The AC group included 36 people altogether. The four studies were based on the same group of people. The reasons for the different number of people in different studies will be presented below.

3.3 Procedures and instruments

3.3.1 General

The idea for the research project emerged within the framework of a clinic where patients using AAS started seeking help. To start with, AC had fairly limited possibilities to help these patients in a professional way. Nor was there much experience to be gained elsewhere, either nationally or internationally. Therefore there was an obvious need for more knowledge on the area.

The research project was designed after having met fifty-odd patients with AAS-related problems at the clinic. Patients were then asked to participate. A number of different stages were included in the project: a social interview, a substance interview, the questionnaires Temperament and Character Inventory (TCI), Symptom Checklist-90 (SCL-90) and Structural Analysis of Social Behavior (SASB). In addition, a whole series of laboratory tests were taken primarily geared towards detecting any side effects caused by AAS. Some of the patients were also offered a neuropsychological examination. The results from the social and substance interviews are presented in this dissertation.

3.3.2 Social interview

An interview model was produced specifically for this project since we were unable to find an established instrument for this area, which corresponded to a great enough extent to the scientific questions. This model was based on experiences of a clinical interview model that has been used at AC, for a long time as a basis for an individual care plan. Further questions on social background, current social situation and criminality were added to the clinical interview model in order to meet the aims of the research project.

Further questions on drug use were added, e.g. hormone substances and other similar substances used for doping. Questions on substances were, however, of an introductory character since a more detailed interview on substances would follow.

When the patients had been informed about the research project and had agreed to participate, a social interview was booked for a couple of days later. The social interview was carried out at an early stage in the contact with a new patient, primarily because the aim was also to use the information in the planning of the clinical work. The patient was given a general idea about what the interview would be about.

The interview was carried out based on an interview model and the aim was to guarantee that all relevant areas were covered in the interview. The interview included questions on social background and the current social situation. The questions on social background covered the following areas: family history, contact with parents and other close relatives, experience of school, psychic and physical abuse, level of education, spare time activities including training, relationship with a partner, criminality and a description of drug habits. The questions on the current social situation covered the following areas: housing, employment, relationships, physical training and current use of alcohol and other substances/drugs.

The interviewer started by asking questions, however, the idea was for the patient to gradually be encouraged to talk freely about his/her life. The role of the interviewer was to show an interest in and encourage the patient to talk, to ask complementary questions and steer the interview to areas that did not come up spontaneously. The interviewer wrote down everything the patient said during the interview. The interviewer went through the notes and wrote them out immediately after the interview.

The social interview took in total between two and three hours per patient spread over two or three occasions. At the second and third meetings the interview started with a run through of the previous interview and the patient was given the opportunity to comment and if the need arose to correct any misunderstandings. All the patients read and approved the social interview.

3.3.3 Substance interview

An interview model for the substance interview based on previous studies (Evans 1997; Malone, et al. 1995) was produced specifically for the project since there was a lack of established instruments for this area. The aim of the interview was to cover the participants' collected experience of AAS, alcohol, pharmaceuticals and illegal drugs of all types.

The questions concerning alcohol consumption were taken from The Alcohol Use Disorders Identification Test (AUDIT) (Questions 35–38 in the appendix), which was developed by the World Health Organization (Saunders, Aasland, Babor, de la Fuente & Grant 1993) and which has been translated into Swedish (Bergman & Kallmen 2002).

The internal consistency, test-retest reliability, and validity of the instrument has been found to be high (Bohn, Babor & Kranzler 1995; Conigrave, Saunders & Reznik 1995; O'Hare & Sherrer 1999; Selin 2003; Shevlin & Smith 2007).

In conjunction with an ordinary session, the patients were given the task of writing down information about the substances they had used, when and in what doses. The idea was to use this written account as a basis for the interview so that the interview would take a reasonable amount of time, and so that the patient at his or her own pace would try to remember all the substances he/she had used. Some patients were able to give a very detailed account of their experience of substances whilst others had a rougher idea of what had happened in that context. It was impossible to get some patients to give a written account at all.

The interview was based on an interview model but in practice it was more like a dialogue where the interviewer played the role of interested guide, encouraging the patient to freely describe his/her experience of drugs. The patient was also asked to describe the reason for his/her choice of different substances, as well as the effects, positive and negative, experienced with each respective substance. The interviewer wrote down all the information given by the patient and later put the information in chronological order.

The substance interview normally took two to three hours; usually spread over two to three meetings. At treatment session that followed, the patient was given the chance to read through the account of his/her experience of substances and the possibility to comment, and if he/she so wished correct the information.

An independent psychiatrist made the psychiatric diagnosis based on the information available.

3.3.4 Questionnaire

It was unreasonable for quantitative reasons to use the face-to-face interview method for the control group. Instead a questionnaire of fifty questions based on the interview with the AAS users was developed. The aim was that the questions should correspond as far as possible to the questions put in the interview in order to facilitate comparisons between the groups. Most questions were multiple-choice questions but for some of them it was possible to give an open answer. The questionnaire is described in the appendix. The questions in the questionnaire that were on alcohol use were taken from AUDIT (Questions 35–38 in the appendix), which has been translated into Swedish (Bergman & Kallmen 2002).

The questionnaires were distributed via the reception at a public gym in Örebro County. The staff were instructed to hand out the questionnaire to people training aged between 18 and 45 years of age, which corresponded to the age distribution in the AC

group. The questionnaires were filled in anonymously and left in a closed box at the gym. Everyone who filled one in received four milk-based protein drinks (Gainomax) as a way of thanking them for their participation.

3.3.5 Register data

With special permission from The Regional Ethical Vetting Board, data was ordered from the Swedish National Council for Crime Prevention on crimes that the patients in the AC group had been convicted of. The data applied to all convictions during the person's lifetime up to a cut off date of 31st December 2007. The information included the type of crime committed and the penalty imposed.

3.4 Methods

3.4.1 Study I

The aim of Study I was to examine the social background and the current social situation of the AAS users in relation to a control group consisting of people with or without experience of AAS use who trained in a gym. All the 34 men in the AC group were included in the study. The two women in the AC group were excluded from the study since there were too few of them. The 34 men from the AC group were compared with 289 men who trained at the gym. Twelve people were excluded from the comparison group because they did not answer the question on experience of AAS use. The remaining people were subdivided into two groups, the first a group of 259 people who had never used AAS and the second a group of 18 people who used or had used AAS.

The study was based on the results from the social interview (the AC group) and from the questionnaire (the gym groups). The social interview was based, as already described, on an interview model in order to ensure that all the relevant areas were taken into account during the interview. The answers from the patients were noted throughout the interview and coded into set answers for the scientific report. Where the answers were unclear the patient was asked which alternative answer was the most correct one in their opinion. The questionnaires were designed to generate set answers.

3.4.2 Study II

The aim of Study II was to based on the patients' own stories produce a fuller and more in-depth narrative on how their abuse developed over time and how different substances came into their lives. The study is based on the social and the substance interviews that

were carried out with all the patients in the AC group. A strategic selection of six patients was made based on two aspects. First and foremost, it was important to have an as great a variation as possible as regards the patients' life stories in order to reflect differences in course of events and drug patterns. Secondly, it was important to include the life stories of both men and women.

The narratives were written down during the interviews (Snow, Lofland & Lofland 2005) and the material was then compiled into a personal, chronologically arranged narrative for each informant (Mishler 1995). The patients were given the opportunity to read and comment the entire narrative afterwards, or ask for something to be deleted from the text. All the interviews were made as neutral as possible in order to make it difficult to identify the informant.

3.4.3 Study III

32 patients (thirty men and two women) from the AC group participated in Study III. Four men from the AC group were excluded since their substance abuse had ended more than four years before, which might have made it difficult to remember substances and would mean that the validity of the information would be called into doubt. This study was also based on the patients' experience of substances that had been noted down by the interviewer.

An in-depth interview focused on drug patterns and use of substances was carried out at a later stage based on previous studies (Evans 1997; Malone et al. 1995). The purpose of the interview was to cover the entire spectrum of experience of AAS, alcohol and both legal and illegal drugs of all types. The questions concerning alcohol consumption were taken from AUDIT (Questions 35–38 in the appendix). All the interviews on drugs were carried out by the author and an independent psychiatrist made the psychiatric diagnoses based on the information available.

3.4.4 Study IV

Study IV included all the 36 patients of the AC group and was based on the part of the interview that concerned criminality in relation to the development of the drug use. Data from the Swedish National Council for Crime Prevention (Andersson 2005) was collected where 32 of the 36 participants were found registered as convicted of crimes subsequently described in the study. The continued account is based on these 32 patients, where we have had access to objective data with regard to the crimes they were convicted of.

The crimes that the patients had been convicted of were divided into the following crime groups: crimes of violence, weapon offences, fraud, crimes against property, drug-related crimes, traffic crimes and other crimes.

In order to compare the total criminality over time we developed a code system based on the maximum sentence for each crime according to Swedish law. Crimes that do not lead to the deprivation of liberty were given 1 point. Crimes with a maximum sentence of 0.5 years 2 points, maximum 1 year 3 points, maximum 2 years 4 points, maximum 3 years 5 points, maximum 4 years 6 points, maximum 6 years 7 points and maximum 10 years 8 points. The code system thus grouped the crimes into eight groups depending on the severity level according to the law.

The points for each individual were then divided by a time period in order to yield a weighted point which expressed a) the total number of crimes, b) the level of severity of the crimes, and c) the intensity of the criminal acts based on time. The computed crime quotients have been compared within four periods; period 1, from entry into criminality to drug start, period 2, from drug start to first treatment contact with AC, period 3, from the start of treatment at AC to the time when treatment at AC was terminated, and period 4, after the termination of treatment to the endpoint of the study on December 31, 2007.

The patients were also divided into four subgroups based on the type of drugs they had used and in which order: group 1 only AAS, group 2 first AAS then other drugs of abuse, group 3 first other drugs of abuse then AAS and group 4 AAS and other drugs of abuse at the same time.

3.5 Data analysis

The statistical analysis of the numerical data in Study I was carried out using a one-way Analysis of Variance (ANOVA) for the equality of mean and a two-sided Fisher's exact test for the comparison of the three groups. The Statistical Package for the Social Sciences (SPSS) software package version 13.0 was used. A significance level of $p < 0.05$ was considered appropriate. No statistical analyses were made in Studies II, III and IV, but the SPSS software package version 16.0 was used to work with the data.

3.6 Ethical approval

The study protocol was approved by the Ethics Committee of Örebro County Council (No.: 538/99) and The Regional Ethical Vetting Board (No.: 2004: M-316) in accordance with Swedish legislation on the approval of medical research and the patients had all given their informed consent.

The six patients who were selected for Study II were given the opportunity to read the manuscript so that they could give comments and say whether they felt that the written narrative corresponded to their life stories, and also so that they could decide whether they felt it was all right for it to be published bearing in mind the possibility of identification. None of the patients wanted to change the written narratives.

4. RESULTS

4.1 Study I: Troubled social background of male anabolic-androgenic steroid abusers in treatment

This study examined the social background and the current social situation of the participants of three groups, all men. The first group consisted of 34 patients using AAS who had sought help at AC in Örebro. The second group consisted of 18 people who had been recruited via a gym and who had filled in the questionnaire and reported that they had used or were still using AAS. The third group consisted of 259 people from the same gym who had reported that they had never used AAS. The average age of the patient group (27.2 years of age) was similar to that of the control group with no experience of AAS (26.1 years of age), while the gym group with experience of AAS was significantly older (34.8 years of age). All the participants were, however, within the age interval 18 to 45 years of age.

Table 2. Comparison of social background between AAS users and non-users

		AC group, n = 34		Gym AAS users, n = 18		Gym, non-users, n = 259		p-value
		%	n	%	n	%	n	
Qualite of upbringing	Good	43.8	14	72.2	13	87.2	224	<0.001
	Indifferent	15.6	5	5.6	1	10.1	26	
	Bad	40.6	13	22.2	4	2.7	7	
Relation with mother	Good	68.7	22	88.9	16	93.7	239	<0.001
	Indifferent	21.9	7	5.6	1	5.5	14	
	Bad	9.4	3	5.6	1	0.8	2	
Relation with father	Good	46.9	15	61.1	11	76.1	194	0.001
	Indifferent	28.1	9	5.6	1	8.6	22	
	Bad	25.0	8	33.3	6	15.3	39	
Physically abused	Yes	30.3	10	22.2	4	5.8	15	0.001
	No	69.7	23	77.8	14	94.2	242	
Mentally abused	Yes	48.5	16	27.8	5	10.2	26	<0.001
	No	51.5	17	72.2	13	89.8	230	
Drug abuse in the family	Yes	43.7	14	35.3	6	19.9	51	<0.01
	No	56.3	18	64.7	11	80.1	205	

In a comparison of the groups there were statistically significant differences in most examined variables. There was a general pattern where both groups with AAS experience had a more difficult social background and were disadvantaged in their current social situation compared to the non-users. This applied above all to the AC group, while the AAS users in the gym group were similar to the AC group albeit to a lesser extent.

The social background was examined based on fifteen variables related to the original family and twelve variables related to experience of school. As regards the original family there were no differences between the groups as regards country of birth, nor were there any differences in the country of birth of the parents. It was significantly more common for the members of the AC group to have only lived with the mother. They were more often an only child in the family.

As regards the individuals' view of the quality of their upbringing, the patients in the AC group felt to a significantly greater extent that it was poor compared to the non-users. It is worth noting that a majority of the AC group saw their childhood as bad or indifferent. There were significant differences both as regards the relationship with the mother and the father, although the relationship with the father was described as being particularly bad. Both physical and mental abuse was more common in the AC group. Furthermore, both user groups reported a higher prevalence of drug and crime problems in the family compared to the non-users.

The patients' experiences of school were significantly more negative than the non-users. Only a few in the AC group saw their school years in a positive light. All the patients bar one reported academic difficulties compared to a fourth of the non-users. The patients in the AC group had extensive experience of concentration difficulties, reading and writing difficulties but also problems like truancy and boredom were more common. The patients also had a significantly lower level of education than the control group with non-users.

As regards the current social situation, the differences were obviously to the disadvantage of the AC group. It was more common for the patients in the AC group to live alone and they were less likely to have a partner. However, it was more common for them to have children compared to the non-users. The patients in the AC group were more likely to be living on social benefits or to be on sick leave compared to the non-user group. For those who had or had had a partner, threats and violence in the relationship were a more common occurrence. Nearly all the participants in the AC group also reported that they have been convicted of a crime where violence had played a major part.

In short, this study shows that patients who are AAS users have a obvious complicated social background compared to a control group of non-users. Their experiences of their family is often negative with bad relationships with both parents, experiences of physical and mental abuse and experience of drug abuse and crime within the family. Furthermore, as regards the current situation of the AAS users, this can be described as more difficult with problems with housing, trying to make a living and income. In addition, violence in close relationships and crime are more common. In many respects, the group that was recruited from the gym who had had experience of AAS described a situation that lay somewhere between the AC group and the group of

non-users. The reported differences between AAS users and non-users apply to the group level, which does not mean that the results automatically can be applied to each separate individual.

4.2 Study II: The development of multiple drug use among anabolic-androgenic steroid users: six subjective case reports

This study was based on the histories of four men and two women from the AC group focusing on upbringing, drug use, current social situation and the development of the use of drugs including different combinations of drugs, experiences of AAS effects and the reasons why they sought medical help. The selection of the patients was determined by a desire to reflect the variations in life stories, to ensure that the histories would be detailed and to include both men and women. The patients' experience of AAS varied between nine months and sixteen years. They were aged between 22 and 37 years of age.

One of the main outcomes of the study was that AAS use can develop under very different circumstances and that the results at the group level can therefore not be extrapolated to a separate individual. As an example, both women in this study describe their childhood as difficult while three of the men felt that they had had a good childhood, at least in their relationships with their parents. Two of the interviewees had a positive view of their schooling while the other four had different types of problems at school, for example with friends or in the shape of concentration difficulties or problems with reading and writing.

All the interviewees in this study started using AAS in conjunction with training. For four of them, AAS were the first drugs they tested. The men used several different types of AAS compared to the women and it was more common for the men to use different nandrolone and testosterone substances than the women, who instead most often used methandrostenolone and stanozolol. Two of the patients used AAS believing that this was necessary if they were going to compete in bodybuilding. These two were, however, more restrictive in their use of other drugs. These two also developed an obsession with their body appearance and this had an important impact on their lives.

The users described the first period of AAS use as very positive, even the best time of their life. The most common positive effects that were described were the increase in strength and body mass but also psychological effects like for example an increase in self-confidence. However, gradually as they continued using AAS the side effects became more numerous and worsened so that they overshadowed the positive effects.

All the interviewees described what they saw as side effects of their AAS use, both physical and psychic. Problems with potency in both directions were common among males. Several of the patients felt that they suffered from a serious form of jealousy, which created problems in their relationships of different kinds; this was further worsened by an increase in aggressiveness. Several of those interviewed went looking for trouble to vent their aggressions. One of the interviewees, who had already had problems with aggression prior to his AAS use, describes what is referred to as steroid rage. Several of those interviewed had also had suicidal tendencies.

In short, the outcome of this study shows that AAS use can develop in many different ways and that there is a risk that these people develop into multiple drug users including many different drugs and/or alcohol.

4.3 Study III: Abuse of narcotics and other drugs in anabolic-androgenic steroid misusers

The aim of this study was to examine the whole drug abuse picture of AAS users and the reason why different substances had been used. Thirty men and two women were included in the study who had on average used AAS for 5.1 years (range 1–16) The AAS debut occurred on average at the age of twenty (range 15– 28). The reason for starting to use AAS was usually to get better results from the physical training and/or the desire to increase muscle strength and body mass but also to improve their chances in bodybuilding competitions.

The absolute majority of the patients came into contact with AAS at the gym and one or two bought it via the Internet. On average the patients had used six different AAS substances but in one case up to 28 different AAS substances had been used. The AAS substances that were used most often were for human use but almost half the patients had also used AAS for animals, e.g. boldenone, trenbolone and methandriol. The most common oral AAS substances were methandrostenolone and stanozolol, and the most commonly used injectable substances included nandrolone esters, different types of testosterone blends as well as the different testosterone substances like cypionate, enanthate, propionate and suspension.

Table 3. Reported lifetime and current use of drugs

Drugs/other preparations	Lifetime use		Current use	
	n	%	n	%

AAS	32	100	32	100
hGH	15	46.9	2	6.2
Insulin	9	28.1	3	9.4
Insulin-like growth factor 1	5	15.6	0	0.0
Thyroid hormone	4	12.5	1	3.1
Alcohol, hazardous or harmful use	15	46.9	13	40.6
Other drugs of abuse	29	90.6	18	56.2
Cannabis	26	81.2	4	12.5
Amphetamine	25	78.1	16	50.0
Ecstasy	18	56.2	4	12.5
GHB	15	46.9	5	15.6
Cocaine	13	40.6	2	6.2
LSD	9	28.1	0	0.0
Heroin	8	25.0	4	12.5
Pharmaceuticals	31	96.9	16	50.0
Other drugs	5	15.6	0	0.0
Dietary supplements	31	96.9	12	37.5

The AAS users also used other hormone substances to a large extent, e.g. hGH, IGF-1, insulin and thyroid hormone. Nearly all of them had also used an illegal drug of some kind. Cannabis seemed to be the most commonly reported other drug of abused in the life histories, closely followed by amphetamines. However, when it came to current use, amphetamines dominated totally. All the patients but one had apart from hormone substances and illicit drugs also used different types of medication as a doping substance and/or to counteract different types of side effects. More than half had used sympathomimetics like ephedrine, benzodiazepines (e.g. flunitrazepam [usually in the form of Rohypnol[®]] and diazepam), adrenergic drugs like clenbuterol and testosterone releasers like chorionic gonadotropin (HCG). Nearly half the patients also currently had an heavy alcohol consumption and two of the patients had even injected themselves with alcohol.

The substance abuse of all the patients was assessed by a psychiatrist who gave addiction diagnoses according to Diagnostic and Statistical Manual of Mental Disorder, 4th edition (DSM IV) (American Psychiatric Association 2000). Nine of the patients were judged as suffering from AAS abuse and eight fulfilled the criteria for AAS addiction. As regards the other drugs, nine patients were given an addiction diagnosis for amphetamine, seven suffered from amphetamine abuse and the four who took heroin fulfilled the criteria for an abuse diagnosis. In addition seven patients were diagnosed as abusers of alcohol and five were diagnosed as addicted to alcohol.

Hormone substances were normally used in order to enhance muscle mass and strength. The thyroid hormone was used to reduce fat, but so was insulin. Stimulantia like amphetamines, cocaine, ephedrine and bronchodilators were used to have more strength in training and to increase the burning of fat. Opioids were used because they could act

as painkillers during or after training. HCG substances (e.g. pregnyl) were used to combat AAS side effects, e.g. to reduce the risk of testicle reduction and to combat the oestrogen transformation effect that might lead to gynecomastia, anti-oestrogens like tamoxiphen was used. Practically all the patients used dietary supplements, like protein, creatine or vitamins.

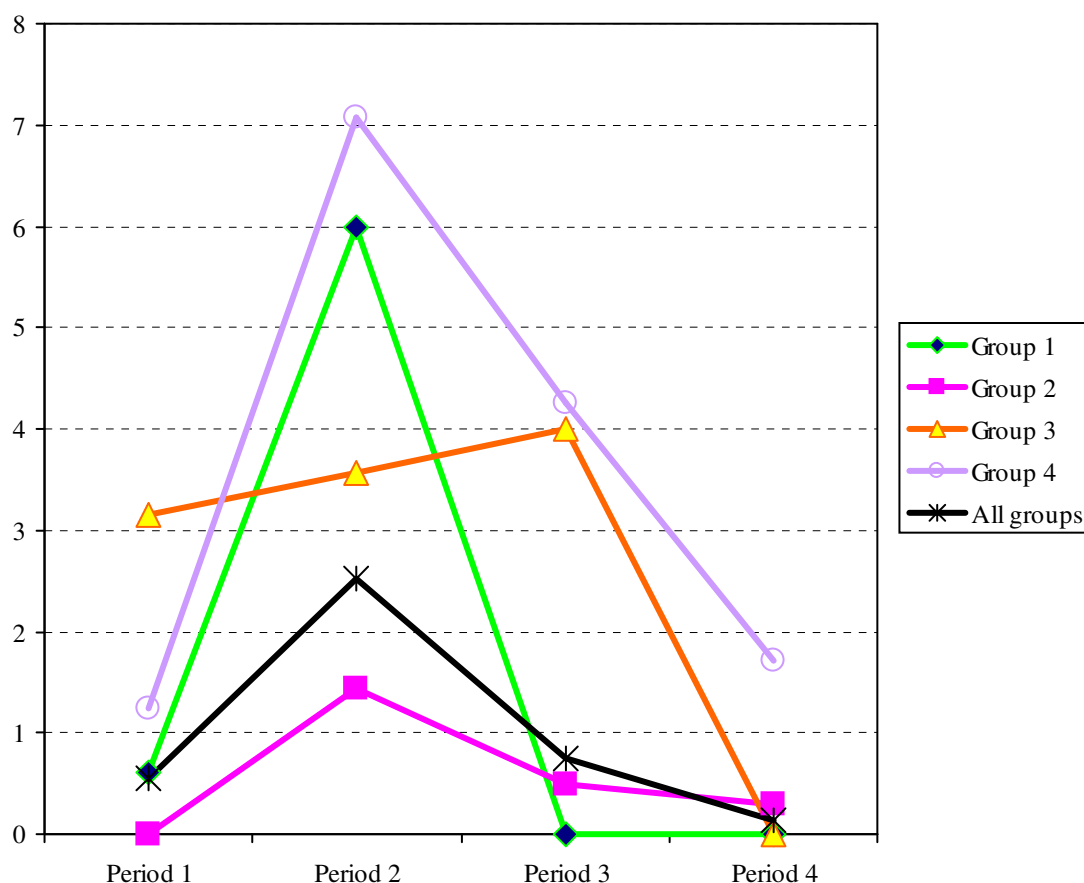
In short, the results of this study show that patients who use AAS and who seek help at an addiction clinic rarely only use AAS. Instead they are often multiple drug users mixing different AAS substances with other hormone substances, other drugs of abuse, pharmaceuticals, alcohol and dietary supplements.

4.4 Study IV: Is there an association between use of anabolic-androgenic steroids and criminality?

In the social interview all the patients bar two said that they had committed crimes that they had been convicted for. The result was compared to data from the BRÅ, the Swedish National Council for Crime Prevention where it emerged that 32 of the patients (31 men and one woman) had been convicted for crimes they had committed. The continued analysis of the crime data was based on these patients where there is objective information regarding the crimes. The analysis was made in accordance with the code system described above where account was taken of both the severity of the crime as well as the time period the crimes had been committed in.

The results were compared between subgroups of patients with different patterns as regards the development of the abuse and with different debut drugs. The subgroups were called group 1 (only AAS), group 2 (AAS first, then also other drugs of abuse O), group 3 (O first, then also AAS) and group 4 (O and AAS at the same time). This subdivision was made in order to be able to examine the link between drug use and the development of criminality more closely.

Figure 1. Criminality scores in periods 1–4 for each group (1, 2, 3 and 4) and for the total population



Before the patients starting taking drugs at all, criminality was relatively low in the groups where AAS came first, while it was slightly higher in group 4 (O and AAS at the same time) and substantially higher in group 3 (first O, then also AAS). After the drug debut, criminality increased for most of the patients. This was most clear in group 1 (only AAS) and in group 2 (first AAS and then also O).

A more in-depth analysis of the results showed that it was in particular within four crime groups that the number of patients increased their criminality after they started taking drugs. The groups were drug-related crimes, weapon offences, crimes against property and crimes against violence. In total over half of the patients had been convicted of a violent crime and/or a crime with a weapon (62 % and 56 % respectively). About half of the patients in group 1 and group 2 had been convicted for violent crime while the figure was much higher for group 3 (80 %) and group 4 (100 %). The crimes that were most common among AAS users were crimes against property like theft and pilfering, drug-related crimes like possession of narcotics and AAS, and violent crimes like battery, violent resistance and violence against civil servant.

There was a notable decrease in the number of crimes committed after treatment at the addiction clinic. Of the 32 patients, 24 decreased their criminality in terms of the number of convictions. This change remained throughout the follow-up period, which was on average five years.

In short, the study shows that there seems to be a link between the use of AAS and criminality, in particular as regards violent crimes and crimes with a weapon. This link becomes even clearer when AAS are combined with other drugs of abuse, which is very common for this patient group. The study also shows that criminality decreases substantially after treatment at an addiction clinic and that this reduction remains after several years of follow up.

5. COMMENTS AND GENERAL DISCUSSION

5.1 Methodological discussion

The aim of the dissertation was to gain knowledge about users of anabolic-androgenic steroids (AAS), with a particular focus on social background, current social situation, the development of AAS use over time, the link to other drugs and criminality, and psychic and physical side effects. The main focus of earlier research has been on users of AAS in competitive sports where the goal of the use has been to achieve a positive impact on performance. This was largely due to the fact that it was in the sports context that the use of AAS had originally started. In more recent years the use of AAS has, however, increased in groups of people who have no connection whatsoever with sports. AAS, which were originally a sports problem, have now become a social problem (Parkinson & Evans 2006). Research on groups outside competitive sports has, however, been fairly limited. Therefore, this study aims to address the problem of AAS use from a broader social perspective and not just limited to sport.

The first most important issue that had to be decided in the work on this dissertation was the matter of how to recruit AAS users to the project. The choice lay between trying to get hold of research informants via adverts in gyms or in newspapers, or to involve patients from the healthcare system. Since the project had its beginnings in the healthcare system based on the clinical question of how to best treat a new and previously unknown group of patients, it was natural to use this group. Hence, the title of this dissertation is AAS Users in Treatment. This decision meant that it was possible to gain broad knowledge about various aspects of AAS use from the group of people who seek help within the healthcare system, although the possibility of extrapolating this knowledge to apply to AAS users in general was fairly limited.

The study was conducted at the Addiction Centre in Örebro, which is an addiction clinic within the psychiatric care system. Young people (from the age of sixteen) and adults who have a drug addiction/dependency and a mental disorder, in other words a dual diagnosis, are offered diagnostic treatment and treatment sessions at the addiction clinic. Towards the end of the 1990s, it was apparent that more and more AAS users were coming to the clinic to seek help for various problems that they attributed to their AAS use. Not everyone came primarily to put a stop to their abuse; sometimes the reason was problems with side effects that they wanted help with. However, the ambition of the staff was also to encourage the patients to stop abusing AAS with support from the clinic.

It is a well-known fact that it is very difficult to get contact with AAS users (Pope & Kanayama 2005) and in addition very difficult to get patients to stay in treatment. In order to put together a reasonably sized research group, the original aim

was to base our inclusion on several clinics. However, treatment specifically aimed at AAS users was only available at very few places around the country and nowhere near our region. Thus it was decided to recruit locally.

Notices were put up at the reception at the addiction clinic during the inclusion period in order to recruit patients to the study. Furthermore, all new patients who came to the clinic were asked whether they had used AAS and whether they were interested in participating in the research project. Those patients who showed an interest were given detailed information about the project, both orally and in writing. It was managed to include 36 patients over a period of 3.5 years with this approach. Despite the limited size of the group, it is still one of the world's biggest groups in this field of research. Most of the participants in the project were men although this was not really regarded as a disadvantage since in general it is more common for men than women to use AAS (Kindlundh, Isacson, Berglund & Nyberg 1998; Luicidi, Grano, Leone, Lombardo & Pesce 2004; Middleman et al. 1995; Nilsson 1995).

One important issue with regard to methodology at this stage was the question of who was going to meet the patients and carry out the interviews. The alternatives were to either use special interviewers who would only meet the patients as part of the research, or to integrate the research with the treatment. There were obvious advantages and disadvantages with both alternatives. The use of special interviewers would mean that an understanding of the patients and their problems that were the core of the project would probably be more limited. On the other hand, the interviews would probably be more structured and rational. The project was, however, planned after an clinical contact with fifty-odd AAS users. This experience combined with the experiences of other researchers made it plain that this patient group is extremely difficult to recruit and at least as difficult to keep in treatment and as a research informant. The explanation for this is may be AAS is a hidden abuse that the users to a large extent hide from the people around them. As has previously been mentioned, it is often the perceived side effects that make the user seek care. In a clinical experience, many AAS users are also wary of the care system and the authorities.

Thus all experience pointed at the fact that the research project would be difficult to carry out with regard to recruitment and the drop out risk. Furthermore, it was clear that the treatment relationship might be disturbed if the question of participation in the research project was put in an unsuitable way or was badly timed. Therefore, it was decided that, based on long experience of both the gym environment and many patients who were AAS users, the author was most suited to be the one who conducted the research interviews. It was even felt that this was a prerequisite for the realisation of the project.

The disadvantage of this decision was that the researcher also was the therapist, which could be perceived as a dual role by the patients. Furthermore, good

understanding of the area might influence the interpretation of the patients' responses. It was believed, however, that this prior knowledge was also a major advantage when it came to understanding these patients from this very special subgroup of people and it also meant that the patients could trust the interviewer as a person since due to his experience he understood what they were talking about (Kvale 2007). All in all, in the opinion his background as a therapist was an important prerequisite for the realisation of the project.

In the research context it is unusual to be able to follow such a large group of AAS patients over a longer period of time (Pope & Kanayama 2004). In order to make this possible, the author coordinated all activities regarding both research and treatment. A team, which also included a doctor, psychologist and a nurse was set up to make it possible to realise all the different parts of the project. Contact with the patients was relatively intensive during certain periods. The aim was to establish a relationship with the patients, which was based on mutual trust to encourage them to want to work on their AAS abuse, but also to contribute positively to the research project. This approach meant that the collection of data went beyond our expectations. Not one of the patients dropped out of the project, which must be regarded as fairly unique in this field of research.

As regards the choice of research methods that corresponded with the aims of the project, it became clear at an early stage that there were no established instruments that were available to us. This meant that instruments had to be produced that were adapted more exactly to both the questions raised in the study and the group of patients. Since the clinic had a great deal of experience of clinical interviews with AAS users, it became natural to base the research interviews on that experience. The structured interview model that has been used at the addiction clinic for many years included templates for anamnesis, substance anamnesis, somatic examinations, psychiatric evaluations, psychological evaluations, nurse examinations and urine and blood test templates. The examination of the patient was subsequently adapted to the AAS users based on scientific studies on the area (Bahrke et al. 1992; Bahrke et al. 1998; Blue & Lombardo 1999; Corcoran & Longo 1992; Haupt & Rovere 1984; Korkia et al. 1996; Malone et al. 1995; Middleman et al. 1995; Olrich & Ewing 1999; Pope et al. 1996).

Due to the nature of the research project, a combination of different scientific methods was regarded as most useful in order to achieve the aims of the study. This approach was judged to reinforce the outcome of the study. The interviews, which took the shape of an ongoing dialogue, required several meetings in order to obtain all the information that was needed. The information was subsequently extracted from these interviews in two different ways. Firstly, by translating the information into quantitative variables, and secondly, by transforming it into personal narratives in Study II.

Perhaps it would be a good idea to spend some time reflecting on this type of data analysis and give reasons for why it was carried out in this way in the dissertation. The aim of Study I was to describe the social background and the current social situation of a group of AAS users in treatment and compare the results with a group of people who trained at a gym. As regards the addiction clinic group (the AC group), there was not really a choice when it came to method. There were no established instruments that corresponded to the aims of the study. As mentioned above, the point of departure was well-tested clinical instruments that were transformed into research interviews. Information was extracted from these and translated into quantitative variables. In most cases, this did not present any methodological difficulties. However, in some cases, the responses given by a patient were difficult to interpret. In these cases, the interviewer continued asking questions until it was clear which alternative in the variables in question was most suitable. This approach was facilitated by the fact that the interviews were spread over several meetings which meant that the interviewer never had to guess which alternative was the most correct one, instead he was able to return to the question if there were any unclear points.

It would for several reasons have been a good idea to use the same method for the comparison groups as well. However, there were also good reasons to choose a different method. One important reason was that AAS users rarely admit their problem openly. It was very important to find out whether the people in the comparison group had any experience of AAS use. It was believed that it was more probable to obtain this information using an anonymous questionnaire instead of conducting personal interviews, and for this reason the questionnaire was the method to choose. Another reason was that it was desirable to use a fairly large comparison group, which meant that interviews were hardly a viable alternative.

The Fisher's exact test was used for the statistical analysis of three of the groups. This method was the choice on the fact that it was a wish to have a robust and conservative method that was suited to the type of data in the study. A post-hoc test 2×2 would have been possible, but we refrained from using this for two reasons. The first reason was that when using Fisher's exact test, there is no correction for the effect of multiple comparisons. The second reason was that there were too few participants in each group (particularly in the gym AAS group) for them to be statistically sound.

The aim of Study IV was to examine the criminal activities of the patients in relation to the use of AAS and possibly also other drugs of abuse. The social interview included questions on criminal activity although at the design stage it was not self-evident that the information we obtained would be reliable. To our surprise, however, the patients were prepared to discuss these matters as well. In spite of this, it was felt that there was a risk that certain patients might exaggerate their criminal activities in order to seem more dangerous than they really were. Hence the risk for reporting too little vis-à-vis

too much was carefully considered (Nilsson 2003). The consequence of this was a decision to validate the results with objective data. The method used was to collect data from the Swedish Council for Crime Prevention (BRÅ), which has a register of all crimes where a sentence has been passed. True, crimes committed that did not lead to a conviction were not included in the data, but this was still considered by far the best method with which to validate the interview data.

5.2 Ethical discussion

Attempts were made in the project to minimise any ethical problems with regard to the participants. The patients who participated in the interviews were told that they did not have to reply to questions of a sensitive nature. They could also drop out of the research whenever they wanted without this affecting their treatment.

It was not feasible, however, to rule out the possibility that the extensive and intrusive interviews might have a negative impact on the patients. Although since the research was integrated with the treatment, any negative reactions could be dealt with at the addiction clinic. As regards the gym group, the participants were guaranteed anonymity. While collecting the data for Study II, there was a risk that sensitive information would emerge. Thus the information anonymous, but for obvious reasons it was made somewhat not possible to do so entirely without eliminating important information. The ethical problem was minimised because the patients were given the opportunity to read through the accounts that were written and they were thus able to say whether they wanted something in the text to be deleted. In the end, this possibility was only used to a very limited extent.

5.3 Results discussion

Naturally it is important to relate the findings of the dissertation to previous research conducted in the field. This is, however, no easy task bearing in mind that there are only a few studies that the studies in this dissertation can be compared with. As regards the study on social background and current social situation, we only found a handful of studies; two from Sweden (Kindlundh et al. 2001; Kindlundh et al. 1999) and one from the USA (Kanayama et al. 2003b), which present slightly more detailed social data on AAS users.

The findings of Study I indicated that it was more common for AAS users compared to non-users to have had a difficult upbringing. This was particularly obvious in the AC group. Previous studies (Kanayama et al. 2003b) have pointed out that AAS users' contact with their fathers is often poorer and this is supported by the findings in this study where the users describe a bad relationship with their fathers and claim they were

physically and mentally abused by their parents. It also emerged from Study I that alcohol or medicine abuse was more common among the patients' families, something not indicated in other studies.

When comparing the level of education and experience of different types of problems at school between users and non-users of AAS, it was found in general that the outcome of the AAS users was much lower in almost all the areas examined. The level of education of an AAS user was lower than that of a non-user, which corresponds to findings in previous studies (Kindlundh et al. 2001) where it emerged that AAS users obtained average or poor school results. These findings can be highlighted by these findings with regard to AAS users often having a history of concentration difficulties, reading and writing difficulties at school while they also reported that they suffered from school fatigue. In that light it might not be so odd that AAS users often played truant, which has been described earlier (Kindlundh et al. 1999).

It is naturally not possible to draw any causal conclusions when it comes to the relationship between social background and AAS use. We are happy to confine ourselves to saying that AAS use seems to be linked to experiences of a difficult childhood and adolescence, both as regards family and school. We interpret this as meaning that AAS use that leads to a desire to seek help within the healthcare system normally does not occur without a social background of the type described above. Moreover, we understand the findings to mean that AAS use also leads to a difficult current social situation. It is naturally impossible to say whether this situation would have existed without the use of AAS, but the impression from the interviews is still that AAS use often takes place in a sub-culture that may be associated with social marginalisation, aggression in close relationships and criminal activity.

In Study II, six AAS users described how drugs (AAS and possibly other drugs of abuse) had affected their lives. The ambition was to as far as possible give a voice to their life histories even if it was expressed via my interpretation of the interviews with them. There are some previous studies that have included case studies (Allnutt & Chaimowitz 1994; Cowan 1994; Pagonis et al. 2006b; Pope & Kanayama 2004; Pope & Katz 1990; Thiblin & Parklo 2002; Thiblin et al. 1999) but there are only a few where the users themselves have been given the opportunity to tell their story (Grogan, Shepherd, Evans, Wright & Hunter 2006; Monaghan 2002; Olrich & Ewing 1999; Todd 1987). In these latter studies it is, however, bodybuilders who have been given the opportunity to tell their stories and not people who have sought help within the healthcare system for problems linked to AAS use.

In this study, the patients described AAS use as being a very positive experience initially, for example due to an increase in strength and body mass, and enhanced self-esteem. One thing the patients had in common, however, was the fact that the negative effects gradually exceeded the positive ones. This corresponds with an earlier study

(Olrich & Ewing 1999) where nine out of ten people described the effects of AAS as predominantly positive, for example as regards social status, impact on the body or sexuality.

The patients in Study II were selected in such a way to ensure as much variation as possible. The different variations were characterized in the following way: early combined drug use starting with AAS, late combined drug use starting with AAS, early development of a complex usage of hormone substances, body obsession and a complex usage of hormone substances, the use of enhancing drugs and an extreme body obsession, and oscillating drugs of abuse and AAS use. For four of the patients, AAS were the first drugs that they had used and this usually happened when they had reached a plateau in their training, i.e. when the training no longer gave any positive results. As far as I know there is no study that describes which drug comes first during the development of a poly-substance use of drugs.

Other drugs like other drug of abuse or medicines were often used to enhance the effect of AAS or to reduce different side effects of AAS use. Commonly reported side effects were either an increased or a decreased sexual ability or sexual desire, testicle reduction, acne, gynecomastia, mood swings, depression, increased aggressiveness and increased body obsession. These problems have been reported earlier (Brower 2002; Eklof et al. 2003; Parkinson & Evans 2006). Moreover, pathological jealousy was a major problem for four of the patients, which is something previous studies have not reported. The drug use put major pressure on the relationships of the users, for example in the form of pathological jealousy. One of the patients suffered from an aggressive outburst known as roid rage on a couple of occasions, which is a very serious aggressive state. (Thiblin et al. 1997). In short, the study shows that the use of AAS may be a gateway to other drug use for both men and women and that it often leads to combined drug use.

Study III indicated that in most cases the AAS debut occurred because the person wanted to obtain better training results. For men the debut occurred on average at the age of 19.7 years of age and for women on average at the age of 20.5 years of age.

The patients often had extensive knowledge about AAS and what substances could be taken together with AAS. The patients obtained information about AAS use in different ways but most often from books that they regarded were an important source of information. Examples of such literature are a book written by a North American bodybuilder (Phillips 1996), a book on how drugs are discovered in amateur sports (Di Pasquale 1984), Steve Gallaway's "The Steroid Bible" (Gallaway 1997) and last, and perhaps most important of them all, William Llewellyn's Anabolics reference series (Llewellyn 2007). The latter is a very extensive reference book that includes detailed information on 200 active substances and almost 2.000 products on sale.

Study III reported how AAS are often combined with various narcotic substances, alcohol and medicines. Insulin is normally used to increase weight in conjunction with training but according to this study insulin can also be used to reduce fat, which is something that has not been reported before in the literature. Previous studies have warned that AAS may be a gateway to a damaging use of alcohol (Johansson, Lindqvist, Nyberg & Fahlke 2000). Our study confirms this risk. AAS have in several studies been identified as a gateway to other drug addiction (Arvary & Pope 2000; Celerier et al. 2003; Johansson et al. 2000; Kanayama et al. 2003a; Wines, Gruber, Pope & Lukas 1999) or multi-addiction (Gruber & Pope 2000), findings which are also supported by this study. Despite the patients' accounts of their polysubstance use, many see themselves as clean-living people and not as drug addicts since they take the substances in order to obtain a beautiful body.

There are only a few studies that touch upon the possible link between AAS and criminality. As far as we know, there is no study that has followed the criminal activities of AAS users over a period of several years and that compares these activities with drug use of different kinds. Of the 32 patients that were followed in Study IV, the criminal activities, in terms of crimes leading to convictions, increased for most after they had started to use drugs. This link was most apparent in the subgroups that had started with AAS. The findings must be interpreted with great care since the material in the study is limited. However, we do believe that it is worth paying continued scientific attention to these findings.

There are a number of studies that have looked into the link between AAS and violent crime (Isacson et al. 1998; Klotz et al. 2006; Klotz et al. 2007; Pope & Kanayama 2004; Pope et al. 1996; Thiblin et al. 1997; Thiblin & Parklo 2002; Thiblin et al. 1999). Our study, unlike Klötz et al.' study from 2006, was able to report a link between AAS and the number of people with convictions in the crime groups drug-related crimes and violent crime. The reason for this discrepancy may possibly be due to differences in different types of populations.

In the study by Klötz et al. where both the AAS group and the non-user group were recruited from the test archives of a doping laboratory, the authors found that there was a higher risk of having been convicted of a crime involving a weapon or fraud if the individual had used AAS, but the study was, however, not able to establish a link between AAS use and violent crime or crime against property (Klotz et al. 2006). In our study, over 60 % had been convicted of a violent crime which supports The second study from Klötz et al. used material from the police register on people under the age of 40 dying of unnatural causes. The finding in this study was that AAS use could be linked to violent crime, particularly if AAS were combined with other drug of abuse drugs (Klotz et al. 2007). In our study, we also noted that violent crimes increased even more when AAS were used at the same time as other drug of abuse.

There was a clear decrease in the number of convictions upon completion of treatment. This was particularly evident in the group that had only used AAS, which makes one suspect that there is a very particular link between AAS and criminality, where treatment may have a positive impact. The study was not designed as a treatment study, and this means that the results cannot definitely be related to the treatment; and still less be extrapolated to apply to AAS users in general. However, in our opinion the findings, which are really secondary findings, deserve attention and should lead to continued scientific studies.

5.4 Clinical implications

Finally, I would like to discuss the clinical implications of the findings of the dissertation. The research project was conducted within the framework of a clinical treatment situation. The research project was designed in such a way that the knowledge of each patient became very extensive, something that was useful in treatment. This knowledge could, however, with care be generalised to apply to AAS users in treatment at other addiction clinics.

The findings in Study I show how important it is in sessions with AAS users to allocate enough time to talk about their upbringing within the family, experiences of school and current social situation. It is true that not all the patients had experienced difficulties in these areas, but it did apply to most. This means that it is a good idea to give the patient the opportunity in therapeutic sessions to focus on different themes like relationships with parents and other people close to them, any experience of abuse and assault, experience of drug abuse and criminality within the family and relationships with partners. Other important areas to discuss in sessions are experiences of school both as regards schoolwork and schoolmates. It is also important to carefully map out the current social situation.

The findings in Study II show how important it is to listen to the life stories of the patients without having preconceived ideas since it is clear that there are enormous differences when it comes to how AAS use may develop and how it may, although not necessarily, be combined with the use of other drugs and/or pharmaceuticals. The patients' stories can provide valuable information about the life history of an individual and their substance use pattern to be used as a basis for an individualised treatment plan.

Knowledge from Study III may be useful in the training and skills enhancement professionals working with AAS users. The study provides in-depth information about the types of substances that are used and the reasons for the use. The study may also contribute to an awareness of the extent of polysubstance use in this patient group. Basic knowledge about this area is very important if the therapist is going to have a meaningful dialogue with the patient.

Study IV also provides a picture of an AAS user as being an aggressive and/or paranoid person with criminal tendencies, which therapists need to take into consideration during treatment. Criminality is common among AAS users and this may have an impact on the outcome of the treatment but it is also important to bear in mind that the study indicates that the treatment itself may have a positive impact on criminal activities.

In conclusion, the studies in the dissertation show how important it is that treatment is carried out by a therapist who has knowledge of the problems of AAS users in a broad sense and of the substances that AAS users may use in combination in their search for the perfect body.

6. SAMMANFATTNING PÅ SVENSKA (SUMMARY IN SWEDISH)

Denna avhandling grundar sig på intervjuer med 36 användare av anabola androgena steroider (AAS) som sökt hjälp vid en psykiatrisk beroendeklinik. En jämförelsegrupp bestående av 277 gymtränande personer ombads fylla i ett frågeformulär. Avhandlingen består av fyra delstudier.

I delstudie I påvisades att AAS-användarna ofta hade erfarenheter av svår uppväxt och svåra aktuella sociala problem var också mer vanliga bland dessa. Användarna rapporterade att de hade dåliga relationer med sina föräldrar och nästan hälften hade erfarenhet av fysisk eller psykisk misshandel. AAS-gruppens skolerfarenheter var mestadels negativa och innefattade koncentrationsproblem, skoltrötthet och inlärningssvårigheter. Deras aktuella situation innefattade ofta narkotikamissbruk, misshandel av partner och annan kriminalitet såsom miss-handel, vapenbrott och stöld.

I delstudie II berättar AAS-användare om sina livshistorier. Utvecklingen av AAS-bruket visade på en betydande variation vad gäller social bakgrund, drogdebut, relation till AAS-bruk och erfarenhet av AAS-effekter. Alla patienterna hade till en början upplevt positiva effekter av AAS men allteftersom överskuggades de positiva effekterna av de negativa. Alla patienterna ägnade sig åt överdriven träning på gym och använde AAS i kombination med gymträning, vilket visar på att bruket av dessa preparat hör nära ihop med denna typ av fysisk träning.

Resultaten från delstudie III visar att blandmissbruk var mycket vanligt bland patienterna. Över hälften missbrukade både narkotika och olika mediciner. Nästan femtio procent av patienterna använde dessutom tillväxthormoner. Knappt hälften av de intervjuade personerna uppvisade ett riskbruk av alkohol. Den vanligaste orsaken man angav för AAS-bruk och användning av andra hormoner var att man ville öka muskelmassan och muskelstyrkan, men vissa personer tog också insulin för att bränna fett. Man använde cannabis för att sova bättre, heroin för att minska smärta och amfetamin för att öka uthålligheten och bränna fett. Dessa data tyder på att de flesta AAS-användarna inom missbrukspsykiatri är blandmissbrukare och flerdrogsberoende.

Delstudie IV belyser relationen mellan AAS-användning och kriminalitet. Kriminaliteten hos de flesta personerna i studien ökade markant efter det att de börjat använda droger. Detta var särskilt tydligt hos de två undergrupper som började sin missbrukskarriär genom att använda AAS. Ökningen var störst vad gäller våldsbrott och vapenbrott. Resultaten tyder på att det finns ett samband mellan AAS-bruk och kriminalitet, speciellt vad gäller våldsbrott och vapenbrott samt att denna typ av kriminalitet ökar när AAS kombineras med annan narkotika.

Avhandlingen visar sammanfattningsvis att AAS-användare ofta har en bakgrund och en aktuell situation som präglas av sociala problem och att AAS- bruket ofta kombineras med andra droger och preparat, att AAS- bruket är kopplat till kriminalitet inklusive våldsbrott och vapenbrott och att AAS- bruk kan vara en inkörsport till missbruk av andra droger.

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EPILOGUE

A well-known concept among people who train and particularly in the world of bodybuilding is: *No pain, no gain*. This means that if your muscles do not ache when you lift weights, the training will not lead to muscle growth. This concept can also be applied to a PhD education.

When I started working on this dissertation I had a very naïve understanding of research. I could not in my wildest imagination have understood the amount of (interesting) work that lay behind a dissertation. It started with reading all the literature available at the same time as I developed more and more contact with patients who were AAS users. After that I got in touch with people around Sweden who had experience of AAS use in many different ways, either clinically or scientifically. Eventually my plans became more structured when I was accepted as a doctoral student at the Psychiatric Research Centre. I started changing the way I thought about research and thus I became more organised in my work. I continued collecting data through the many sessions I had with patients, interviews, medical assessments, psychological examinations, urine and blood tests. All the data was entered into SPSS. A questionnaire was produced and used at a gym for interviews with gym clients. The collection of material went remarkably quickly and all the data was subsequently entered into the computer system. After some years it was possible to publish the data in the four studies that form the basis of this dissertation. I continued my sessions with patients, which had started a few years earlier, the telephone rang and I wrote.

Finally, it was time to write the summarising chapter of my compilation dissertation. I would use four words to describe the journey to the completion of this dissertation: *No pain, no gain*. In this context the concept means that as a PhD student doing a doctoral dissertation if you do not work so hard that your body and head ache, there will be no dissertation growth.

APPENDIX

QUESTIONNAIRE ON TRAINING AT A GYM

The Psychiatric Research Centre, together with the Addiction Centre in Örebro, is carrying out a research project on the abuse of anabolic steroids and other doping substances. In the study, we are among other things studying the social background of the steroid users. Therefore we are now looking for a control group of people training at a gym to facilitate our work with evaluating the results.

If you answer the questions in this questionnaire, you will remain anonymous.

You answer the questions by ticking the right box or by writing in your response. When you are done, hand in your sealed filled in questionnaire to reception and no one will know who you are.

A couple of questions on who you are first

1. *Are you a man or a woman?*

Woman

Man

2. *How old are you (years)?*

3. *How tall are you (in cm, no decimals)?*

4. *How much do you weight (in kg, no decimals)?*

5. *Were you born in Sweden or abroad?*

Sweden

Abroad

6. *Were your parents born in Sweden?*

Yes, both of them

Yes, one of them

No, neither of them

7. *How do you make a living?*

(Tick one or several)

Income from work

Income from sick leave benefit

Income from study benefit

Income from social benefit

Income from unemployment benefit fund

Other: _____

8. *Do you have a driver's licence?*

Yes

No

9. How would you describe your health?

Very good

Good

Neither good nor bad

Bad

Very bad

10. Do you agree or disagree with the following statements?

(Tick one box in each line)

**Totally
disagree**

Agree

- a. *I have a positive image of myself.*
- b. *I have a greater worth than most other people.*
- c. *I am usually able to concentrate on what I am doing.*
- d. *I am on the whole happy with my body.*
- e. *I think a lot about what my diet consists of.*
- f. *Sometimes I feel that I am worthless.*
- g. *I often worry about different things in my life.*
- h. *I often have trouble sleeping because of worry.*

i. *I always have someone to turn to when I need help.*

j. *I often have problems with my temper.*

Questions on your childhood and adolescence

11. *Who did you grow up with?*

(Tick one box)

With both biological parents

With my father

With my mother

Other: _____

12. *How were your childhood and adolescence years?*

(Tick one box)

Very good

Fairly good

So so

Fairly bad

Very bad

13. *Are your biological parents divorced?*

Yes

No

13a. *If yes, how old were you when they got divorced?*

(Tick one box)

0-5

6-10

- 11–15
- 16–20
- Over 20

14. *What was your relationship with your father like during your childhood and adolescence?*

(Tick one box)

- Very good
- Fairly good
- So so
- Fairly bad
- Very bad

15. *What was your relationship with your mother like during your childhood and adolescence?*

(Tick one box)

- Very good
- Fairly good
- So so
- Fairly bad
- Very bad

16. *How many full siblings have you got?*

- None
- 1
- 2
- 3
- 4 or more

17. *Have you got children of your own?*

- Yes
- No

17a. *If yes, how many?*

1

2

3

4 or more

18. *Was/Is there anybody else who was important to you during your childhood and adolescence?*

Yes

No

18a. *If yes, who?*

(Tick one or several boxes)

Maternal grandmother

Maternal grandfather

Paternal grandmother

Paternal grandfather

Maternal uncle

Paternal uncle

Maternal aunt

Paternal aunt

Other: _____

19. *How old were you when you left home?*

11–15

16–20

21–25

Other: _____

20. *How do you live now?*

(Tick one box)

Live alone

Single parent

With my father

With my mother

With a partner

Other: _____

21. *How do you live now?*

(Tick one box)

No permanent relationship

Common law spouse

Married

Living apart

Other: _____

22. *Have you ever hit someone you have lived with?*

Yes

No

23. *Have you ever threatened someone you have lived with?*

Yes

No

24. *Were you physically abused as a child/adolescent?*

Yes

No

24a. *If yes, by whom?*

(Tick one or several boxes)

- Father
- Mother
- Sibling
- Other

25. *Were you mentally abused as a child/adolescent?*

- Yes
- No

25a. *If yes, by whom?*

(Tick one or several boxes)

- Father
- Mother
- Sibling
- Other

School years

26. *What level of education have you got?*

(Tick one box)

- Dropped out of compulsory school
- Compulsory school
- Dropped out of upper secondary education
- Upper secondary education
- Dropped out of higher education
- Higher education

27. *How do you like/did you like school?*

(Tick one box)

- A lot
- Quite a lot
- It is/was ok
- Not much
- Not at all

28. *Do you/did you play truant?*

(Tick one box)

- No, never
- Once a semester or so
- Once a month
- 2–3 times a month
- Once a week
- Several times a week

29. *Have you ever experienced any other problems with your studies?*

- Yes
- No

29a. *If yes, which one(s)?*

(Here you can tick more than one box if you like)

- Concentration difficulties
- Writing difficulties
- Reading difficulties
- School fatigue
- Fights at school
- Sport was more important
- Drug abuse
- Other: _____

30. *Did you ever bully anyone at school?*

Yes

No

31. *Were you ever bullied at school?*

Yes

No

Some questions on training at a gym

32. *Why do you train at a gym?*

(Tick one or two alternatives)

To perform better in a sport

To become stronger

To get a nicer body

To meet friends

To relax

To feel good

To have fun

Other reason: _____

33. *How many times a week do you train?*

(Tick one box)

More than 5 times a week

At least 5 times a week

3–4 times a week

1–2 times a week

Less often

34. *Have you ever taken/do you take dietary supplements?*

(By dietary supplements we mean e.g. protein, creatine, vitamins etc.)

Yes

No

Some questions on drugs and other substances

Alcohol habits

By alcohol we mean “folköl”, beer purchased in a supermarket (approx. 3.5 % volume), “mellanöl/starköl”, medium or strong beer (+ 3.6 %) purchased at the alcohol retail monopoly, strong cider, wine, fortified wine and spirits.

(By 1 glass we mean 50cl “folköl” or 33cl “starköl” or 10 – 15cl white or red wine or 5 – 8cl fortified wine or 4cl spirits).

35. *How often have you drunk alcohol during the last 12 months?*

- 4 times a week or more
- 2–3 times a week
- 2–4 times a month
- Once a month or less often
- Never

36. *How many glasses (see example above) of alcohol do you drink on an average drinking day?*

- 1–2 glasses
- 3–4 glasses
- 5–6 glasses
- 7–9 glasses
- 10 or more glasses

37. *How often do you drink six glasses or more on the same occasion?*

- On a daily or almost a daily basis
- Every week
- Every month
- Less than once a month
- Never

38. *How often have you drunk so much alcohol that you have been drunk in the last 12 months?*

Daily or almost daily

A couple of times a week

Once a week

2–3 times a month

Once a month

Once or a couple of times every six months

Less often or never

Sniffing and illegal drugs

39. *Have you ever sniffed?*

Yes, several times

Yes, once

No

40. *Have you ever taken drugs?*

(By drugs we mean e.g.: hash, marijuana, amphetamine, heroin, ecstasy, GHB, cocaine and crack)

Yes, earlier on in my life

Yes, in the last six months

No

40a. *If yes, which type(s) of drug(s) have you taken?*

(Tick one or more boxes)

Hash

Marijuana

Amphetamine

Cocaine

Heroin

Crack

LSD

Kat

GHB

Another type of drug: _____

Do not know

Use of anabolic-androgenic steroids and/or other doping substances

In all the questions on the use of anabolic-androgenic steroids including testosterone, growth hormones and other doping substances we do not mean drugs that have been prescribed by a doctor for medical use.

41. *Have you ever taken any of the following doping substances?*

(Tick one or more boxes)

No, I have never taken any doping substances

Earlier on in my life In the last six months

Yes, anabolic-androgenic steroids

Yes, testosterone

Yes, growth hormones

Yes, insulin

Yes, thyroid hormones

Yes, IGF 1

Yes, Ephedrine

Yes, Clenbuterol

Yes, other

Use of prescribed medicines

42. *Have you ever taken sedatives or sleeping pills prescribed by your doctor?*

(Tick one or more boxes)

No, I have never taken sedatives or sleeping pills

Yes, sedatives (e.g. Valium, Sobril (Oxazepam), Librium, Apozepam (Diazepam), Stesolid (Diazepam), Xanor)

Yes, sleeping pills (e.g. Mogadon, Nitrazepam, Sobril (Oxazepam), Stilnoct, Apodorm (Nitrazepam), Rohypnol, Flunitrazepam, Imovane)

43. *Have you ever taken a sedative or a sleeping pill without a doctor's prescription?*

(Tick one or more boxes)

No

Yes, a sedative

Yes, a sleeping pill

Questions on the abuse of alcohol and other drugs in your family

44. *Did anyone in your family ever abuse alcohol during your childhood and adolescence?*

(Tick one or more boxes)

No

Yes, my father

Yes, my mother

Yes, a sibling(s)

Yes, someone else

45. *Did anyone in your family ever abuse illegal drugs during your childhood and adolescence?*

(Tick one or more boxes)

No

Yes, my father

Yes, my mother

Yes, a sibling(s)

Yes, someone else

46. *Did anyone in your family ever abuse medicines during your childhood and adolescence?*

(Tick one or more boxes)

No

Yes, my father

Yes, my mother

Yes, a sibling(s)

Yes, someone else

Criminality

47. *Has anyone in your family ever been convicted of a crime?*

(Tick one or more boxes)

No

Yes, my father

Yes, my mother

Yes, a sibling(s)

Yes, someone else

48. *Have you ever committed a crime?*

Yes

No

49. *Have you ever been convicted of a crime?*

Yes

No

49a. *If yes, what type of crime?*

(Tick one or more boxes)

Crime involving a firearm

Burglary

Theft

Assault

Drug crime

Sold drugs

Sold doping substances

Drink driving

Some other crime: _____

50. *Have you ever been the victim of a crime?*

Yes

No

Thank you very much for your cooperation!

Put the questionnaire in the envelope and seal it. Hand it in to reception.

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