# Patterns and Correlates of Anabolic-Androgenic Steroid Use

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NDARC Technical Report No. 48

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**National Drug and Alcohol Research Centre**
**Technical Report number 48**

ISBN 0 947229 78 7


Funded by the New South Wales Department of Health

## ACKNOWLEDGEMENTS

This study was funded by the Drug and Alcohol Directorate, Centre for Disease Prevention and Health Promotion, New South Wales Department of Health.

We would like to thank the following organisations who assisted with this project: Northern Beaches HIV Prevention Centre; NSW Users and AIDS Association; Canterbury HIV Service; Central Coast Needle Exchange; Drug Referral and Information Centre, ACT; Assisting Drug Dependants Inc., ACT; Redfern Needle Exchange; St George Needle Exchange; Fairfield Community Health Centre; Western Sydney AIDS Prevention Service; Australian Rugby League; Fire Brigades of NSW; and to the various gyms and sporting organisations who supported the project. In particular we would like to thank, Ms Helen Stathis, Dr Tony O'Sullivan, Mr Perry Fletcher, Ms Liz Skinner, Mr Keith King, Ms Nicole McDonald, Ms Astrid Spielman, and Ms Mathew Greene. Thanks also to Dr Maree Teeson for her statistical advice.

To the anabolic-androgenic steroid users who participated in the study, we thank you for your trust and your cooperation.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

## EXECUTIVE SUMMARY

The use of anabolic-androgenic steroids (AAS) has gained widespread attention because of its use in the sporting arena, with high profile sporting identities testing positive to one or more banned anabolic substance. In addition, links have been made between the illicit use of these compounds with aggressive and often violent behaviour in animals and humans. The present study of 100 anabolic-androgenic steroid users sought to address the paucity of research into anabolic-androgenic steroid use in Australia by examining the patterns and correlates of anabolic-androgenic steroid use by a variety of groups in the community.

The present study has identified AAS as a very discrete sub-group of illicit drug users. This sample of AAS users were more likely to be male, homosexual, in a stable relationship, well educated and in full or part-time employment than other groups of injecting drug users recently studied in Australia. This sample also had a substantially higher disposable income than the general Australian community, with only 27% earning less than $30,000 per annum. In common with other illicit drug users, however, in addition to the perceived benefits of the drug, they experience significant negative health and psychological effects of their AAS use. In a small, but important, proportion of AAS users this includes the development of problems with dependence and withdrawal and irreversible side-effects. This study also reported the first documented case of AAS dependence in a women using a variety of measures.

Although the majority of subjects in the study felt that the benefits of their AAS use outweighed any negative aspects of use, there were still significant numbers of side effects reported by the sample. These included irreversible side-effects in women of deepening of the voice and clitoral enlargement. Nearly half of the participants reported that their behaviour was more aggressive when using AAS and 26% reported experiencing the phenomenon known as `roid rages'.

AAS users tend to be a very health conscious group who use low levels of other psychoactive drugs and engage in rigorous physical exercise and training on a regular basis. Subjects reported that the most likely deterrent to AAS use was health concerns and this was idenified as an important issue to be discussed in harm reduction activities.

A number of activities that the AAS users in the present sample engaged in, however, were potentially harmful. These include self-taught injection procedures; injecting specific muscles for localised muscle growth (calves, biceps); concurrent use of AAS (stacking) and use of high doses; use of other drugs such as clenbuterol,

thyroxine, insulin and human growth hormone, nutritional supplements; and among the gay group in particular, concurrent use of recreational drugs, both licit and illicit.

The AAS user is actively involved in the seeking out of information that is relevant to their patterns of use, with the objective of increasing the benefits and reducing the side effects. Many users in this study expressed a desire to access a well informed medical practitioner as their most preferred source of information. The most common sources of information utilised, however, were not entirely reliable. There is much scope, therefore, for the improvement of harm reduction information to this eager group.

The present study has suggested a number of fruitful avenues for further research and intervention activities which will assist in the reduction of harm experienced by anabolic-androgenic steroid users.

# 1.0 INTRODUCTION

The use of anabolic-androgenic steroids has gained widespread attention because of its use in the sporting arena, with high profile sporting identities testing positive to one or more banned anabolic substance. In addition, links have been made between the illicit use of these compounds with aggressive and often violent behaviour in animals (Rejevski, Brubaker, Herb, Kaplan & Korituik, 1988) and humans (Yates, Perry & Murray, 1992; Corrigan, 1996). With the growing attention of the Australian media and reports from the United States and the United Kingdom, interest in and use of these substances within Australia is becoming more widespread and not restricted to athletes. The present study has sought to address the paucity of research into anabolic-androgenic steroid use in Australia by examining the patterns and correlates of anabolic-androgenic steroid use by a variety of groups in the community.

## 1.1 Historical Background

### 1.1.1 *Testosterone: discovery, synthesis and characteristics*

For nearly one and a half centuries, scientists believed that testicular failure could be the cause of many of the symptoms seen in ageing men, such as the reduction in sexual and mental vigour (George, 1996). It is now know that the so called 'testicular principle' was the male sex hormone testosterone. In 1935 scientists isolated testosterone, thus confirming the endocrine function of the testis (Kochakian, 1993).

Subsequent experiments using human and animal subjects showed that testosterone exerted both androgenic and anabolic effects (George, 1996). The androgenic effects of testosterone are those that are involved with the development and maintenance of male primary and secondary sex characteristics. The anabolic effects stimulate protein synthesis, particularly in the skeletal muscle, reduction of bone resorption, promotion of bone growth and calcium deposition, wound repair, and inhibition of urinary nitrogen loss.

### 1.1.2 *Anabolic-androgenic steroids*

Having synthesised testosterone, scientists were disappointed to find that both oral and injectable administration of testosterone resulted in little or no effect as it is rapidly degraded to mostly inactive compounds (George, 1996). This led medicinal chemists from the late 1940s to try and develop analogues of testosterone that would not degrade as quickly. Some 50 years on, a number of synthetic analogues have been developed and marketed for clinical purposes, initially for the treatment of hypogonadism and catabolic states. However, the search for a purely 'anabolic' steroid has failed. To scientists and users alike, the

dissociation of the anabolic and androgenic characteristics of synthetic testosterone derivates remains "an impossible dream" (Kochakian, 1993, p.20). It is, therefore, most appropriate to refer to these compounds as anabolic-androgenic steroids (AAS).

As described by Lukas (1996), there are four distinct groups of AAS; essentially testosterone and 3 major structural analogues of testosterone. These are explained in table 1.1, along with structural representations and common examples. There are only a small number of legitimate AAS available for human use in Australia (see MIMS Australia 1995). In addition, there are a number of AAS preparations used in veterinary science, although the quality control procedures used in the manufacture of these drugs are in no way equivalent to those used in human medicine. The great demand for AAS for non-medical use coupled with the restricted availability arising from their S4 classification (ie. available from pharmacists by prescription only), has created a blackmarket in AAS, leading to the manufacture of counterfeit AAS, containing few, if any, active ingredients (Lukas, 1996).

### 1.1.3 *Medical and non-medical use of anabolic-androgenic steroids*

Anabolic-Androgenic Steroids were initially used in the treatment of hypogonadism and catabolic states (Kennedy, 1992). The use of AAS in medical practice broadened to treatment of other conditions, including growth promotion, refractory anaemias, malignancies, alcohol liver disease, hyperlipidaemia, osteoporosis, male contraception, wound healing and hereditary angioneurotic oedema. In recent years, however, more effective compounds have been developed and AAS are now rarely used in medical practice (Kennedy, 1992).

The research on veterinary use of AAS is limited (Kochakian, 1993). Anecdotal reports cited in Kochakian suggest that AAS improve nitrogen retention, weight gain, appetite, stamina and general vigour and appear to be useful as adjunct therapies for a variety of other problems (see Kochakian, 1993, for further description).

The non-medical use of AAS may have begun at the 1936 Berlin Olympics with reports of testosterone use by German athletes (Yesalis, Courson and Wright, 1993). However, these reports, and others like it (eg. testosterone administration to Nazi soldiers during World War II) are yet to be confirmed. The first confirmed report of the non-medical use of AAS was in preparation for the 1954 World Weightlifting Championships in Vienna.

**Table 1.1** Androgenic Steroids (testosterone analogues) and their relationship to testosterone

| Name | Modification to structure | Benefits | Common Example |
|---|---|---|---|
| Testosterone | Ineffective following oral ingestion or injection | | Testosterone Suspension |
| Type A - 17α-alkylated | Addition of an alkyl group at position 17α | Allows for oral use and is slowly catabolised by the liver | Methyltestosterone |
| Type B - 17β-esterification | Esterification (conversion of acid to an ester) at the 17β-hydroxy group | Allows for injection as lipid soluble and hence slower release into circulation (ie. longer lasting compared with oral) | Type B<br>Type A Testosterone Propionate |
| Type C - Modified Ring Structure | Modification to the ring structure at any of the points 1-12, 14 | Allows for oral dosing and increased potency | Type C substitution at any point Fluoxymesterone |

* Adapted from George, 1996)

** some testosterone esters have additional features that allow for oral administration (eg. *testosterone undecanoate, 'Andriol')*

During this competition the Soviet Union's team physician revealed to the U.S. team physician, Dr John Ziegler, that their team was using testosterone in an attempt to improve performance (Yesalis et al., 1993). Yesalis et al. noted that Dr Ziegler subsequently experimented with testosterone on himself, and others, at his gym in the United States. Concerned about the androgenic effects of testosterone, he began experimenting in 1958 with a newly released drug, Dianabol *(Methandrostenolone)*. Describing his results in various health and fitness periodicals, and with the success of a number of early users in their respective competitions, beliefs about the efficacy of AAS began to spread throughout the various strength-intensive sports.

The non-medical use of AAS is now widespread, and is not limited to the sporting field. There is a growing demand for steroids by people who simply wish to improve their appearance, ranging from adolescents to gay men (Beel, 1996).

### 1.1.4 *Anabolic-androgenic steroid education and prevention*

Opinions regarding the use of AAS for non-medical reasons differ vastly; even within the AAS using population there are some subgroups (eg. competitive bodybuilders) that believe the use of AAS by other subgroups (eg. body image) is less acceptable. Health promoters have made significant inroads into the prevention of a number of high-risk behaviours, such as high-fat diets and smoking, however, those who regard AAS use as a significant health risk have not enjoyed the same success (Yesalis & Wright, 1993).

By the 1980s, medical practitioners, researchers, and educators had begun a campaign against the use of AAS by denying that ergogenic benefits were possible (Ardito,Goldstein, Bahrke & Sattlerl, 1994). Users believed otherwise as they could see the differences AAS produced. In addition, unsubstantiated claims about the dire health consequences were made by some, then sensationalised by the media, leading to a proliferation of misinformation among the general public (Yesalis & Wright, 1993). By the time the American College of Sports Medicine (1984) reversed its position on AAS use, suggesting that ergogenic benefits were possible under certain circumstances, communication between users and professional bodies had been significantly damaged. With increased legal sanctions and law enforcement attention, advice for would-be AAS users significantly dried-up (Ardito et al., 1994). This led to the rise of amateur (unqualified) biochemists and endocrinologists in gyms around the world and the development of a code-of-silence among many AAS using networks, hampering research efforts.

## 1.2 Subpopulations of Anabolic-Androgenic Steroid Users

The 1995 National Drug Strategy Household Survey (Commonwealth of Australia, 1996) indicated that 0.2% of people surveyed had tried AAS for non-medical purposes in the preceding 12 months. This figure translates to a weighted estimate of over 28,800 people nationwide, more than twice that of the 1993 survey. Given the degree of under-reporting regarding AAS use (Beel, 1996), this is a conservative approximation of the extent of use within Australia.

### 1.2.1 *Sports related*

The disqualification of Canadian sprinter Ben Johnson at the 1988 Seoul Olympics after a drug test revealed that he had used an AAS (*stanazol*) brought the attention of the world to the sporting arena and to the ergogenic use of AAS. This was by no means the first case of AAS use in sport, but, due to the surrounding circumstances (i.e. world record 100 metre run), it is the most memorable. According to Todd (1987), AAS use within the Olympic arena was restricted to the Soviet Union and some U.S. weightlifters at the 1960 Olympic Games, however, by the 1964 Games AAS use was quite extensive among strength athletes. From 1968 the number of sports containing AAS users dramatically increased, such that by 1990 individuals involved in track-and-field, hockey, swimming, cycling, skiing, volleyball, wrestling, handball, bobsledding, and soccer were reportedly using AAS (Dubin, cited by Yesalis et al., 1993). Non-Olympic Sports were also witnessing AAS use, including American Football (Yesalis et al., 1993), powerlifting, boxing, Rugby League and BMX events (Australian Sports Drug Agency (ASDA), 1995).

### 1.2.2 *Body image*

Although athletes might be the most visible population, it has been hypothesised that they represent the smallest group of AAS users (Buckley, Yesalis, Friedl, Anderson, Streit & Wright, 1988). Buckley and colleagues report that there is a larger group of amateur or recreational users with various reasons for using. According to Brower (1989) one such group endeavour to enhance appearance rather than performance and have subsequently been labelled as 'aesthetes', where cosmetic reasons underlie use (Shapiro, 1994). Among the aesthetes are competitive and recreational bodybuilders, models and aspiring actors (Brower, 1989; Shapiro, 1994) and gay men (Beel, 1996).

### 1.2.3 *Occupational*

The use of anabolic-androgenic steroids may also be functional in that its use serves a direct purpose, usually in the carrying out of employment duties (Shapiro, 1994). This group includes bodyguards, door staff/security personnel, construction workers, police, firefighters, and members of the armed services, and members of

street gangs (Black, 1992; Brower, 1989; Dart, 1991; Mugford, 1995; and Shapiro, 1994).

### 1.2.4 *Adolescents*

A final group of AAS users, and perhaps the most concerning, are adolescent users (eg. Buckley, Yesalis, & Bennel, 1995; Yesalis, 1993). At a time when they are seeking to find their identity, their perceptions of the glamorous life of the elite sportspersons and muscular actors lead many teenagers to strive to reach the same physical stature portrayed in the popular media and they believe that AAS steroids will assist them in this endeavour (eg. Brower, 1989; Yesalis et al., 1993; Yesalis, 1993).

## 1.3 Other Illicit Drug Use among Anabolic-Androgenic Steroid Users

The use of AAS for non-medical purposes is regarded by many as a high-risk behaviour. It has also been suggested that AAS users are more frequent users of other illicit drugs. In a survey of more than 1800 adolescents in the United States, DuRant et al. (1993) found 76 secondary students who had used AAS, 53 of which had used more than twice. An examination of the frequencies of AAS and other illicit drug use revealed a significant linear relationship between the frequency of AAS and cannabis, cocaine, cigarettes, smokeless tobacco, and alcohol use.

In a survey study of 164 gym goers in Cleveland, Ohio, a total of 31 current AAS users were identified with a mean age of 26 years and 6.5 years of experience with AAS (Malone, Dimeff, Lombardo, & Sample, 1995). This study found a significantly lower incidence of current alcohol use between current AAS users and both non users and previous users. Further, there were no differences between any of the three groups in the incidence of other illicit drug use; surprisingly though, none of the AAS users reported current cigarette use. In contrast, a study of 21 current AAS users in Australia (Beel, 1996) found equivalent levels of alcohol use, and a greater incidence of other illicit drug use in AAS users compared to controls; more than half of the users were regular cigarette smokers. In interpreting her findings, however, Beel suggested that perhaps AAS users were more open about their drug use having already identified themselves as AAS users; whereas the control group may have been less likely to admit to substance use.

Reported patterns of other drug use among AAS users are equivocal. The evidence to date indicates that while adolescent (DuRant et al., 1993) and some post-adolescent AAS users (eg. Beel, 1996) may be using other drugs more

frequently than the general population, there are still indications of low concurrent substance use (Malone et al., 1995). It would be necessary, therefore, to investigate which subgroups of AAS users are more likely to use/abuse other drugs, and the factors surrounding this behaviour to clarify this relationship.

## 1.4 Reasons for Use

The classification of AAS users described above is based on individuals' motivations to use. The athlete who chooses to use is almost entirely motivated by their desire to succeed and the subsequent rewards, financial or otherwise. Brower (1989) describes this as a 'win-at-all-cost' approach; a behaviour reinforced by a belief that their competitors are using. In a study of elite powerlifters (Wagman, Curry & Cook , 1995), the most important reasons offered for using AAS were to improve their performance and increase their chance of winning.

While competitive bodybuilders are indeed searching for victory, they are a select group of aesthetes. Their 'sport' is based on the improvement of appearance rather than athletic performance, consequently, they are looking for improvements in appearance. Competitive bodybuilders provide the link between the aesthetes and the athletes. Not all aesthetes, however, are driven by the glory of victory. Many recreational weight trainers use steroids to improve their appearance without any thought of competition (eg. Gridley & Hanrahan, 1994). Brower (1989) suggests that these individuals may be motivated by a need to improve their self-confidence as an attractive physical appearance is said to promote social acceptance, admiration and opportunity (Schwerin, Corcoran, Fisher et al., 1996).

The functional user believes that their 'survival' depends on their physical ability. For example, according to Dart (1991), as police become more concerned about their ability to protect themselves, the incidence of abuse will probably increase with steroids giving them the physical edge they fear they lack. Further, Brower (1989) suggests that the need for power is another motivating factor, especially for street gang members.

## 1.5 Patterns of Anabolic-Androgenic Steroid Use

No two groups of AAS users have the same pattern of drug administration (George, 1996). There is also considerable variation within each subgroup, as each user develops the best regime for him/herself. Although the specific features of individual patterns of use are varied, a number of key concepts can be addressed, including cycling, dose management, and stacking.

### 1.5.1 *Cycling*

The main feature of steroid use is the cycling pattern, where users cycle on and off AAS. The 'on' cycle (referred to as the 'cycle') is where users will administer steroids for a period of time, usually predetermined according to specific, short term goals. These are followed by 'off' cycles (referred to as rest periods) which is a period of no use. This is based on the belief that the body becomes 'immune' to the effects of steroids, such that, beyond a certain point any further administration of steroids is useless as their anabolic effects cannot be utilised, possibly due to receptor shutdowns (World Health Organisation (WHO), 1995). The duration of these cycles, and their rest periods, vary enormously. According to the WHO (1995), short cycles (approx. 6 weeks) accompanied by longer rest periods are used to avoid side-effects, however, more serious bodybuilders will often use longer cycles, where gains are maximised. Despite the belief that cycles beyond 14 weeks are counterproductive (WHO, 1995), many bodybuilders will have longer cycles, with 68 week cycles having been reported in one study (Perry, Anderson & Yates, 1990). Anecdotal reports also indicate that some users "never come off the gear" .

During a period of AAS administration (cycle), users make decisions about the specific dosages that will be used. It is now widely recognised that many users will administer dosages well beyond that recommended for the various therapeutic indications (eg. Korkia, 1994). Further, the dose used often varies within the cycle. 'Pyramiding' refers to the practice of increasing the dose up to a certain level and then reducing the dose back towards the base level (George, 1996). Other methods that have been used include: reverse pyramid schedules; gradually increasing the dosage used over time; using a constant dose for the majority of the cycle and then decreasing rapidly as the cycle finishes (fast tapering); and fluctuating dosage levels throughout the cycle. Many users, however, will simply use a constant dose throughout the cycle.

### 1.5.2 *Stacking*

To further complicate the issue, users will administer more than one AAS at a time, known as stacking (George, 1996). Although there is no scientific validation of this practice, users believe that the use of different steroids helps to avoid the problem of receptor shutdown. Consequently, users will administer a selection of steroids, either oral or injectable, or a combination of both, at different points within the cycle. In a study of 110 users Korkia et al. (1994) found that the men typically used around 3 different AAS, a result replicated in an Australian study by Gridley and Hanrahan (1994). Korkia and colleagues (1994) also found that some had administered as many as 16 different AAS. The women did not show the same pattern, using on average 2 steroids per cycle, with a maximum of 4.

### 1.5.3 *Usage patterns*

The complicated nature of individual AAS use patterns has confounded research, thus restricting the extent to which these studies can be compared. With users reportedly spending anywhere between $300 and $800 on a cycle of AAS, or as Korkia et al. (1994) found in the United Kingdom, an average £500, users want to ensure that they are getting the best possible results from their AAS regime. For this reason, many AAS users will monitor their use and the results carefully and will make changes for the next cycle if feel they are warranted.

### 1.5.4 *Related drug use*

In addition to the use of AAS, many users administer other drugs to assist with their training routine, or to address side effects of their AAS use. A number of drugs are in use that have similar anabolic effects to AAS. These include: insulin (eg. Reynolds, 1995); insulin-like growth factor 1 and 3 (IGF-1/IGF-3) (Veggeberg, 1996); and human growth hormone (HGH) (Beel, 1996; Rickert et al., 1992). Insulin, IGF-1, IGF-3, and HGH are gaining in popularity in the competitive field as there are, as yet, no accurate means of testing whether levels of these compounds in the body are above those levels which would be considered endogenous.

Stimulants are used by some AAS users to increase the intensity of their training (Beel, 1996). Consequently the illicit use of amphetamine, ephedrine and pseudoephedrine have been found; caffeine use specifically for the purpose of increasing intensity has also been reported (Beel, 1996). For the aesthete (including bodybuilders) a number of drugs are used to refine the definition of the muscle, known as 'cutting up'. This is achieved through the use of substances such as clenbuterol. Krammerer (1993) indicates that it is clinically used as an asthma treatment (although not approved in Australia or the U.S.), it is also reported by users to have anabolic properties and assist in the reduction of subcutaneous fat (Prather , Brown, North & Wilson, 1995). In addition, thyroxine, which increases the body's metabolism, and diuretics, to promote water loss, are used for cutting up purposes (Korkia et al., 1994).

In order to prevent or reduce the side effects of AAS, a number of drugs have been used. A common side effect of AAS use in males is gynecomastia (the development of breasts, see below) (Friedl & Yesalis, 1989). Brought about by the aromatising of many AAS, gynecomastia is addressed, with mixed success, by the use of an oestrogen antagonist such as tamoxifen or *mesterolone* (eg. proviron), a non-aramotizable androgen (Freidl et al., 1989). Human chorionic gonadotrophin (hCG) has also been used by bodybuilders to combat gynecomastia (Freidl et al., 1989), however, it is often administered specifically to

restore spermatogenesis in males (Korkia et al., 1994). Anti-inflammatory medication and pain killers are also commonly used (Beel, 1996).

### 1.5.5 *Nutritional supplements*

Finally, there are a wide range of vitamin, mineral and nutritional supplements used by AAS users, as well as other members of the exercise/health conscious community. Included in this group are the vitamins (Bs, C, E, multivitamins), minerals (calcium, iron), digestive enzymes and protein powders. In addition, there are a number of supplements that are reported to assist with muscle growth and strength; creatine monohydrate has, at this stage, the most promising scientific data to support the claims made by manufacturers (see Greenhaaf, Bodin, Soderlund & Hultman, 1994; Harris, Viru, Greenhaaf & Hultman , 1993; Haventidis, Cooke, King & Butterly, 1995). All of these products are available over the counter.

## 1.6 Effects of Anabolic-Androgenic Steroid Use

Both the scientific community and AAS users themselves agree that there are both positive and negative outcomes associated with the non-medical use of AAS. Various research studies have been conducted looking at the physical benefits of AAS use (summarised in Haupt & Rovere, 1984), such that the American College of Sports Medicine (ACSM) (1984) reversed an earlier position statement to conclude that there are ergogenic benefits to be gained. The medical and paramedical professions, on the other hand, have been quick to report the negative side-effects associated with AAS use (eg. Corrigan, 1996; Pope and Katz, 1994). Anecdotal reports suggest that many users are aware of the risks involved with using AAS, however, as far as many users are concerned, the benefits outweigh any actual or potential negative side-effects. With the majority of research examining the side-effects, few studies have examined the physical and psychological benefits of AAS use that are experienced.

### 1.6.1 *Benefits of anabolic-androgenic steroid use*

Regardless of the possible side-effects of AAS, users believe that there are benefits to be gained from the use of AAS; the growing incidence of AAS use is testament to this. In addition, each AAS user weighs up the relative risks and benefits.

A number of perceived benefits have been identified in the literature and subjected to experimental investigation. These benefits could be categorised as either improvements to the physiology of the individual, or to their psychological well being. Table 2 summarises the perceived benefits of AAS use.

At present, the mechanisms by which AAS exert their effect is largely unknown. A number of suggestions have been put forward to explain the mechanisms of action:

(1) a general increase in protein synthesis
(2) inhibition of the catabolic effects of the glucocorticoids
(3) effects on the CNS and neuromuscular function
(4) placebo

The above mechanisms, described by Lombardo (1993), have not been confirmed and it is possible that the real mechanism(s) by which AAS function involves a combination of the above and a number of as yet unidentified mechanisms.

#### 1.6.1.1 Physiological benefits

Although reported as a benefit *per se* (Beel, 1996), 'improvements to appearance' could summarise a number of the reported benefits. It is commonly noted that AAS users are seeking increases in both size and weight (eg. Beel, 1996; Lombardo, 1993; Yesalis & Bahrke, 1995). Further, there are expected reductions to fat levels (Beel, 1996), such that the weight gains are essentially an increase in lean body mass (Lombardo, 1993). As a consequence of the changes to fat levels and distribution, AAS users also expect associated improvements to muscle definition (Beel, 1996).

Various ergogenic benefits are also expected. Ergogenic benefits include: increases in physical strength; increasing the frequency, intensity, and duration of training sessions; improved endurance; prevention of injuries; reduced fatigue; and associated improvements to sporting performance (Bahrke, 1993; Beel, 1996; Lombardo, 1993; Yesalis et al., 1995). It has been suggested that women may generally experience a more significant anabolic and androgenic response to the same dose of AAS than males since they have low levels of naturally occuring testosterone. In addition, the number of unsaturated anabolic-androgenic receptors in the skeletal muscles of adult females may be higher than in normal adult males (Reynolds & Sullivan, 1997).

Although there is widespread conviction among the exercise community of the benefits of AAS use, research on the expected benefits is inconclusive, such that the extent of improvements and the factors contributing to these changes are not well understood or documented (Yesalis et al., 1995). There is considerable evidence that AAS do cause weight gain, however, there is conflicting data as to whether this only represents an increase in lean body mass (Kennedy, 1992; Lombardo, 1993). A similar situation surrounds the issue of increases in strength. Despite the conflicting results, the American College of Sports Medicine (ACSM) has indicated that "gains in muscular strength through high intensity exercise and

proper diet can be increased by the use of anabolic-androgenic steroids in some individuals" (ACSM, 1984, p.13).

**Table 1.2 Perceived Benefits of Anabolic-Androgenic Steroid Use**

| Category | Benefit |
|---|---|
| **Physiological** | |
| appearance | improved appearance |
| | increased size |
| | increased weight |
| | improved muscle definition |
| | decrease body fat / promote lean body mass |
| ergogenic | increase strength |
| | train harder and longer / endurance |
| | reduced fatigue |
| | prevent injuries |
| | improved sporting performance |
| **Psychological** | increased chance of reaching goals |
| | improve self esteem / self confidence |
| | increased approval from others |
| | greater arousal |
| | increased pain threshold |
| | increased sex drive |

Yesalis (1995) has identified a number of factors that may contribute to the contradictory findings concerning the physiological benefits of AAS. Methodological issues include: the dose variation between studies and the small amount typically administered compared with that used by illicit AAS users; different methods and techniques for assessing the variables of interest (eg. strength and body fat); different AAS used across studies; the number, weight training experience and physical condition (pre-experiment) of the participants; and the design and interpretation of the study. Further reasons for the lack of

consensus include legal and ethical factors that prevent the design of studies with more realistic dosages, as well as the unknown mechanisms of action and the assessment and control of placebo effects.

#### 1.6.1.2 Psychological benefits

A number of the psychological benefits of AAS use are likely to be due to perceived improvements to the individual's body shape and appearance: increased self-esteem and self-confidence; greater belief in achieving personal goals; and increased approval from others (Beel, 1996; and Bahrke, 1993). Other benefits which may be more directly related to the administration of AAS include: elevated arousal and increased pain threshold (Bahrke, 1993) as well as increased sex-drive (Beel, 1996)

### 1.6.2 *Side-effects associated with anabolic-androgenic steroid use*

A review of the literature suggests that there are two broad areas of concern within the medical profession regarding the non-medical use of AAS. The first area concerns the physical side-effects, and the second covers the issue of psychological well being and behaviour.

#### 1.6.2.1 Physical side-effects

There are a number of physical side-effects reported in the literature concerning abnormalities in: physical appearance, sexual organs, liver function, cardiovascular function, musculoskeletal function, and immunological function.

A summary of the physical side-effects of AAS use is presented in Table 1.3. A common symptom of AAS is the appearance of acne, particularly on the shoulders and back (Haupt et al., 1984; Brower, Catlin, Blow, Eliopulos & Beresford, 1991). Usually dependent on the male sex steroids, androgen therapy has also been shown to contribute to acne development in high dose AAS users, possible due to the increase in sebum production (Friedl, 1993). It has been suggested that the synthesis of skin lipid cholesterol, which increases with androgen use, is related to sebum excretion (Kiraly, 1988). Consistently high levels of androgen use is also responsible for premature baldness, or alopecia (Brower et al., 1991; Haupt et al., 1984). According to Friedl (1993) the individual must be predisposed to baldness, with androgen use merely accelerating the process. In contrast, the unusual growth of hair (hirsutism) has also been reported (Brower et al., 1991). Brower et al. (1991) also reported that cases of jaundice, characterised by a yellowing of the skin, have been described.

Given the pharmacological similarities between AAS and testosterone (see above), it is not surprising that there are reported changes in the sexual

characteristics of both men and women. In men, there have been reported changes in testicular size (Brierly, 1987; Brower et al, 1991), due to the inhibition

**Table 1.3:**

**Some Reported Physical Side-Effects of Anabolic-Androgenic Steroid Use for Non-Medical Purposes**

| Category | Side-Effect |
|---|---|
| **Physical Appearance** | acne |
| | alopecia |
| | hirsutism |
| | jaundice |
| **Sexual Organs** | testicular shrinkage * |
| | decreased spermatogenesis * |
| | decreased endogenous testosterone production * |
| | gynecomastia * |
| | deepening voice ** |
| | shrinking breasts ** |
| | clitoral hypertrophy ** |
| | uterine atrophy ** |
| | menstrual irregularities ** |
| **Liver Function** | tumours |
| | hepatocellular dysfunction |
| **Cardiovascular Function** | high cholesterol & LDL:HDL ratio |
| | atherosclerotic heart disease |
| | decreased glucose tolerance |
| | high blood pressure |

| | |
|---|---|
| **Musculoskeletal** | weak connective tissue |
| | premature closure of epiphyses in long bones*** |
| **Immunological Function** | higher risk of infection |

* men only ** women only *** children only

of the follicle stimulating hormone (FSH) and the luteinising hormone (LH). There are also accompanying reductions in spermatogenesis and endogenous testosterone production (Briely, 1987). Males have also reported priapism, involuntary and long lasting (days) erections. The development of breasts in men, known as gynecomastia, has been commonly reported (eg. Briely, 1987; Brower et al., 1991; Friedl et al., 1989; Haupt et al., 1984). This subareolar tissue, which can be bilateral or unilateral, is said to be caused by a reduction in the ratio of bioavailable androgen and estrogen, or an increase in total estrogen (Friedl et al., 1989).

Anabolic-androgenic steroids reportedly produce virilising effects in women that, unlike those in men, are usually irreversible (Brierly, 1987). In addition to the unusual growth of body hair described above, women users of AAS experience a deepening of the voice, shrinking breasts, clitoral hypertrophy, and uterine atrophy (Bierly, 1987; Strauss and Yesalis, 1993). Reversible side-effects include menstrual irregularities, infertility, and acne. The use of AAS by pregnant women can cause female foetuses to develop male characteristics.

As described earlier the oral AAS are broken down at a much more rapid pace than those AAS prepared for injection (Lukas, 1996). This places a heavier burden on the liver where much of this breakdown occurs. A number of studies have indicated that long-term abuse of AAS can lead to hepatocellular dysfunction (reported in Bierly, 1987). According to Bierly, this liver cell dysfunction is linked to an increase in alkaline phosphatase and lactatedehydrogenase levels (LDH), which are enzymes involved in cellular reactions. The possibility of liver tumours has been described by some (see Bierly, 1987), but has been questioned by others (eg. Friedl, 1993).

A number of authors have identified AAS users as being at risk for atherosclerotic heart disease (ASHD) due to the changes in cholesterol levels (Melchert & Welderl, 1995; Bierly, 1987). The human body contains two forms of cholesterol, one beneficial and one harmful. Beneficial cholesterol is high density lipoprotein cholesterol (HDL), while low density lipoprotein cholesterol (LDL) is harmful. In summarising the research on cholesterol, heart disease and AAS use, Friedl

(1993) explains that it is well established that androgen self-administration leads to a reduction in HDL levels. This reduction in HDL is offset by an increase in LDL, while not necessarily affecting total cholesterol levels (cf. some authors who suggest that total cholesterol levels do increase, eg. Brower et al., 1991). Friedl (1993) clarifies his position, however, by asserting that not all androgens produce this effect. It would appear that while the 17-alkylated androgens do, the testosterone esters (eg. cypionate, propionate, enanthate) do not.

Further increasing the risk of heart disease is the observation that AAS users develop reduced tolerance to glucose (see Friedl, 1993; and Brower et al., 1991). Impaired glucose tolerance might also serve to decrease HDL, although, as Friedl (1993) suggests, this may be a risk factor in itself. Another risk factor identified by Brower et al. (1991) is hypertension; however, increases in blood pressure seen in AAS users are rarely observed in people not predisposed to hypertension (Freidl, 1993).

The musculoskeletal system in the human body is affected by AAS use. Although not a problem for the AAS user alone, Lombardo (1992) reports that the incongruity in the strengthening of the muscle tissue and the tendons will result in greater forces being applied to an ill-prepared tendon. As AAS allows individuals to train harder, they would therefore be at greater risk of tendon injuries than weight trainers *per se*. Bierly (1987) reports that AAS use can lead to the premature closure of the epiphyses in long bones of adolescent users who have not finished their growth cycle, leading to permanent short stature.

According to Lombardo et al. (1992), AAS users might be at greater risk of infection due to effects on the immune system. This prediction is based on the reported reduction of serum immunoglobulins and increased natural killer cell activity found in AAS users. However, Lombardo and his colleagues indicate that the clinical significance of these changes to the immune system are yet to be clarified.

A final physical side effect of AAS use is the risk of thrombotic stroke. Four cases of thrombotic stroke in high dose androgen using males described by Freidl (1993) suggest that androgen use might contribute to clotting abnormalities, although there is some inconsistency in the findings, with some androgens apparently not associated with this problem.

#### 1.6.2.2 AAS effects on psychological well being and behaviour

The non-physical side effects of AAS can be grouped into those that: (1) affect the individual's subjective psychological states and feelings; (2) inhibit comfortable social interaction; (3) affect psychiatric well being; (4) are due to both

psychological and physical factors; and (5) factors associated with the illegal status of AAS.

The first group of side effects affect the individual's psychological states and feelings. Based on subjective reports from AAS users (described in Brierly, 1987; Brower et al., 1991; Corrigan, 1996) and close friends and relatives of users , AAS users will experience regular fluctuations in general mood levels. Further, some users reportedly experience feelings of euphoria and hypomania, while others report feelings of dysphoria (Brower et al., 1991). According to Bahrke and his colleagues (see Bahrke et al., 1990; Bahrke et al., 1992), the changes in mood perceived in AAS users may be subtle. This conclusion is based on a lack of significant change on the Profile of Mood States (POMS) questionnaire in their studies of users.

Secondly, in both the professional literature and the general media, considerable attention has been devoted to AAS users' interactions with other individuals, both known and unknown to them. There are consistent reports of increased irritability (summarised in Haupt et al., 1984; and, Brower et al., 1991), with some authors describing many users as being quarrelsome (Corrigan, 1996). More serious are reports that AAS users are frequently hostile (Yates, Perry & Murray, 1992) and often violent (Conacher & Workman, 1989; Corrigan, 1996; Lubell, 1989); although not all authors concur with these suggestions (see Bahrke et al., 1990; Bahrke et al., 1992). There are, however, an abundance of claims that AAS use increases aggressiveness (Haupt et al., 1984; Bierly, 1987; Brower et al., 1991; Moss, Panzak & Tartar, 1992; Parrot, Choi & Davies, 1994; and Corrigan, 1996), with some suggesting that it may be associated with violent crime (Conacher et al., 1989). Although not a clinically recognised term, many authors refer to the aggressive, hostile behaviour of AAS users as a 'roid rage'; a term which the popular media has frequently used without clear definition.

The third subgroup of psychological side effects has a psychiatric basis. There have been reported cases of clinically significant depression and anxiety among AAS users (Brower et al., 1991). Furthermore, prolonged use may be associated with severe paranoia, hallucinative and delusional psychosis, suicidality, and dependence (Brower, 1992; Brower, Blow, Young & Hill, 1991; Brower et al., 1989; Corrigan 1996; Kashkin et al., 1991). (A discussion on AAS abuse/dependence is presented below). Williamson (1994), however, suggests that AAS could precipitate a psychiatric illness only in those individuals who are predisposed as it has not been established that they cause psychiatric illness.

The interplay between the mind and the body is likely to be responsible for the apparent changes in libido, both increases and decreases, sleeplessness and nervous tension reported in the literature (Haupt et al., 1984; Bierly, 1987; Brower et al., 1991; and Corrigan, 1996).

An additional side-effect that is not directly physical or psychological in its origin, nor a side effect of AAS use *per se*, is the risk of transmission of HIV and other blood borne viruses. As many AAS users use injectable steroids, this sub-group faces the same risk that other injecting drug users face. However, unlike any of the physical and psychological side effects described above, the risk of HIV transmission following AAS administration can be removed by employing safe injecting practices. Despite this, cases of needle sharing have been reported among AAS users (Perry et al., 1992), as has the transmission of HIV following AAS injection (Scott & Scott, 1989). In contrast, two studies carried out in Australia report few cases of injecting practices conducive to HIV transmission. In a sample of 152 AAS users, Plowright (1993) found only one case of needle sharing, and no cases of needle reuse in each individual's AAS using history. Similarly, a smaller unpublished needs assessment for AAS users in the Northern Beaches region of Sydney (Stathis, unpublished report) also found no incidence of needle sharing or reuse. Plowright (1993) suggests that this finding is due to the availability of injecting equipment from pharmacies and needle and syringe exchanges in Australia as well as a successful HIV/AIDS education program. Plowright also suggested that the low levels of needle sharing found may also be due to the fact that the act of injecting AAS is not a social one, unlike other illicit drugs, such as amphetamines.

The unauthorised possession and supply of anabolic-androgenic steroids, both those intended for human and veterinary use, as well as the administration of AAS to another person is an offence and carries a penality. In Western Australia for example the penalty is a $100,000 fine and 25 years in gaol. The illegal status of the drugs leads many users to be in touch with criminal "black markets" with whom they would not usually associate. The stress of being involved in clandestine activities is a further negative consequence of AAS use.

#### 1.6.2.3 Anabolic-androgenic steroid dependence

The first documented case of AAS dependence appears to have been in 1980 (Wright, 1980). Since then a number of case reports have been published describing apparent AAS dependence (eg. Brower et al., 1989; Hays, Littleton & Stillner, 1990; Tennant et al., 1988). Kashkin et al. (1989) and others since (eg. Brower et al., 1991) have indicated that dependence on AAS could be assessed

using the criteria for substance dependence outlined in the Diagnostic and Statistical Manual of Mental Disorders III- Revised (DSM-III-R) (APA, 1987):

(1) AAS use over longer periods than desired;
(2) unsuccessful attempts to stop;
(3) substantial amount of time obtaining, using, and recovering from AAS use;
(4) frequent intoxication or withdrawal when expected to fulfil role functions;
(5) important activities given up or reduced due to AAS use;
(6) continued use despite significant psychological problems caused by them;
(7) tolerance;
(8) characteristic withdrawal symptoms occur; and
(9) use of AAS to relieve withdrawal symptoms;

Using these criteria, evidence of AAS dependence has been mixed. One study (Brower et al., 1990) reported a 75% dependence rate, but used a sample size of only 8 male users. In a later study Brower and his colleagues (Brower et al., 1991) found a 57% incidence of dependence in a larger sample of 49 males. In the above two studies the assessment involved a survey keyed to DSM-III-R criteria. Using the Structured Clinical Interview for DSM-III-R, or SCID (Spitzer et al., 1989), Malone et al. (1991) found an even smaller rate of dependency among 77 male and female users of 14.3%. However, interpretation of these figures should take into consideration that, unlike those studies carried out by Brower and his colleagues, the Malone et al. study included a small number of female users and according to Brower et al. (1992), there has never been a reported case of female AAS dependency.

The results reported indicate that, as is the case with other drugs of abuse, not all people who use AAS will become dependent. While researchers investigate the factors that distinguish between dependent and non-dependent AAS users, further study into the failure to identify dependent female AAS users is warranted. In summarising the research to date, Brower (1992) identifies a number of predictors for dependence: (1) early age of onset; (2) intensive patterns of use (long cycles, multiple AAS used, the use of injectables); (3) a perception that their own strength is less than average, and/or that their body shape is smaller than desired.

#### 1.6.2.4 Withdrawal and treatment

On cessation of AAS use, whether it be a rest period or with more permanent intentions, a number of symptoms of withdrawal have been identified. These include depressed mood, fatigue, muscle and joint pain, restlessness, anorexia, insomnia, decreased libido, headaches, desire for more steroids, and suicidal depression (Brower, 1991). In describing the 'withdrawal syndrome', Brower suggests that it might follow a biphasic pattern, categorised by:

(1) hyperadrenergic symptoms resembling opioid withdrawal; and, (2) depressive symptoms and craving. The nature and time course of the AAS 'withdrawal syndrome', however, is not yet understood.

Treatment approaches for AAS use have had limited attention in the literature beyond theoretical postulation. In an earlier paper, Brower (1989) suggested that the treatment protocol should be viewed as a four step process: assessment, intervention, detoxification and rehabilitation. This standard North American

treatment model recommends that during assessment the AAS user would undergo a drug-use history, physical, mental status and laboratory examinations to identify the specific needs and factors that might influence treatment (see also Brower, 1993). During the intervention stage, the user must be encouraged to accept treatment by overcoming their resistances and defences to treatment. Following compliance to treatment, abstinence would be initiated during the detoxification stage, including the treatment/management of symptoms. It is then during the rehabilitation stage that abstinence is maintained, health restored and efforts are made to reduce the psychosocial pressures to use AAS.

Consequently, when a person presents at a clinical setting, Brower (1991) suggests that following the identification of a need for treatment and compliance to treatment on the part of the user, four goals should be considered:

(1) alleviate distressing symptoms and prevent complications
(2) facilitate and initiate abstinence
(3) prevent relapse
(4) restore the function of the hypothalamus-pituitary-gonadal (HPG) axis

Brower (1993) believes that the treatment should involve a combination of supportive therapy and pharmacotherapy. Supportive therapy would address various psychological measures, provide reassurance, education and counselling. Pharmacotherapy would firstly seek to restore the HPG axis. Brower suggests that medically supervised human chorionicgonadotrophin (hCG) administration is the best treatment according to current research; alternatives offered include the use of a testosterone ester for cross tolerance followed by tapering, antiestrogens, and *leuprolide acetate* (clinically used in the treatment of prostate cancer). Secondly, pharmacotherapy should provide symptomatic relief and/or treatment of coexisting disorders. The use of antidepressants and non-steroidal anti-inflammatries is recommended.

Corcoran & Longo (1992) offer an alternative approach based on psychological treatment in a group setting. As described in their review, the treatment sessions would address the AAS users' cognitive beliefs, lifestyle, affective orientation, motivation, social pressures, value clarification, norm dissociation and possible alternatives to AAS. These authors also suggest that therapist characteristics might be critical, with health conscious or muscular therapists possibly having a better chance of developing rapport with the client.

Very little is known about appropriate treatment approaches for AAS users. A greater understanding of the nature of AAS use and the variation within the user population can only help the development of treatment protocols. As we become more aware of the different subgroups of AAS users, their motivations, experiences, and patterns of use, the more likely it is that the treatment will need to be flexible. A controlled clinical trial would assess the most appropriate model of intervention for dependent AAS users.

## 1.7 Study Aims

The present study targeted people who had used anabolic-androgenic steroids in the preceding 12 months for any reason and for any length of time. Essentially we were addressing four topics: (1) what are the characteristics of the people who use anabolic-androgenic steroids?; (2) what motivates people to use anabolic-androgenic steroids?; (3) how are anabolic-androgenic steroids being used?; and, (4) what are the consequences of using anabolic-androgenic steroids? Consistent with these, a number of objectives were established prior to the commencement of the study. These were: (a) to identify patterns and reasons of use among various subgroups of anabolic-androgenic steroid users; (b) to identify harms associated with anabolic-androgenic steroid use among various subgroups of users; (c) to identify gender differences in the patterns of use and harms associated with the use of anabolic-androgenic steroids; (d) to identify harms experienced by adolescent users; (e) to identify knowledge, attitudes and behaviours around harm reduction strategies for anabolic-androgenic steroid use; and (f) to identify appropriate health promotion and harm reduction strategies for anabolic-androgenic steroid users.

# 2.0 METHOD

## 2.1 Procedure

World wide experience with anabolic-androgenic steroid users has indicated that they are a very difficult group to access. In order to maximise the number of participants in the study, a variety of recruitment alternatives were tried, with an expectation that 'snowballing' would result in additional users. The recruitment of AAS users was sought via:

· personal contacts with AAS users;
·contacts known to other researchers and health care workers;
·various sporting organisation within NSW;
·associations that represent relevant occupational professions;
·retail shops supplying sporting goods and services;
·gymnasia;
·needle and syringe exchanges;
·radio interview(s);
·an advertisement in a major Sydney newspaper.
·an advertisement in a Australian produced 'muscle' magazine
·articles in specialty and local newspapers.

To facilitate recruitment, a number of business cards and fliers were printed to invite users of anabolic-androgenic steroids and other muscle building drugs to 'have [their] say' confidentially and anonymously. The business cards and fliers included a contact name and phone number for the project officer.

Subjects contacted the project officer, or other members of the project team, by telephone. In the case of personal contacts, they were approached by the member of the research team known to them. To be eligible for the study, the individual had to have used AAS for any period during the preceding twelve months, or if they had not done so, an intention to use in the near future. All participants were volunteers and were offered up to $20 reimbursement of travel costs and out-of-pocket expenses. The questionnaire constructed for this study (see Appendix B) was carried out as either, a structured interview, or, by self-completion and returned by mail to the project officer.

Each face-to-face interview was conducted in a location determined by the subject in an attempt to minimise any hesitation they might have about participating. Consequently, interview sites included hotels, coffee shops, parks, shopping centres, subject's homes and the researchers' workplace (National Drug and Alcohol Research Centre). All subjects were guaranteed,

both at the time of screening and interview, that any information they provided would be kept strictly confidential and anonymous and they signed the subject's consent form. The project protocol was passed by the University of New South Wales Committee for Experimental Procedures Involving Humans as consistent with the Declaration of Helsinki (1989) and the National Health and Medical Research Council's Statement on Human Experimentation (1992). All interviews were conducted by one of the research team (not including Ms Beel) and took between 45 minutes and two and a half hours to complete.

Where self-report was preferred by the subject, they made initial contact with a member of the project team and a suitable place where the questionnaire could be handed over was determined or an address for mailing was provided. Accompanying the questionnaire was an information sheet clearly explaining what they were required to do; they were also asked to call the project officer a week after mailing back the questionnaire so that the project officer could clarify any responses that were unclear.

## *2.2* Structured Interview

A questionnaire was constructed specifically for this project drawing on information contained in various questionnaires, reports, and the scientific literature, as well as feedback received from key informants (users and health care workers). The questionnaire was constructed so that it could be used in a structured interview or by self-report and is divided into ten separate sections, described below. Please see Appendix B for the complete interview schedule.

### 2.2.1. *Demographics*

The demographic details obtained included: the subject's gender, age, height, weight, percentage (%) body fat, nationality, primary spoken language, sexual preference, relationship status, living arrangements, level of education achieved, employment, and prison record.

### 2.2.2 *Patterns of use*

This section sought to gain as much information about the subject's AAS use history as possible, ranging from general issues to specific patterns used. Areas covered included age of first use and regular use, a cycle history (average, shortest, longest durations), average length of rest periods, and dose management techniques used. A checklist of over 65 AAS was provided for identifying AAS ever used, separated into human and veterinary products. Specific details were obtained about the most recent and the most typical cycle of AAS administration, with a week by week summary of the actual AAS and doses used. Additional checklists were provided to identify which other drugs

and supplements were being used for training purposes or for the management of AAS side-effects. Health related questions were asked concerning injecting practices (sharing, reusing etc.) and medical check-ups.

### 2.2.3 *Reasons for using*

Identification of the user type each subject identified with, namely weight trainer, bodybuilder, competitive athlete, occupational, or body image user (or other). In addition to asking for their main motivation to use AAS, this section sought to examine what each individual expected from their AAS use before they commenced their first cycle, and prior to the commencement of their most recent cycle. A list of commonly reported expectations from the literature was provided, with space for additional items. This section concluded with enquiries into their sporting involvement and whether they had been randomly drug tested at any time.

### 2.2.4 *Opinions and attitudes*

Likert scales were used to determine the subject's attitudes toward a number of steroid and drugs-in-sport related issues, including: AAS use *per se*, drug use in sport, AAS use for appearance, efficacy of AAS for sporting enhancement, privacy issues, drug testing, AAS use by non-competitive gym members, and doctor prescription. Questions then sought to discover what changes they would make to their usage behaviour if AAS became available through medical prescription for non-medical reasons. Identification of the individual(s) who suggested they use drugs, which drugs were suggested, and where they heard about the efficacy of AAS were then requested. In addition, perceptions of a number of personal characteristics and the results so far, also using Likert scales. Finally, the respondents were asked to identify their role models in sport, and which physique(s) they admired.

### 2.2.5 *Training activity*

This section examined the training activity of the AAS user. Considering both before and after steroid use had commenced, the questions cover the length of time training with weights, their reasons for weight training, the frequency and duration of weight training sessions, who they train with, and how they balance their training program with the rest of their life. Additional questions addressed their nutrition, resting and sleeping patterns and the percentage of their income that they spent on training related activities.

### 2.2.6 *Sources of steroids*

General information about where they obtain their steroids, as well as their relationship with their supplier(s), the accessibility of the AAS they desire and

the average financial cost of each cycle were sought. Experience with fake, or counterfeit, steroids was also assessed.

### 2.2.7 *Information sources*

After rating their perceived knowledge levels, this section examined their AAS information seeking behaviour, identifying where they obtain information from, how often they obtain information, and what sources of information they would find most useful.

### 2.2.8 *Steroids effects*

An examination of the effects of AAS was separated into the benefits and side-effects. Checklists based on previous research were provided for the individual to identify the benefits, side-effects, and mood and behaviour changes that they had experienced; for each checklist there was an opportunity to provide additional effects not covered. The AAS users were asked to identify what, if any, were their concerns about AAS and whether the benefits outweighed the risks. Aggression levels were assessed in more detail, and if changes were reported, the individual was asked to identify how it had affected personal and business relationships. The 'roid rage' phenomenon was also examined, with users reporting if they have experienced a 'roid rage' and the circumstances that surround each event; they were also asked to provide a description of what they think a 'roid rage' is, regardless of their personal experiences. The DSM-IV criteria for dependence were also included along with an examination of the nature of withdrawal, with descriptions of the symptoms experienced (if any), the length each symptom persisted, and the steps taken to deal with each one.

### 2.2.9 *Lifestyle*

An overview of the AAS users drug use history was investigated looking at current alcohol and cigarette use, lifetime experience with other drugs (amphetamines, cocaine, ecstasy, heroin, methadone, cannabis, hallucinogens, inhalants and analgesics), and injecting drug use history.

### *2.2.10 Deterrents*

The final section asked the user to identify the extent to which a number of factors (covering financial, legal, health and social issues) might deter them from using AAS.

## 2.3 Statistical Analysis

The majority of the analyses were descriptive in nature. Percentages are reported for categorical variables; means and medians are reported for normally distributed and skewed continuous variables, respectively. A number of univariate comparisons of major variables of interest are reported: unadjusted odds ratios (OR) and their corresponding 95% confidence intervals (95% CI) for categorical data, and t-test or the non-parametric equivalent for skewed data for continuous variables. The data analysis was carried out using SPSS for Windows (Version 6.0).

# 3.0 RESULTS

## 3.1 Characteristics of the Sample.

A total of 100 anabolic-androgenic steroid (AAS) users were recruited over a 9 month period from September 1996 to May 1997. The sample was predominantly male (94%) with only 6 females participating in the study.

### 3.1.1 *Sample demographics*

The subjects ranged in age from 18 to 50 years with a median of 27 years (mean 29.2 years; SD 6.91). On average the sample was 170.5cm tall (SD 5.3) and weighed 79.1kg (SD 13.4). As might be expected, the height (177 versus 164 cm; $t_{97}$=4.4, p<.001) and weight (91 versus 66 kg ; $t_{97}$=2.9, p<.006) of the female users were significantly lower than that of the males. Sixty six percent of the sample provided a self-reported measure of their percentage body fat, the mean of which was 12.2% (SD 3.7) ranging from 4% to 23%. The female subjects had higher percentage body fat than the men (17.2% vs 11.8%)

#### 3.1.1.1 Sexual preference and relationship status

Twenty-seven per cent of the sample were homosexual, with a further 3% indicating that they were bisexual. Fifteen percent of the sample were married and had been in their present relationship for 66 months (5.5 years)(SD 59.5 months), 6% were divorced or separated, 22% were cohabiting with their sexual partner, while the remainder (57%) were single. Of the 85 people who were not married, 55% were currently in a relationship that had lasted for an average duration of 22.5 months.

#### 3.1.1.2 Citizenship and background

The majority of the sample (89%) were Australian citizens. Of the 11 AAS users who were not, seven were New Zealand citizens, two were English, the remaining two being American and Turkish. All of the females were Australian citizens. One male was of Aboriginal or Torres Strait Islander descent. Table 3.1 describes the country of birth of both parents of each person in the sample. Despite the diversity of ethnic background, as given by their parents' birthplaces, 92% of the sample spoke English as their first language; the other 8% had first languages of Serbo- Croation, Lebanese, Spanish, French, Turkish, Italian, Greek, and Arabic.

#### 3.1.1.3 Education and employment

The median number of years of education was 13 (mean 14.2; SD 3.3) with a range of 9 to 26 years. More than one third of the sample (35%) had completed or were part way through university educations, a further 33% had earned diplomas or trade certificates. Eleven percent had completed secondary school, 19% to the end of year

10, with the final 2% still at school. The majority of the sample were employed, either full-time (73%) or part-time (13%).

**Table 3.1 - Parental birthplace of AAS users in the sample**

| Country of Birth | Father (%) | Mother (%) |
|---|---|---|
| Australia | 49 | 55 |
| Italy | 8 | 7 |
| England | 8 | 8 |
| New Zealand | 5 | 5 |
| Lebanon | 4 | 5 |
| Malta | 3 | 3 |
| Greece | 3 | 2 |
| U.S.A. | 2 | 3 |
| Germany | 2 | 1 |
| Samoa | 1 | 2 |
| Yugoslavia | 1 | 2 |
| Scotland | 2 | - |
| Uruguay | 1 | 1 |
| Sri Lanka | 1 | 1 |
| Egypt | 1 | 1 |
| Turkey | 1 | 1 |
| Northern Ireland | 1 | 1 |
| Holland | 1 | - |
| Austria | 1 | - |
| Ukraine | 1 | - |
| Cypress | 1 | - |
| France | 1 | - |
| Syria | 1 | - |
| Croatia | 1 | |
| East Africa | - | 1 |
| Peru | - | 1 |

Only 5% were unemployed, with the remainder being full-time students (6%) or pensioners (2%). A breakdown of the current types of employment carried out by the sample is given in Table 3.2. An interesting feature of the spread of occupations is the high proportion who work in areas of management and responsibility: company directors, managers, and professional/para-professional (38%). Forty-two percent of the sample had worked in a job where they believed a good physical appearance and/or strength was important for their ongoing employment. Positions as security personnel/bouncers were the most common (49%). Other jobs reported in this instance were those in the fitness industry (22%); manual labour (17%); 'entertainment' (male escort, male performer) (10%); and actor (2%).

In terms of salary, 14% earned less than $20,000 p.a.; 13% between $20,001 and $30,000; 29% between $30,001 and $40,000; 12% between $40,001 and $50,000; 10% between $50,001 and $60,000; and 14% earned more than $60,001 (8% of the sample offered no response).

**Table 3.2 - Type of occupations**

| Type of work | % of the sample |
|---|---|
| **Security or fitness industry** | 14 |
| **Company Directors, Senior Management** | 4 |
| **Managers**, administrators, supervisors | 11 |
| **Professional** eg. medical, social/business professional, engineer, accountant, computer operator | 10 |
| **Para-professional** eg. technical officer, builder, nurse, police, fire fighter | 13 |
| **Tradesperson** eg. building, electrical, food | 8 |
| **Self-employed** | 3 |
| **Salesperson, personal service worker, clerk** eg. sales, beauty therapist, escort, receptionist | 12 |
| **Labourer, machine operator or related worker** | 9 |
| **Domestic duties** | 1 |
| **Student, Pensioner** | 8 |
| **Unemployed** | 5 |
| (not given) | 2 |

3.1.1.4 Living arrangements

Subjects were recruited from a number of metropolitan and regional areas of New South Wales and the Australian Capital Territory. Table 3.3 shows the geographical spread of the present sample, indicating that most of the subjects resided in the inner city/east, followed by the south west and the north. At the time of participation, the majority of the sample were living with their partner (31%); 23% with parents;

17% in a group situation; 15% alone; 9% with friends or relatives; and 3% in correctional institutions, while 2% did not give their living arrangements.

**Table 3.3 - Geographical location**

| Geographical Location | Percentage of Sample |
|---|---|
| North Coast | 5 |
| Central Coast | 1 |
| Hunter Region | 6 |
| ACT | 3 |
| Sydney - North | 12 |
| Sydney - Inner City / East | 38 |
| Sydney - South | 2 |
| Sydney - Inner West | 7 |
| Sydney - South West | 16 |
| Sydney - West | 6 |
| (Not given) | (4) |

3.1.2 *Alcohol and other drug use history*

The majority of the sample were non-smokers (68%); the avErage number of cigarettes per day of those that did smoke was 11.4 (SD 8.4).

**Table 3.4 - Other illicit drug use (% of the sample)**

| Drug | Ever Used | Ever Inject | Daily Use | Weekly or more | Mthly or more | 1-5 / per year |
|---|---|---|---|---|---|---|
| amphets | 51 | 6 | - | 3 | 8 | 25 |
| cocaine | 43 | 4 | - | 1 | 4 | 26 |
| ecstasy | 49 | 3 | - | 3 | 15 | 20 |
| heroin | 9 | 5 | - | 1 | - | 3.1 |
| methadone | 2 | 1 | - | - | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| marijuana | 70 | - | 1 | 10 | 6 | 24 |
| hallucinogens | 36 | - | - | - | - | - |
| inhalants | 20 | - | 1 | 3 | | |

Over one fifth of the sample reported that they 'never' drank alcohol (21%), with a further 29% indicating that it was 'rare' for them to drink; 22% said that they would drink 'monthly' or a 'couple per month'; 27% 'weekly' or 'couple per week'. Only 1% of the sample indicated 'daily' alcohol use. The median number of drinks on occasions when they were drinking was 2.5 (mean 4.00; SD 4.9); 6% of the sample indicated that they would usually have more than 8 standard drinks. Experience with, and recent use of other illicit drugs is set out in table 3.4. There were significant differences in patterns of other drug use between the homosexual and heterosexual subjects in the sample. Homosexual subjects were ten times (OR=10.6; 95% CI= [3.3, 33.8]) more likely to have ever used amphetamines ($\chi^2$ 19.7, df 1 p<.01); seven times (OR=7.3; CI= [2.7, 19.8]) more likely to have ever used cocaine($\chi^2$ 17.8, df 1 p<.01); fifteen times (OR=15.9; CI= [4.4, 58.3]) more likely to have used ecstasy ($\chi^2$ 24.2, df 1 p<.01); seven times (OR=7.5; CI= [2.8, 19.7]) more likely to have used marijuana ($\chi^2$ 18.8, df 1 p<.01); and almost fourteen times (OR=13.9; CI= [4.4, 44.7]) more likely to have used inhalants ($\chi^2$ 25.3, df 1 p<.01) than were heterosexual subjects.

### 3.1.3 *Training activity*

The mean number of years experience in weight training was 7.0 (SD 5.0), ranging from six months to 27 years. The number of years of weight training prior to commencing AAS use was 3.4 (SD 3.7; range 0 to 23 years). A comparison of the frequency and length of training sessions during an AAS cycle and rest period is given in table 3.5. As can be seen from the final column in this table, the frequency and duration of training sessions is significantly reduced when they are not using AAS. Finally, the median proportion of their income spent on training related activities per year was 20% (mean 24.8%; SD 21.18), ranging from less than 1% to 80%.

**Table 3.5 - Frequency and duration of training sessions**

| | Using AAS | NOT Using AAS | Paired t-tests |
|---|---|---|---|
| **Training sessions per week** | 5.0 (SD .90) | 4.4 (SD 1.09) | $t_{97}$=7.0 ; p<.001 |
| **Training sessions** | 1.1 (SD .3) | 1.00 (SD .2) | $t_{93}$=2.8 ; p<.015 |

| | | | |
|---|---|---|---|
| **per day (when training)** | | | |
| **Length of training session (hours)** | 1.2 (SD .4) | 1.2 (SD .3) | $t_{97}$=2.5 ; p<.015 |

3.1.4 *Self perceptions*

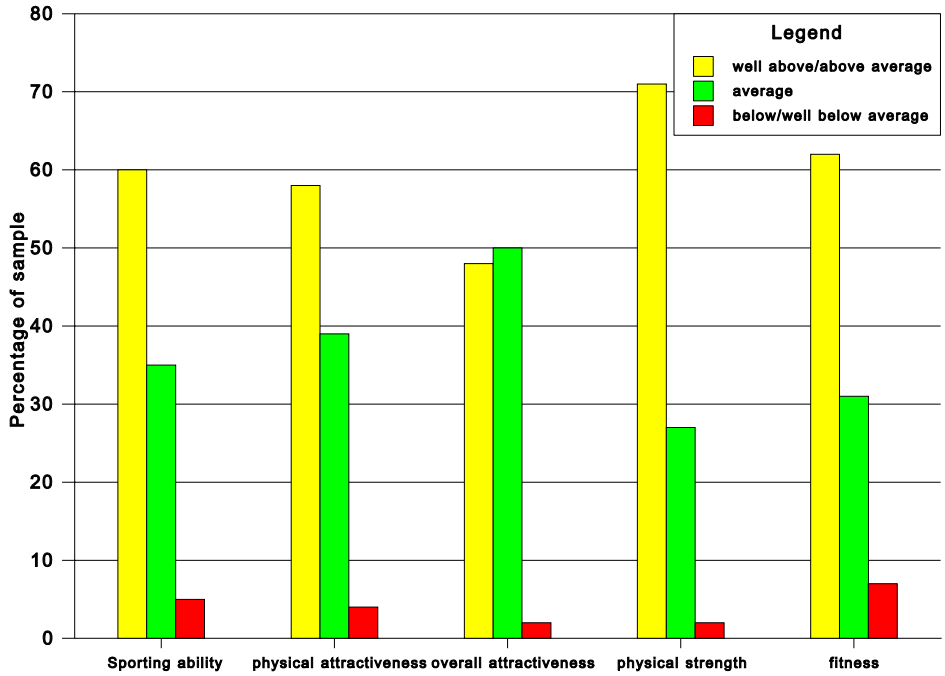
Table 3.6 describes how the subjects perceived their physical build, and how they believed their build was perceived by their peers/friends, partner and parents. From this table it can be seen that the majority of the sample believed that their build was perceived as being 'about right', followed by 'too big' and then 'too small', although this pattern was less clearly defined for their views on their parents' perceptions.

**Table 3.6 - Perceptions of physical build**

| | 'about right' | ''too big' | 'too small' | 'unsure' |
|---|---|---|---|---|
| Own view | 57 | 29 | 7 | 4 |
| Peers/friends' view | 56 | 26 | 7 | 10 |
| Partner's view | 72 | 18 | 5 | 5 |
| Parents' view | 48 | 42 | 9 | 1 |

In addition, half of the sample were satisfied with their body shape. Of those who were not satisfied, 68% wanted to be bigger (generally, or specific muscle groups), 26% wanted to be leaner, 6% wanted to be a different height. Subjects were also asked to rate a number of aspects of their physical and sporting abilities. These results are presented in figure 3.1. and indicate a belief in their sporting and physical ability, and a confidence in their appearance.

**Figure 3.1 - Perceptions of physical characteristics**




### 3.1.5 *Opinions and attitudes regarding AAS*

Opinions and attitudes of the sample were gauged on a number of issues regarding the use of AAS. This is summarised in Table 3.7 and illustrates the AAS users' belief in the beneficial aspects of use. In addition, most of the sample (94%) believed that 'non-competitive gym member should be allowed to use steroids for non-medical purposes', citing 'personal choice' (37%), 'no body's business' (9%) and 'own body' (7%) as the main reasons, with 20% offering no reason. Further, 89% believed that

'doctors should be allowed to prescribe AAS for other than medical purposes'; 23% believed this would allow proper monitoring of their use, 25% saw this as a means of reducing/removing the counterfeit and blackmarket, 19% thought it was safer and 7% indicated that there were benefits that could be gained psychologically (eg. self esteem), the remaining 17% offered no reason.

**Table 3.7 - Summary of opinions on AAS**

| Statement | Strongly Agree / Agree (%) | Strongly Disagree / Disagree (%) | Neutral (%) |
|---|---|---|---|
| It is alright to use AAS for one cycle | 57 | 20 | 23 |
| Using drugs to do better in sport is cheating | 35 | 40 | 25 |
| AAS will help me to look better | 82 | 9 | 9 |
| It's no ones business if I choose to use AAS | 86 | 6 | 8 |
| AAS increases an athletes chance of winning | 87 | 5 | 8 |
| drug testing in sporting competitions should occur | 53 | 30 | 17 |

## 3.2 Expectations and Motivations of AAS Use

Prior to addressing specific motivations to use AAS or broader expectations regarding them, subjects were asked to identify what type of user they would classify themselves as. Over one third (39%) identified themselves as primarily 'bodybuilders', and 28% described themselves as 'body image' users; a further 12% classified themselves as both 'bodybuilders' and 'body image' users being unable to distinguish between the two. 'Competitive athletes' and 'weight training' users each made up 6% of the sample. Only one of the sample identified himself as an 'occupational' user, although 5% described themselves as 'occupational' and 'body image' users. The remainder (3%) preferred to describe themselves as 'life-enhancing' users.

The main motivations to use AAS prior to the first use and the most recent use of AAS are provided in table 3.8. 'Other' motivations included 'increase weight', 'increase sex drive', 'change muscle quality', 'obtain a psychological edge', 'something different', and 'an alternative to antidepressants'. (The reason for more missing values prior to the most recent cycle reflects the number of subjects who had used for only one cycle). A greater proportion of homosexual subjects reported they were motivated by improving their appearance on the first and most recent occasion of AAS use than were heterosexual subjects (69% versus 39%). Females subjects appeared to be less motivated by increasing size (1/6 subjects) and placed more emphasis on improving sporting performance (2/6 subjects) than did male subjects.

**Table 3.8 - Motivations to use AAS**

| Main Motivation | Prior to first use (% of the sample) | Prior to most recent use (% of the sample) |
|---|---|---|
| improve appearance | 46 | 35 |
| increase size | 33 | 31 |
| increase strength | 7 | 4 |
| improve sporting performance | 6 | 8 |
| injury prevention/recovery | 1 | 2 |
| other | 3 | 5 |
| (no answer given) | 4 | 15 |

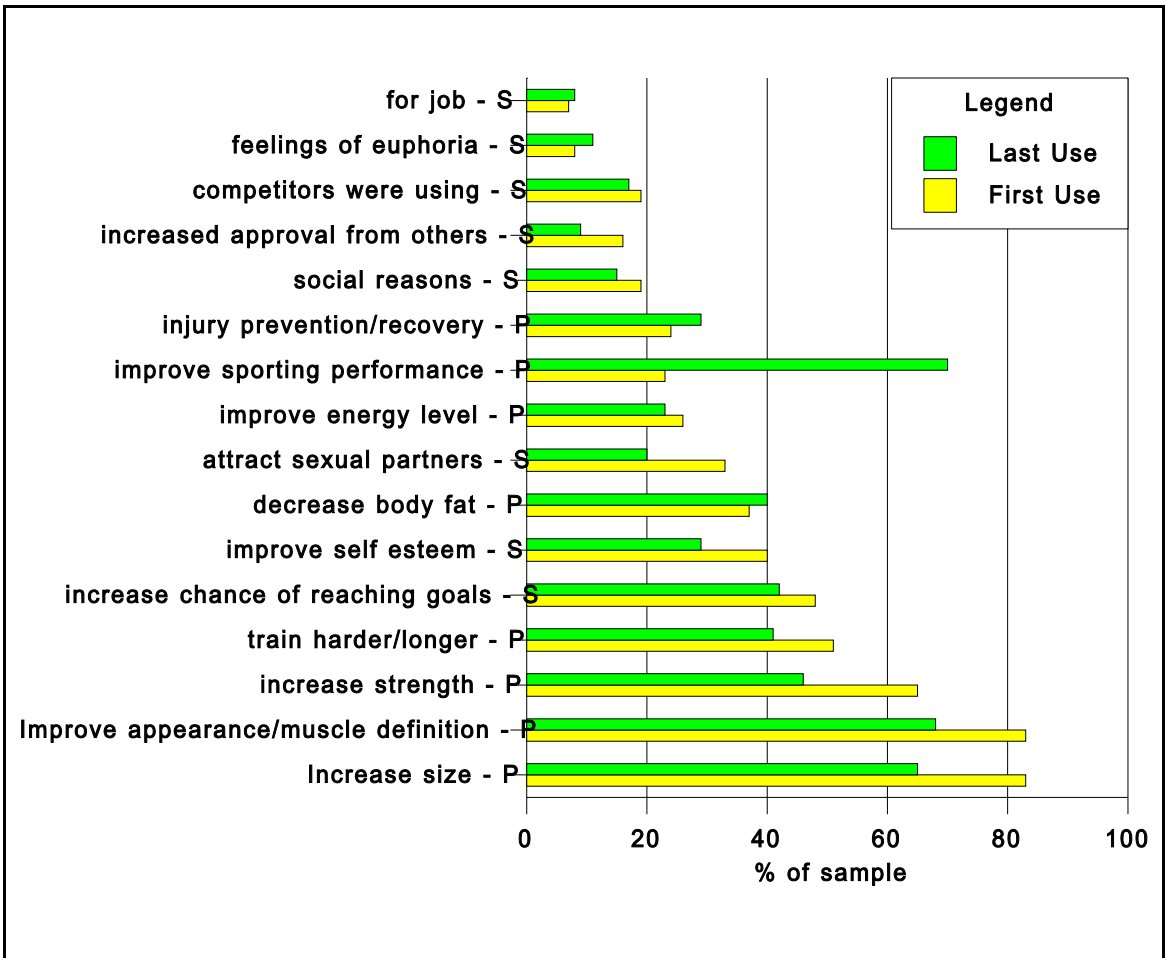
Subjects were then asked to identify what they were expecting from their AAS use, before their first ever, and most recent use. A list of items were provided, with an opportunity to add in expectations that were not listed. These data are summarised in figure 3.2.

The most commonly reported expectation prior to first use of AAS was improve appearance/muscle definition and increase size. There is a noticeable shift towards an expectation of improved sporting performance from the time before first and last use of AAS, to a point where it is of equal importance to those regarding appearance and size.

To further investigate the reasons why people use AAS the total number of expectations (maximum of 16) for each occasion (first and most recent) were added. The number of expectations prior to their first use (mean 5.9; SD 2.9) was significantly more than the number before the most recent cycle (mean 4.9; SD 3.4) ($t_{97}$=2.9; p<.005). In addition, we divided the expectations into physical and psychological, obtaining separate totals for each. (The groupings are identified in figure 3.2) . More physical expectations were made than psychological prior to the first cycle (mean 4.0 vs 2.3; SD 1.8 & 1.3 for physical and psychological respectively) and last cycles (mean 3.4 vs 1.8; SD 2.3 & 1.6 for physical and psychological respectively). In both cases, the differences were significant ($t_{81}$=10.7; p<.001 and $t_{81}$=8.3, p<.001 for first and last respectively). There was also a significant decrease in the total number of expectations within each expectation category from the first cycle to the most recent ($t_{97}$=2.6, p<.015 for physical; and $t_{81}$=2.8, p<.01 for psychological).

**Figure 3.2 - Expectations regarding AAS use**

(P=Physical; S=Psychological)




## 3.3 Patterns and Correlates of AAS Use

### 3.3.1 *Patterns of use*

The average age at first use of AAS was 25.1 years (SD 6.3) ranging from 14 to 46 years. Homosexual subjects were significantly older than heterosexual subjects (28.6 years versus 23.7 years) when they first used AAS ($t_{95}$=-3.7, p<.001). For the whole sample, regular use of AAS commenced typically one year after their first use (mean 25.9; SD 6.3), ranging from 17 to 46 years. Overall the subjects had been using for a mean of 4.2 years (SD 3.6), ranging from less than one month to 21 years. The number of years of regular use ranged from less than one month to 16 years, with a mean of 3.6 years (SD 3.2). In addition to starting regular use on average almost one year after their first use, 26% indicated that for some period of time between the age of regular use and the time of interviewing, they would have considered themselves as not being current AAS users. Some of the reasons given for this include, "the training required didn't suit my lifestyle at the time", "I was giving myself an extended break to allow receptor sites to recover", "I wanted to see if I could maintain weight naturally", and "I was worried about the bloating effect."

3.3.1.1 Monitoring of use

At the time of study participation, 38% were half way through a cycle (SD .21). For the remaining 62%, the median number of weeks since their last cycle was 12 weeks, ranging from 1 to 156 weeks (mean 28.3; SD 36.1). More than half of the sample (54%) were being monitored, of which the majority were being monitored by a doctor (59.3%), followed by a friend (25.9%), trainer (7.4%), medical student (3.7%), wife and self monitored (1.9% each). Most of these subjects were being monitored from the start of their first cycle (80.8%), 13.3% from some point within the first cycle; the remainder (5.9%) had their AAS use monitored from the second course.

3.3.2 *Information: levels of knowledge and sources*

Due to the large number of anabolic-androgenic steroids available, the levels of knowledge of the AAS used rather than AAS *per se* were ascertained.

**Table 3.9 - Frequency of information seeking**

| Frequency of Information Seeking | Percent of the sample |
|---|---|
| Daily | 6 |
| Several per week | 5 |
| Weekly | 14 |
| Every 2-3 weeks | 15 |
| Monthly | 24 |
| Twice yearly | 24.5 |
| Yearly | 2 |
| Less than Yearly | 4 |
| Never | 6 |

Most of the sample believed that they had either 'very good' (28%) or 'good' (40%) levels of knowledge. A further 23% believed that their knowledge of the AAS they use was 'average'; few users reported having 'limited' (3%), 'poor' (5%), or 'very poor'

(1%) understanding of the AAS that they used. Table 3.9 shows how often the sample obtained information about AAS.

Nearly two thirds of the sample (64%) obtained information about AAS on a monthly or more frequent basis. The sources of this information were quite varied and are presented in figure 3.3 along with the proportion of the sample who obtain information from them. 'Other' sources of information include the 'internet' and 'medical students'.

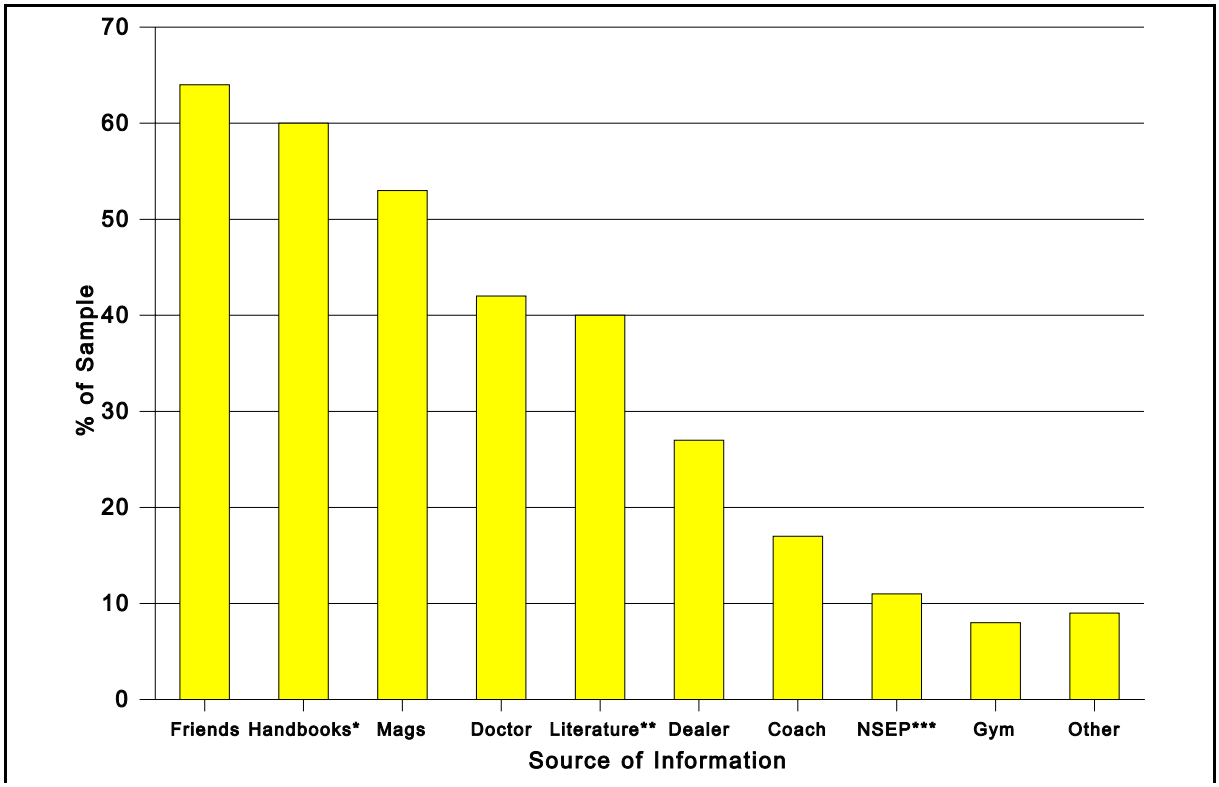
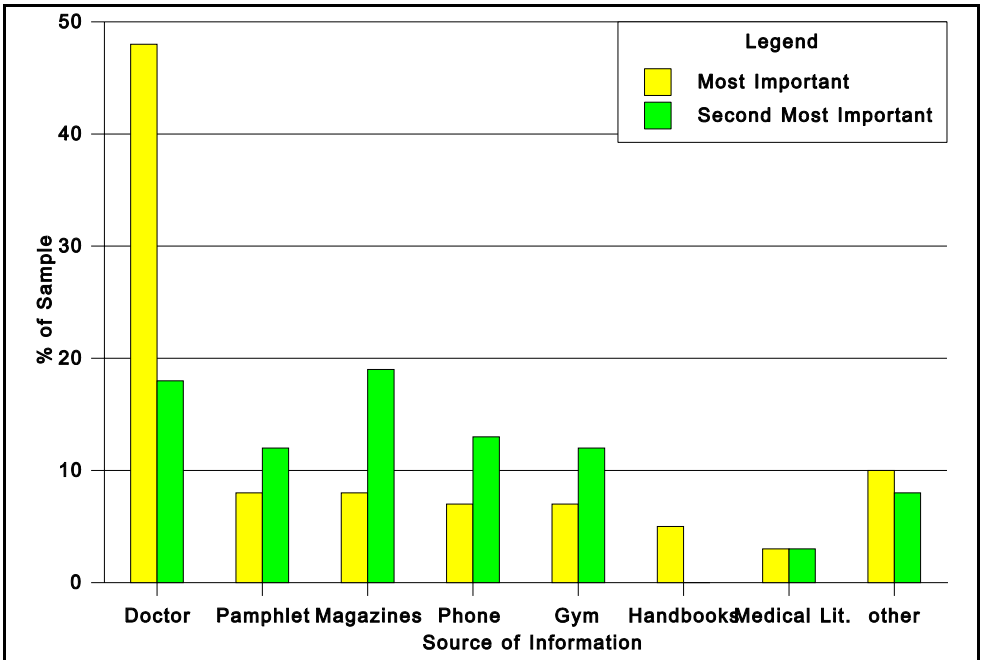



**Figure 3.3 - Sources of AAS Information**

* Steroid Handbooks (eg. Philips, 1993) ** Medical Literature *** Needle and Syringe Exchange

Subjects were then asked what source of information they would access if they could, or if it was available (they were asked to assume the information provided in each case was factual and reasonably unbiased). informed doctor (medical practitioner)' would be accessed by the great majority of users (73%), followed by 'medical literature' (57%), 'fitness magazines' (45%), 'pamphlets' (42%), 'gym employees' (36%), 'phone counselling or information service' (35%) and, 'poster' (4%). They were then asked to determine what would be the most important source of AAS information (if available). This is summarised in figure 3.4, clearly illustrating that a well informed doctor is a preferred source of AAS information. 'Other' sources of information included needle and syringe exchanges, friends and the internet.

**Figure 3.4 - First and second most important sources of information**




### 3.3.3 *Sources of AAS*

The majority of the sample (64%) believed that it was either 'easy' or 'very easy' to obtain the AAS that they wished to use. One quarter of the sample believed that it was either 'difficult' or 'very difficult', while the 11% remaining were not able to say. Subjects were asked to indicate where they usually and had ever obtained their

AAS, summarised in table 3.10. The sources of AAS are not restricted to friends and dealers, with some users accessing the distributors directly.

For many (57%), the suppliers' stock of AAS dictated which AAS they would use, although more than half of the sample (57%) had more than one type of regular supplier (eg. friend, dealer). Just under one third of the sample (31%) indicated that their relationship was purely a business interaction, paralleled by 32% who said that there was not a high degree of trust between themselves and their regular supplier(s). Collapsing the form of relationship into either a friendship or business relationship indicated that it was more likely for there to be a high degree of trust if the subject and the supplier were friends.

**Table 3.10 - Sources of AAS**

| Source | Ever Obtained (% of sample) | General Supplier(s) (% of sample) |
|---|---|---|
| Friend | 64 | 54 |
| Doctor* | 42 | 21 |
| Pharmacist* | 18 | 8 |
| Dealer | 41 | 32 |
| Gym employee | 14 | 9 |
| Coach/trainer | 14 | 10 |
| Vet | 11 | 6 |
| Relative | 6 | 4 |
| Mail Order | 4 | 3 |
| Vet supplier | 1 | 1 |
| Fake prescription | 1 | - |
| Horse trainer | 1 | - |
| Brought in from | 1 | - |

overseas

* legal and illegal procurement not distinguished

Almost half of the sample (44%) had seen, and 21% had used, what they believed to be fake AAS. The reasons given for identifying particular AAS as being fake include 'poor labelling and packaging', 'incorrect appearance [and/or texture] of the AAS', 'didn't have the desired effect' and was 'too cheap'. Of the sample who had used fake AAS, the majority experienced no side effects (72.7%); the remainder experienced increased acne and 'viral' symptoms including fever, stomach pains, nausea, vomiting and headaches.

### 3.3.4 *General cycle information*

The average number of cycles in the last 12 months was 2.1 (SD 1.5); the median number of cycles since commencing AAS use being 7 (mean 8.5; SD 8.9) with a range of 1 to 60. Ranging from 3 to 52 weeks, the usual length of their cycles was around 10 weeks (mean 9.8; SD 5.3), with a rest period between consecutive cycles being 12 weeks (mean 11.7; SD 9.7); the rest periods ranged from less than 1 week to 1 year.

#### 3.3.4.1 Patterns of use among homosexual subjects

Gay men in the study demonstrated a significantly different pattern of AAS use to their heterosexual peers. In addition to being older at commencement of their AAS use, they used significantly fewer (median of 2, range 1-5 versus median of 5, range 1-11) different types of AAS per cycle (Mann-Whitney U = 634, $p<.01$) than their heterosexual peers. Homosexual subjects also used significantly lower dosages (Mann-Whitney U = 394, $p<.001$) as measured in milligrams per week (median of 120mgs, range 2-800mgs versus median of 312.5mgs, range of 2-2000mgs) and had significantly fewer ($t_{78}=-2.8$, $p<.05$) cycles of AAS in the previous twelve months (mean of 1.6 versus 2.2) than did heterosexual subjects.

**Table 3.11 - Methods of dose management (self-reported)**

| Description of Dose Management | % of the Sample |
|---|---|
| pyramid | 39 |

| | |
|---|---|
| constant dose | 22 |
| fluctuating/always changes | 13 |
| gradual/long increasing | 8 |
| short increasing | 4 |
| long/gradual decreasing | 6 |
| fast tapering | 3 |
| phasing | 2 |
| reverse pyramid | 1 |

Fifty-two weeks was the longest reported cycle by anyone at any time in the AAS use history of the sample (mean 13.1; SD 8.2), while one person reported that their shortest cycle was 16 weeks (mean 6.4; SD 2.8). When asked to indicate how they usually vary their AAS dosages within any given cycle, more than one third preferred 'pyramid' cycling, while 22% said that they kept the dosage 'constant' (see Table 3.11).

3.3.4.2 Injecting issues

Only 3 participants in the study had never injected AAS. The majority of those who had injected (83%) did so from the commencement of their AAS use history; 8.8% commenced injecting within the first year of use, 6% within 2 years, while the remainder commenced injecting between 3 and 14 years since first AAS use. For those making the transition to injecting from entirely oral administration, many reported feeling apprehensive at first, but were under the impression that injectables were inherently 'safer' and were not worried (43.4%), 4.7% had 'no problem', 21.6% were still apprehensive and the remainder were undecided.

Please see Table 3.12 for a summary of the sample's introduction and current injecting practices. While many preferred to have someone else inject them on their first administration of AAS, there is an obvious shift to self injection. Another interesting feature of this data is the number of subjects who taught themselves how to inject, using information provided in sources such as steroid handbooks, instructional videos and medical literature.

**Table 3.12 - Identifying persons involved in injecting of AAS**

| Person | Who injected you the first time? | Who injects you most often? | Who injects you now? | Who showed you how to inject? |
|---|---|---|---|---|
| Friend | 37 | 20 | 14 | 29 |
| Doctor | 24 | 7 | 5 | 30 |
| Self | 23 | 64 | 65 | 13* |
| Coach/trainer | 7 | 2 | 1 | 6 |
| Partner | 2 | 4 | 3 | 1 |
| Dealer | 1 | 0 | 0 | 1 |
| Med. Student | 2 | 0 | 0 | 0 |
| Brother\relative | 1 | 0 | 0 | 3 |
| Training partner | 2 | 1 | 1 | 1 |
| Gym employee | 1 | 0 | 0 | 0 |
| Nurse (friend) | 0 | 2 | 2 | 2 |
| (No longer use) | - | - | 9 | - |
| Never personally injected | - | - | - | 14 |

* self taught from steroid handbooks and other steroid information sources

**Figure 3.5 - Injection sites**

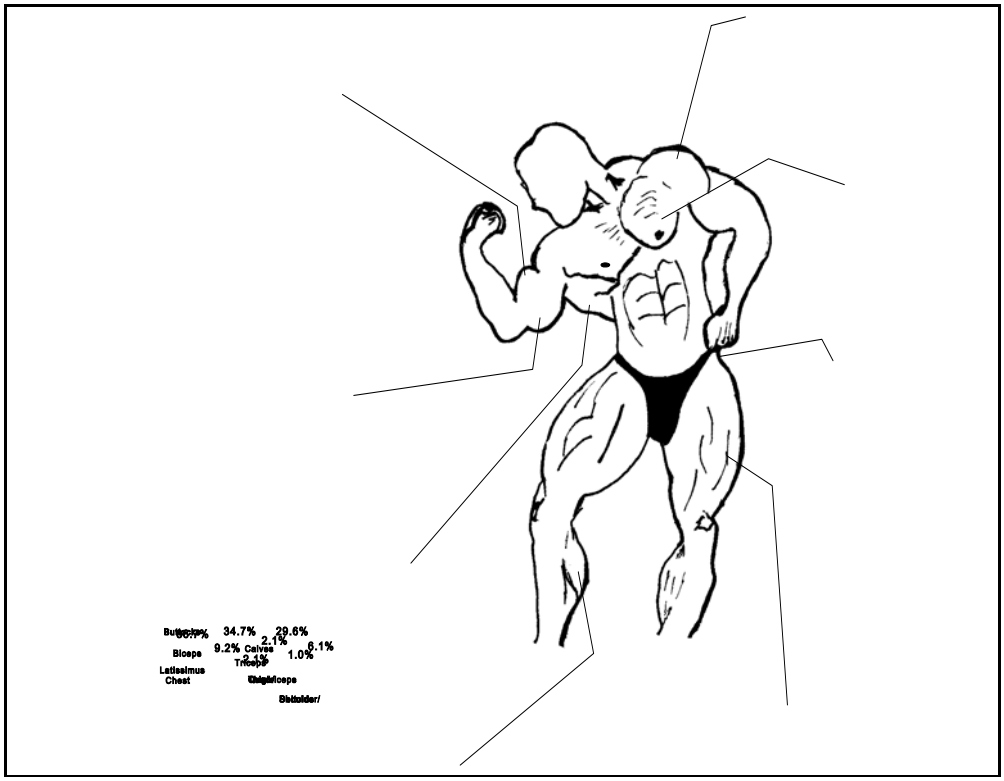



Figure 3.5 shows injecting sites, with the most common sites being the buttocks and the shoulders/deltoids. Forty-five percent of the sample are regularly injecting into more than one place, up to a maximum of 6 different injection sites. Nearly half are

(49%) injecting into the buttocks only, 4% only in the thigh muscle, and 2% only in the shoulder. Just on two-thirds injected on the own (65%).

With regard to safe injecting practices, there was only one instance of re-use of someone else's needle or syringe after they had used it but this did not occur in the 12 months preceding the interview. Four subjects reported someone else using the needle or syringe after they had used it, two of which occurred more than 12 months ago, and 2 in the preceding twelve months. Four subjects reported re-using their own needles and syringes in the last month, two of which did not attempt to clean them before re-use. The small number of people engaging in risky injecting practices is reflected in the large majority of those injecting who have no problems getting clean needles and syringes (92%). Figure 3.6 shows where the subjects were obtaining their needles and syringes, with chemists and needle exchanges being the preferred choice; of those reporting problems cited the refusal of chemists to sell them the appropriate equipment.

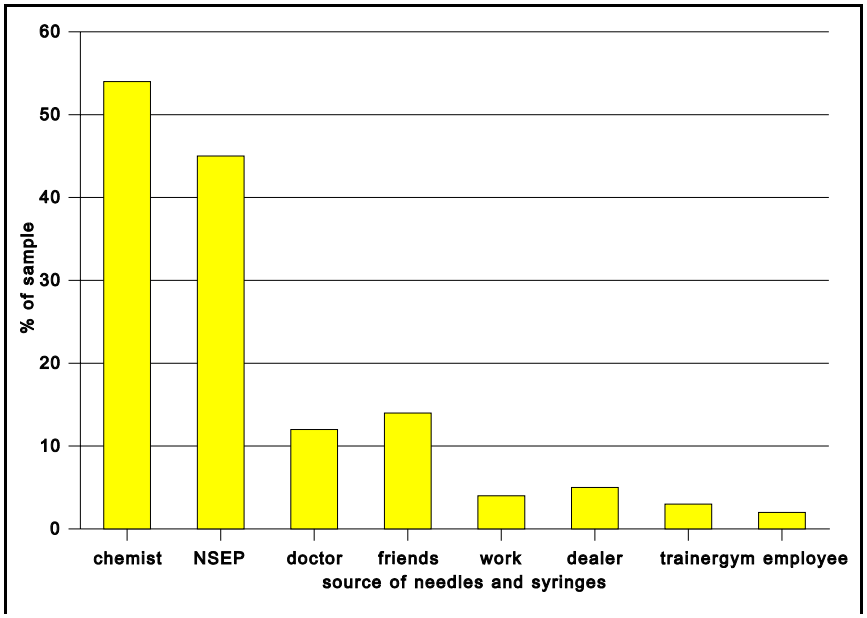



**Figure 3.6 - Sources of needles & syringes**

#### 3.3.4.3 Anabolic-androgenic steroids, other ergogenic drugs, and supplements used

Just over two thirds of the sample (67%) were using a combination of human and veterinary AAS preparations, 20% were using veterinary preparations only and 13% human preparations only. Separate lists of human and veterinary AAS preparations were presented to the subjects, with the opportunity to include preparations that they had used that were not listed.

Tables 3.13 and 3.14 list the human and veterinary AAS preparations respectively along with the proportion of the sample who had ever tried each one. Eight-two percent of the sample had ever used human AAS, while 90% had used veterinary products. 'Deca-durabolin' (*nandrolone decanoate*) and 'Sustanon 250' (*testosterone propionate, testosterone phenylpropionate, testosterone isocaproate, and testosterone decanoate* mix) were the most commonly used human AAS, both of which are injectable preparations; 'Anapolan 50' (*oxymetholone*) and 'Primobolan tablets' (*methenolone acetate*) were the most commonly used oral preparations. The most commonly used veterinary AAS, both of which are injectable preparations, were 'Stanazol' (*stanazolol*) and 'Deca 50' (*nandrolone decanoate*).

A number of other drugs were used in addition to AAS as part of their training routine by 49% of the sample. These are listed in table 3.15 along with the proportion of the sample who used each one, and commonly reported reasons for using them. The five most commonly used non-AAS drugs reported as part of the cycle were used for the management or prevention of side effects.

**Table 3.13 - Human AAS preparations used (% of total sample)**

| AAS | Oral (O) Injectable (I) | % of sample ever tried | AAS | Oral (O) Injectable (I) | % of sample ever tried |
|---|---|---|---|---|---|
| Deca-durabolin | I | 68 | Parabolan | I | 12 |
| Sustanon 250 | I | 64 | Durabolin | I | 11 |
| Anapolan 50 | I | 49 | Lonavar | | 11 |
| Primobolan tablets | O | 38 | Sustanon 100 | I | 9 |
| Andriol | O | 23 | Deca 100 | I | 9 |
| Primobolan depot | I | 22 | Dianabol | O | 8 |
| Primoteston depot | I | 19 | Adroyd | O | 6 |
| Dyanabol | I | 18 | Testosterone enanthate | I | 5 |
| Testoviron | I | 12 | Masterid | | 4 |
| Halotestin | O | 12 | Testosterone Cypionate | I | 2 |
| Halotestin | O | 12 | Masteron | I | 2 |

NB.
DHEA, stromba, d-bol tablets (1% each)

(Acknowledgement: This list of human steroids were prepared by Helen Stathis at the Northern Beaches HIV Prevention Centre, Manly, NSW and is used with her permission)

**Table 3.14 - Veterinary AAS preparations used**

| **AAS** Oral (O) Injectable (I) | | **% of sample ever tried** | **AAS** Oral (O) Injectable (I) | | **% of sample ever tried** |
|---|---|---|---|---|---|
| Stanazol | I | 74 | Hardock's Tepro H. I. | I | 11 |
| Deca 50 | I | 56 | Laurabolin | I | 9 |
| Dynabol 50 | I | 45 | Testosterone Injection | I | 8 |
| Drive | I | 44 | Testosterone cypionate | I | 8 |
| Testo La | I | 30 | Laubal-h | I | 7 |
| Supertest | I | 28 | Probolin | I | 5 |
| Spectriol | I | 25 | Protabol | I | 5 |
| Testosterone propionate | I | 24 | Testosterone enanthate | I | 5 |
| Cooper's Banrot | I | 22 | Tepro Sterile Injection | I | 5 |
| Tribolin 75 | I | 22 | boldenone | I | 5 |
| Testosterone suspension | I | 21 | Androbol | I | 4 |
| Methandriol | I | 20 | Superbolin | I | 4 |
| Boldebal-h | I | 19 | Testosus 100 | I | 4 |
| Filybol | I | 19 | Anaplex | O | 2 |
| Boldenone 50 | I | 18 | Geldabol | I | 2 |
| Boldec | I | 16 | Winstrol V | I | 2 |

| | | | | | |
|---|---|---|---|---|---|
| Libriol | I | 15 | Norabolin 50 | I | 2 |
| Stanosus 50 | I | 13 | Depobol | I | 2 |
| Testo prop | I | 13 | Ringer Testosterone | I | |

NB. Testomet, durateston, metabolin, nitrotain, nandrolone cypionate, Deca 200 duobolene, virabol, trobolin-h. (1% each)

(Acknowledgement: This list of veterinary steroids were prepared by Helen Stathis at the Northern Beaches HIV Prevention Centre, Manly, NSW and is used with her permission)

**Table 3.15 - Drugs used in conjunction with AAS as part of training**

| Drug | **% of sample** | **Reasons for use as reported by the sample** | ***When Used*** | **Where obtain from** | ***Side Effects Reported by the sample*** |
|---|---|---|---|---|---|
| proviron | 23 | - makes you hard<br>- increased natural testosterone production | *- pre-competition* | - doctor prescription<br>- 'blackmarket'<br>- friend | *- minimal* |
| oestrogen antagonist | 19 | - prevent or reduce gynecomastia<br>- reduce body fat<br>- reduce oestrogen related effects | *- throughout the AAS cycle* | - doctor prescription<br>- trainer<br>- friend<br>- dealer | *- depression*<br>*- sleepy, dulling effect* |
| clenbuterol | 14 | - burns body fat<br>- removes fluid under skin | *- at end of cycle* | - dealer<br>- friend<br>- blackmarket<br>- mail order<br>- trainer | *- nervousness - headaches*<br>*- cramps - tremors, shakes*<br>*- increased HR and body temp.*<br>*- sleeplessness* |
| diuretics | 12 | - reduce fluid levels | *- 1-2 days before competition* | - doctor prescription<br>- blackmarket | *- loss of balance* |
| hCG (human Chorionicgonad-otrophin) | 11 | - kick start natural testosterone production<br>- stop weight loss<br>- stop testicular atrophy<br>- increase strength | *- middle or end of cycle for max. 3 weeks* | - doctor prescription<br>- blackmarket<br>- friend | *- gynecomastia* |
| ephedrine | 11 | - provided an added 'kick' to training sessions | *- when training (not necessarily* | - chemist<br>- blackmarket | *- aggression*<br>*- insomnia* |

| | | | | | |
|---|---|---|---|---|---|
| | | - fat loss | *with AAS)* | - friend | *- trembling* |
| growth hormone | 9 | - anabolic effects<br>- reduce fat | *- within AAS cycle in conjunction with testosterone ester* | - friend<br>- training partner<br>- blackmarket | *- paranoia*<br>*- hypoglycemia*<br>***(Continued...)*** |
| **Drug** | **% of sample** | **Reasons for use as reported by the sample** | ***When Used*** | **Where obtain from** | ***Side Effects*** |
| thyroxine (T4) | 8 | - increase metabolic rate to reduce fat | *- pre-competition* | - Doctor<br>- blackmarket | *- 'speed like effects'* |
| amphetamine | 6 | - for training purposes<br>- reduce fat | *before, during and after AAS cycle* | - friend's prescriptions<br>- dealers | |
| insulin | 4 | - anabolic effects<br>- 'read about it' | *after training sessions* | - Doctor | *- increased appetite* |
| beta blockers | 3 | - fat loss | *throughout cycle* | - friend | |
| antibiotics | 2 | - kill acne | *daily* | - Doctor | *diarrhoea* |
| pregnyl | 2 | - increase natural testosterone levels | *- end of cycle* | - Doctor | *- increased sex drive* |
| daonil | 2 | - promotes natural insulin release | *- start of cycle* | - friend | |
| chromium picolinate | 1 | - keep body weight down | *- throughout* | - over-the-counter in U.S. | *- dizziness - insomnia - high BP* |
| hydroxocobalamin (Vit. | 1 | - helps put on weight | *- at end of cycle* | - friend | *- none* |

| | | | | | |
|---|---|---|---|---|---|
| B12) | | | | | |
| teroxin (T3) | 1 | - stops fattening | *while dieting* | - blackmarket | - *cramps* |
| aminogluthimide | 1 | - reduce receptors affinity to cortisol | *- middle to end of cycle* | - friend | - *tender joints* |
| IGF 1 | 1 | - anabolic effects<br>- reduce fat | *throughout AAS cycle* | - blackmarket | |
| caffeine tablets | 1 | - fat burning | *- used as caffeine, ephedrine, aspirin stack when training* | - over-the-counter here and U.S. | - |

The use of 'over-the-counter' nutritional supplements were used by 80% of the sample. These are listed in Table 3.16.

**Table 3.16 - Nutritional supplements used**

| Supplement | % of the sample | Supplement | % of the sample |
|---|---|---|---|
| protein powders | 57 | caffeine tablets | 2 |
| mutlivitamins | 52 | multiminerals | 2 |
| Vitamin C | 44 | RX Factor | 1 |
| Vitamin Bs | 36 | phosphagen | 1 |
| energy drinks | 36 | recovery tablets | 1 |
| creatine monohydrate | 30 | cod liver oil | 1 |
| Vitamin E | 20 | B12 | 1 |
| iron | 11 | ascorbic acid injection | 1 |
| calcium | 9 | guarana extract | 1 |
| digestive enzymes | 5 | prozest | 1 |
| HMB | 4 | Vitamin A | 1 |
| sulfate tablets | 2 | antioxidants | 1 |
| CLA | 2 | evening primrose oil | 1 |
| glutamine | 2 | garlic | 1 |
| dietary suppressant | 2 | l-carnitine | 1 |
| tidenosen | 2 | | |

3.3.4.4 Specific cycle information

A series of open-ended questions were asked to gain an understanding of the subject's specific cycles, including, a week-by-week description of their most recent AAS cycle, detailing the AAS preparations used and the amount(s) and timing of each administration. Following this question they were asked if the cycle that they had just described was typical of their AAS use history; if this was not the case,

similar information was obtained concerning their typical cycle. The following description of specific AAS cycles covers those cycles that were regarded by each subject as being typical of their AAS use history; 80% of the sample indicated that this was in fact also their most recent cycle. Six subjects were excluded from the following analyses, preferring to describe their typical cycle in general terms (4), while the remaining subjects did not provide cycle information.

The typical cycles described by the sample ranged from 3 to 52 weeks in duration, with an average length of 9-10 weeks (mean 9.6; SD 5.3). Within the cycle, an average of 2.5 different AAS preparations were used; 30.9% used just the one, 34% used two, 22.3% used three or four, 9.6% used five or six, 3.3% used seven or eight. The majority of the sample (73.4%) do not usually use an oral AAS; 19.1% used only one, with the remainder (7.4%) using either two or three. Nearly two thirds of the sample are using either one (29.8%) or two (35.1%) injectables, 23.4% use either three or four, 6.4% five to seven, with only 5.3% not usually using injectable AAS.

A total of thirty-nine different AAS preparations were used across the 94 typical cycles reported in this section. Predominantly veterinary, they are presented in Table 3.17, along with their chemical composition, strength, anabolic/androgenic activity ratings (based on reports of a number of the subjects), and the number of people who report using them.

**Table 3.17 - Anabolic-androgenic steroids reported in the typical cycles of the present sample**

| AAS Common Name | % of the sample who use | Composition | Strength (mg/ ml unless indicated) | Reported ANABOLIC activity | Reported ANDROGENIC activity |
|---|---|---|---|---|---|
| anaplex | 1.1 | *norandrolone / norethandrolone* | 5 mg oral | Medium | High |
| anapolan 50 | 8.5 | *oxymetholone* | 50 mg oral | High | High |
| andriol | 1.1 | *testosterone undecanoate* | 40 mg oral | Low | Low |
| boldebal-h | 2.1 | *boldenone undecylenate* | 50 | Medium | Low |
| boldec | 2.1 | *boldenone undecylenate* | 25 or 50 | Medium | Low |
| boldenone | 2.1 | *boldenone undecylenate* | 25 or 50 | Medium | Low |
| cooper's banrot | 9.6 | *testosterone cypionate* | 75 | High | High |
| deca-durabolin | 17.0 | *nandrolone decanoate* | 50 | High | Medium |
| deca 50 | 27.7 | *nandrolone decanoate* | 50 | High | Medium |
| dianabol | 6.4 | *methandrostelone / methandienone* | 5 mg oral | High | High |
| | | *boldenone undecylenate /* | | Medium/Hig | |

| | | | | | |
|---|---|---|---|---|---|
| drive | 12.8 | *methandriol diproprionate* | 55 | h | Medium |
| dynabol 50 | 12.8 | *nandrolone cypionate* | 50 | High | Low |
| filybol | 2.1 | *methandriol dipropionate / nandrolone decanoate* | 70 | High | M |
| **AAS Common Name** | **% of the sample who use** | **Composition** | **Strength (mg/ ml unless indicated)** | **Reported ANABOLIC activity** | **Reported ANDROGENIC activity** |
| hardock's tepro hormone injection | 1.1 | *testosterone propionate* | 100 | High | High |
| halotestin | 2.1 | *fluoxymesterone* | 5 mg oral | Medium | High |
| laubal-h | 1.1 | *nandrolone laurate* | 50 | Medium | Medium |
| parabolan | 1.1 | *trenbolone hexahydrobencylcarbon* | 76 / 1.5ml | High | High |
| primobolan depot | 1.1 | *methenolone enanthate* | 100 | Medium/High | Low |
| primobolan tablets | 5.3 | *methenolone acetate* | 5 mg oral | Medium | Low |
| primoteston depot | 4.3 | *testosterone enanthate* | 250 | High | High |
| | | | | | |

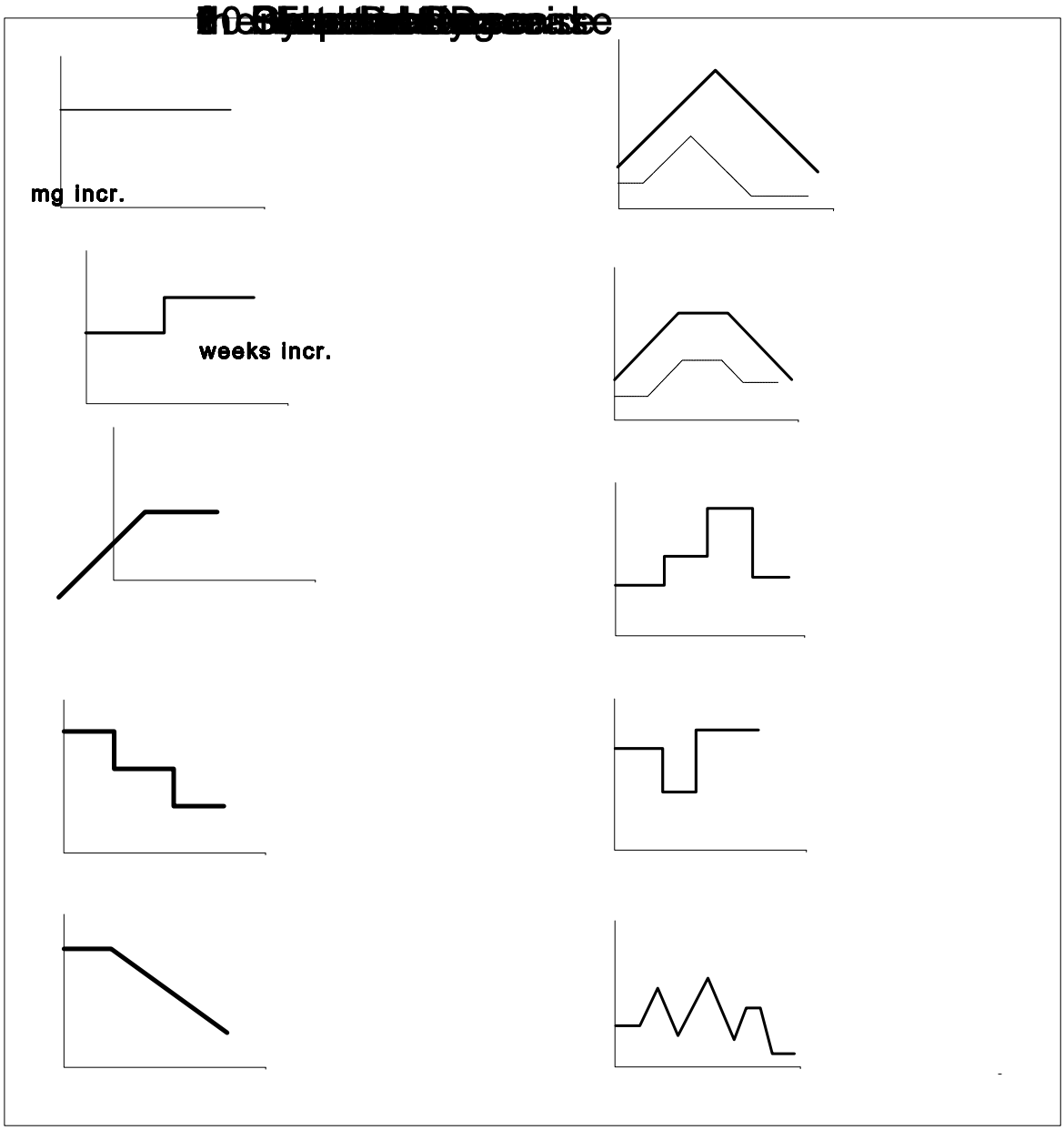
| | | | | | |
|---|---|---|---|---|---|
| proviron | 2.1 | *mesterolone* | 25 mg oral | - | High |
| spectriol | 4.3 | *methandriol dipropionate / nandrolone phenylpropionate / testosterone enanthate / testosterone hexahydrobenzoate / testosterone propionate / testosterone cypionate* | 65 | Medium | Medium |
| stanazol | 36.2 | *stanazolol* | 50 | High | Low |
| supertest | 3.2 | *testosterone propionate* | 50 | High | High |
| sustanon 250 | 24.5 | *testosterone propionate / testosterone phenylpropionate / testosterone isocaproate / testosterone decanoate* | 250 | High | High |
| tepro sterile injection | 3.2 | *testosterone propionate* | 100 | High | High |
| **AAS Common Name** | **% of the sample who used** | ***Composition*** | **Strength (mg/ml unless indicated)** | **Reported ANABOLIC** activity | **Reported ANDROGENIC activity** |
| testo la | 8.5 | *testosterone cyclopentylpropionate* | 100 | High | High |
| testosterone cypionate | 9.6 | *testosterone cypionate* | 100 | High | High |

| | | | | | |
|---|---|---|---|---|---|
| testosterone enanthate | 7.4 | *testosterone enanthate* | 100 | High | High |
| testosterone propionate | 12.8 | *testosterone propionate* | 50 | High | High |
| tribolan 75 | 5.3 | *nandrolone decanoate / methandriol dipropionate* | 75 | High | High |
| winstrol tablets | 1.1 | *stanazolol* | 2 mg oral | Medium | Low |
| methandriol tablets | 1.1 | *methylandrostenediol dipropionate* | 5 mg oral | Medium | High |
| dianabol tablets | 1.1 | *methandrostenelone / methandienone* | 5 mg oral | High | Medium |
| testosterone suspension | 2.1 | *testosterone* | 100 | | |
| dynabolin 50 | 1.1 | | 50 | | |
| DHEA | 1.1 | *dehydroepiandosterone* | 25 mg oral | Low | Low |
| superbolin | 1.1 | *methandriol dipropionate* | 75 | High | Medium |

An examination of the levels of usage among the sample was conducted. Simple addition of the amount of each AAS (in milligrams) used within each cycle presents itself with problems regarding the validity of assuming equal relative strengths of various AAS preparations. Even for the 29 subjects whose typical cycle involves only one AAS, there were 15 different AAS preparations used.

**Figure 3.7 -**

**Dosage management techniques:**




**Underlying structures from the present sample**

The most commonly used AAS by these subjects was stanazol (31%) and deca 50 (17%), both injectable veterinary preparations; two subjects reported using anapolan 50, an oral preparation. Irrespective of the AAS used, the average duration was 10.0 weeks (SD 8.8).

To determine the dosage management technique used within the cycle, the total amount of AAS (in milligrams) was calculated and graphed across time, allowing a visual inspection of the technique used. A total of 10 different patterns were identified and are summarised in figure 3.7. (These 10 techniques were compared to the dosage management methods used for each different AAS within multiple AAS cycles, and were found to be all-encompassing). Forty-eight per cent of the sample who were using one AAS used a constant dosage, with 17% using either a 'pyramid' or 'step increase then decrease' technique.

The remaining 65 typical cycles given involved two or more AAS. An examination of these cycles illustrated the great variation in individual steroid cycles. Collapsing the AAS into their reported anabolic and androgenic activity (see table 3.17) did not indicate any consistencies across users. For the present purposes a look at the commonly used AAS, dosage management techniques used, and AAS often used in combination are presented in table 3.18.

Another way to examine the typical cycles of AAS use is to group users based on the amount used. Employing cut-off points determined in other studies (eg. Pope et al, 1994), we allocated the subjects into groups of 'LOW' (less than 300mg/week), 'MEDIUM' (301 to 1000mg/week) and 'HIGH' (greater than 1000mg/week) dosage users. Two methods for determining group allocation will be reported here. The first is that used by Pope et al whereby the maximum weekly dose taken at any point within the cycle is the defining criteria. Owing to the variation within individual cycles (see figure 3.7), an alternative method will also be presented for comparison; the group allocation in this instance is based on the average weekly dosage administered. Table 3.19 summarises some demographic and AAS cycle information for the three groups, separately for each method. Initial comparison of the two methods suggests that the maximum method is more likely to allocate users into the HIGH dosage group than that based on average weekly administration.

In addition the differences between the groups regarding their expectations was examined. There was no difference between the groups, using either method, in the total number of expectations , or, in the number of physical and psychological expectations.

**Table 3.18 - Most commonly used AAS in typical cycles involving 2 or more AAS**

| Commonly used AAS | No. who use in typical cycle | Dosage management | AAS used in combination |
|---|---|---|---|
| Stanazol | 34 | 31.3% constant<br>18.8% pyramid<br>12.5% step incr/decr<br>9.4% fluctuate<br>9.4% gradual decr. | Deca 50<br>Sustanon 250<br>Testosterone propionate<br>Dynabol 50<br>Drive<br>Testosterone cypionate |
| Deca 50 | 26 | 46.1% constant<br>14.5% pyramid<br>9.2% step incr<br>9.2% step incr/decr | Sustanon 250<br>Stanazol<br>Anapolan 50<br>Drive<br>Testosterone cypionate<br>Testosterone propionate<br>Primobolan tablets |
| Sustanon 250 | 23 | 69.6% constant<br>8.7% pyramid | Deca 50<br>Stanazol<br>Dynabol 50<br>Testosterone propionate<br>Primobolan Tablets<br>Dianabol |
| Deca-durabolin | 16 | 56.0% constant<br>20.0% pyramid | Stanazol<br>Primobolan tablets<br>Testo la<br>Coopers Banrot<br>Testosterone cypionate<br>Drive |
| Drive | 12 | 43.8% constant<br>15.6% pyramid<br>12.5% step incr/decr | Deca 50<br>Stanazol<br>Dynabol 50<br>Testosterone enanthate<br>Testosterone propionate<br>Cooper's Banrot<br>Anapolan 50<br>Deca-durabolin |
| Dynabol 50 | 12 | 36.1% constant<br>25.0% pyramid<br>19.4% step incr/decr | Stanazol<br>Deca 50<br>Testosterone enanthate<br>Drive |

| | | | |
|---|---|---|---|
| | | | Tribolan 75<br>Testosterone propionate<br>Testo La |
| Commonly used AAS | No. who use in typical cycle | Dosage management | AAS used in combination |
| Testosterone propionate | 12 | 70.0% constant<br>15.0% gradual decr | Deca 50<br>Stanazol<br>Testosterone enanthate<br>Anapolan 50<br>Sustanon 250<br>Dynabol 50 |
| Cooper's Banrot | 9 | 47.1% constant<br>23.5% pyramid<br>11.8% gradual decr. | Drive<br>Dynabol 50<br>Testosterone propionate<br>Stanazol<br>Deca 50 |
| Testosterone cypionate | 9 | 92% constant | Deca 50<br>Stanazol |
| Anapolan 50 | 8 | 69.6% constant<br>17.4% gradual decr.<br>13.0% step incr. | Deca 50<br>Testosterone propionate<br>Testosterone enanthate<br>Testosterone cypionate<br>Drive<br>Stanazol |
| Testo La | 8 | 50.0% constant<br>25.0% pyramid<br>15.0% step. decr. | Sustanon 250<br>Deca 50<br>Dynabol 50<br>Stanazol |
| Testosterone enanthate | 7 | 50.0% constant<br>18.2% pyramid<br>13.6% gradual decr. | Testosterone propionate<br>Drive<br>Deca50 |
| Dianabol | 6 | 33.3% constant<br>33.3% step incr.<br>13.3% pyramid | Testosterone cypionate<br>Testosterone enanthate<br>Sustanon 250<br>Deca-durabolin<br>Stanazol |
| Tribolan 75 | 5 | 62.5% constant<br>18.8% step incr/decr | Stanazol<br>Dynabol 50 |
| Primobolan | | | Deca 50 |

| | | | |
|---|---|---|---|
| tablets | 5 | 88.8% constant | Sustanon 250 |

**Table 3.19 - Demographic & AAS cycle information for LOW, MEDIUM and HIGH dosage groups.**

| | Maximum Method | | | Average Method | | |
|---|---|---|---|---|---|---|
| **Variable** | **LOW** | **MEDIUM** | **HIGH** | **LOW** | **MEDIUM** | **HIGH** |
| **N** | **41** | **40** | **13** | **44** | **45** | **5** |
| **Demographics** | | | | | | |
| Age | 30 (6.8) | 29 (6.8) | 28 (7.8) | 30 (6.6) | 28 (7.2) | 30 (6.5) |
| Height | 176 (7.3) | 176 (7.4) | 176 (7.5) | 176 (7.0) | 176 (7.5) | 172 (9.2) |
| Weight | 85 (18.5) | 91 (21.0) | 99 (14.6) | 85 (17.0) | 93 (20.9) | 100 (19.6) |
| % Body fat* | 14 (4.3) | 11 (3.5) | 12 (2.4) | 13 (3.9) | 11 (3.6) | 11 (2.8) |
| Years training before AAS | 3 (3.6) | 4 (2.5) | 4 (3.1) | 3 (2.8) | 4 (3.3) | 4 (1.8) |
| Age first use AAS | 27 (6.3) | 24 (6.0) | 24 (5.4) | 27 (6.1) | 24 (5.9) | 24 (6.6) |
| Duration of use (regular) | 3 (3.4) | 4 (2.7) | 4 (3.2) | 3 (2.6) | 4 (3.5) | 4 (1.3) |
| Number of cycles in last 12 months | 2 (1.3) | 2 (1.3) | 3 (1.5) | 2 (1.2) | 2 (1.7) | 3 (1.2) |
| **Cycle Information** | | | | | | |
| Shortest duration | 7 (2.8) | 7 (2.8) | 6 (2.6) | 7 (2.8) | 6 (2.7) | 6 (1.7) |
| Longest duration | 12 (9.9) | 14 (17.4) | 14 (4.1) | 13 (9.9) | 14 (6.9) | 13 (1.0) |
| Typical duration | 10 | 9 | 10 | 11 | 9 | 10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (7.5) | (2.5) | (2.3) | (9.6) | (2.6) | (0.9) |
| Maximum dosage | 173 (81.0) | 573 (184.7) | 1403 (472.5) | 216 (128.4) | 679 (367.9) | 1647 (531.1) |
| Minimum dosage | 118 (80.0) | 357 (210.5) | 632 (515.1) | 118 (75.2) | 364 (208.0) | 1125 (470.0) |

| **Variable** | **LOW** | **MEDIUM** | **HIGH** | **LOW** | **MEDIUM** | **HIGH** |
|---|---|---|---|---|---|---|
| Number of AAS | 2 (0.8) | 3 (1.4) | 5 (1.6) | 2 (1.0) | 3 (1.4) | 6 (1.6) |
| AAS used (common) | Deca* (49%) Stanazol (44%) Drive (12%) | Deca* (35%) Stanazol (30%) Sustanon 250 (28%) | Sustanon 250 (62%) Deca* (46%) Dyanabol, Stanazol, Test. propionate (38% each) | Stanazol (45%) Deca (45%) Drive (14%) | Sustanon 250 (33%) Deca (29%) Stanzol (27%) | Dynabol 50 (60%) Test.** propionate (60%) Stanazol (60%) |

## 3.4 Benefits and Side Effects Reported

### 3.4.1 *Benefits*

The subjects were asked to nominate the most important benefit from AAS use that they had experienced. An equal number (37%) indicated that either 'improved appearance' or 'increased size' was the most important benefit to them. A further 7%

**Table 3.20 - Benefits from AAS use reported**

| **Benefit** | **Always** | **Often** | **Sometimes** | **Rarely** | **Never** |
|---|---|---|---|---|---|
| Improve appearance | 61 | 31 | 6 | 0 | 2 |
| Increase size | 66 | 25 | 7 | 1 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Increase strength | 67 | 18 | 9 | 2 | 4 |
| Improve sport performance | 28 | 2 | 20 | 12 | 18 |
| Increase self esteem | 36 | 29 | 19 | 5 | 11 |
| Increase energy levels | 36 | 31 | 18 | 7 | 6 |
| Increase sex drive | 48 | 22 | 19 | 13 | 8 |
| Decrease body fat | 18 | 25 | 38 | 12 | 7 |
| Able to train harder | 53 | 31 | 9 | 2 | 5 |
| Prevent/recover from injury | 34 | 25 | 15 | 6 | 20 |
| Approval from others | 16 | 18 | 30 | 16 | 20 |

nominated 'increased strength', 5% 'improved self esteem, 4% 'decreased body fat', 3% 'improved sporting performance', 3% were not able to say, while the remainder (4%) nominated one of either 'increased approval from others' and 'feel good'. They were then asked to indicate which benefits they experienced and how often. These are summarised in table 3.20.

3.4.2 *Side-effects*

**Table 3.21(a/b) - Reported side effects of AAS**

**(a)** Physical Side Effects

| **Effects** | **% of sample** |
|---|---|
| increased appetite | 85 |
| increased sex drive | 84 |
| water retention | 64 |
| sore injection sites | 57 |
| acne | 54 |

**(b)** Psychological/Behavioural Effects

| **Effects** | **% of sample** |
|---|---|
| increased motivation | 82 |
| increased confidence | 82 |
| increased sex drive | 80 |
| more satisfied with body image | 76 |
| mood swings | 54 |

| | | | |
|---|---|---|---|
| increased body hair | 48 | more irritable | 54 |
| sleeplessness | 43 | fatigue | 29 |
| headaches | 28 | more relaxed | 29 |
| high BP | 18 | more impulsive | 28 |
| more frequent colds | 17 | decreased sex drive | 25 |
| decreased appetite | 17 | euphoria | 24 |
| tendon injuries | 16 | depression | 21 |
| voice changes | 16 | suspicion | 12 |
| nose bleeds | 14 | rush after injection | 1 |
| bum sores | 13 | | |
| hair loss | 10 | smaller breasts | 67 |
| liver problems | 10 | **MEN ONLY** | **(N=94)** |
| kidney problems | 3 | shrinking testicles | 55 |
| lymph node swelling | 3 | gynecomastia | 34 |
| heart problems | 2 | painful erections | 15 |
| **WOMEN ONLY** | **(N=6)** | impotence | 4 |
| clitoral enlargement | 100 | problems with reproductive function | 4 |
| facial hair | 83 | prostate problems | 3 |
| menstrual irregularities | 67 | | |

'Increased appetite' and 'increased sex drive' were the most commonly reported symptoms of AAS, experienced by 85% and 84% of the sample respectively. A list of physical side effects and the percentage of the sample who have experienced them is given in table 3.21(a). One fifth of the total sample believed that they had permanent side effects from AAS use, involving gynecomastia (5%), voice changes (4%), acne scars and hair loss (3% each), metabolic changes, clitoral enlargement, testicular shrinkage, stretch marks, and put on fat easier (each1%). In addition, 21% believed that they had experienced side effects bad enough to stop, although this usually resulted in the discontinued use of only certain preparations.

Just on two thirds of the sample (66%) were concerned about the side effects of AAS. A large proportion of these people (75%) were concerned about general health issues (eg. heart, liver, and cardiovascular function), 56% concerned about deleterious effects on their reproductive functioning, 48% concerned about general appearance (eg. acne, hair loss), 30% effects on family, 27% mood changes, 22% legal concerns, 19% increased aggression, and 1.5% each on the financial drain it causes, and immune system suppression.

### 3.4.3 *Psychological/behavioural Effects*

Table 3.21(b) indicates the number of subjects who experience certain psychological or behavioural effects from AAS use. When specifically asked whether their behaviour while using steroids was more or less aggressive, 42% indicated their behaviour was more aggressive, 47% the same and 3% were unsure. Of those who described their behaviour as more aggressive, a number of reasons were offered by this group including 'lose patience easier' and 'lose temper easier' (each 23.5%), 'more easily irritated' (17.6%), 'agitated more easily' (5.9%), and 'more sensitive', 'more scared', 'more assertive', 'more outspoken', 'uptight', 'more likely to argue', 'greater belief in yourself', 'less tolerant', and 'more likely to resort to violence' (each 2.9%).

When asked whether their friends or family have been affected by their AAS use, 30% indicated that they had, of which 73% said that their relationships had worsened; they attributed this to, for example, 'being less tolerant' (16.7%), 'unable to deal with small issues' (12.5%), 'increased pressure' and 'not communicating' (8.3%). Other explanations were 'poor conflict resolution skills', and 'too dedicated to training routine'. A similar question directed at work relationships revealed that only 13% believed that AAS had had an effect, of which only 46.7% believed that it had worsened. 'Impatience', 'aggressiveness' and 'mood swings' being the main explanations for worsening work relationships. 'Greater confidence' and 'lower stress levels' were offered as explanations for work relationships that had improved.

With regard to the 'roid rage' phenomenon, 26% believed they have experienced a 'roid rage', a median of 2.5 times (range 0-100). Subjects were asked to describe the context within which they had experienced a 'roid rage' (for those who had), and what they believed are the characteristics of a 'roid rage'. Common features of the responses to each of these open ended questions are given in table 3.22 and 3.23. According to these users, 'roid rages' require a trigger, may involve violence, and are usually short in duration.

**Table 3.22 - Common features of 'roid-rage' experiences reported (n=23)**

| | |
|---|---|
| Precursors to/ triggers of 'roid rage' | · notion of being at an extreme end of psychological state (eg. stressed, hungry) (n=3)<br>· an innocent remark from someone known or unknown to them (n=5)<br>· engaged in an argument with relationship partner or friend (n=6) |
| Character of 'Roid rage' | · sudden loss of control or rush of anger (n=7)<br>· uncharacteristic anger (n=3)<br>· verbal abuse (n=5)<br>· violence towards an object (eg. smashing object, throwing across the room) (n=9)<br>· violence to another person / physical fighting (n=6)<br>· absence of physical violence (n=6)<br>· very short in duration (n=15)<br>· realisation of the stupidity of the behaviour after the event (n=5)<br>· realisation as it happens so able to maintain control (n=2) |
| Environment | · driving a motor vehicle (n=7)<br>· domestic (n=6)<br>· sporting environment (n=2) |

**Table 3.23 - Common features of 'roid-rage' descriptions reported (n=79)**

| | |
|---|---|
| · a sense of being out of control with anger (usually unreasonable anger) | (n=23) |
| · persons experiencing 'roid rages' are naturally aggressive anyway | (n=17) |
| · violent tendencies: potential for violence, actual violence to person or object(s) | (n=17) |
| · general aggressiveness, bad temper, irritability (without physical violence) | (n=14) |
| · associated with too much AAS use (particularly high level androgen AAS) | (n=8) |
| · absence of reasoning prior to the event | (n=7) |
| · a deviation from the normal character of the individual | (n=6) |
| · haven't come to terms psychologically/mentally with steroids and the subsequent changes it makes in your life | (n=6) |
| · an excuse for being antisocial | (n=6) |
| · roid rage is a myth | (n=6) |
| · it just happens, there are no warnings, not aware while it is happening. | (n=3) |
| · a trigger is needed before it occurs | (n=3) |
| · short in duration | (n=2) |

### *3.4.4 Dependence and withdrawal*

Questions keyed to the DSM-IV criteria for substance use disorder were examined as a means of screening for abuse/dependence on anabolic-androgenic steroids. These questions are presented in table 3.24 along with the proportion of the sample who endorsed those items. The number of answers indicating a positive response were added together as a means of assessing the likelihood of AAS dependence within the sample. Thirteen percent of the sample answered 'yes' to three or more of the questions. A further 37% answered 'yes' to one or two of the questions, while 50% answered 'no' to all of the questions. Using the full Composite International

Diagnostic Interview (CIDI) Core Version 2.0, substance related disorders module to provide DSM-IV diagnoses of substance abuse/dependence, one of the female subjects endorsed the items that `AAS frequently interfered with her work at school, on a job or at home'; ` it lead to problems with her family, friends, at work or at school'; she `had to use much more than before to get the effect she wanted'; `she had felt such a strong desire or urge to use AAS that she could not keep from using them'; `she had spent a great deal of time using AAS, getting them, or getting over their effects'; `she had experienced withdrawal symptoms when she stopped or cut down'; `she had experienced medical problems as a result of using AAS'; `she had emotional or psychological problems from AAS use'; and `she had given up or greatly reduced important activities in order to get or to use AAS'. As she endorsed more than three of the dependence criteria, she qualified for a diagnosis of dependence. This female subject also completed the Severity of Dependence Scale (Gossop, Griffiths, Powis and Strang (1992) modified for AAS and scored 6 which is above the cut-off of 5 to earn a diagnosis of dependence. A final measure of dependence, the Ontario Adult Drug Use Questionnaire which operationalises ICD-10 dependence, criteria was completed by the subject. She once again met the criteria for dependence by endorsing 6 of the 6 criteria, where 3 of 6 is necessary to qualify for an ICD-10 diagnosis of dependence.

**Table 3.24 - Questions keyed to DSM-IV criteria for substance use disorder**

| DSM-IV Criteria | % of sample who endorsed item |
|---|---|
| *Has your steroid use caused problems at work?* | 3 |
| *Has your steroid use caused problems with the law?* | 5 |
| *Have you/ do you continue to use even though you know it was/is causing you harm?* | 34 |
| *Do you need more to get the same [psychological] effect?* | 14 |
| *Have you ever wanted to cut down but couldn't?* | 5 |
| *Do you feel a strong desire to use that you can't resist?* | 17 |
| *Do you spend a great deal of time getting* | 8 |

| | |
|---|---|
| *and using the steroids?* | |
| *Do you often use more than intended?* | 13 |
| *Do you use AAS to relieve withdrawal symptoms* | 7 |

Symptoms of withdrawal following the cessation of AAS use (including rest periods between cycles) were also examined. Table 3.25 describes the reported symptoms of withdrawal. A small number of those who reported each symptom estimated the length of time that it persisted and what they did in order to relieve it. These are also presented in table 3.25. Many of the more commonly reported withdrawal symptoms were psychologically based. Seven percent of the sample reported using AAS to relieve the symptoms described below.

**Table 3.25 - Symptoms of withdrawal from AAS**

| Symptoms | % of sample | Length* | Symptom Relief** |
|---|---|---|---|
| Dissatisfaction with body image | 38 | median = 4.5 wks (mean 9.0; SD 11.59) | · *use supplements*<br>· *talk to friends* |
| Loss of appetite | 33 | median = 2.25 wks (mean 6.2; SD 9.37) | *(nothing specific)* |
| Depression | 31 | median = 4 wks (mean 7.1; SD 9.25) | · *continue training hard* |
| Desire for more | 28 | median = 4 wks (mean 9.0; SD 11.09) | · *continue training*<br>· *plan next AAS cycle*<br>· *use supplements*<br>· *Vitamin B12 injections* |
| Fatigue | 24 | median = 2 wks (mean 3.35; SD 3.21) | · *keep training with reduced workload*<br>· *Vitamin B12 injections* |
| Lack of interest | 23 | median = 4 wks | |

| | | | |
|---|---|---|---|
| | | (mean 8.3; SD 11.14) | |
| Anxiety | 12 | median = 2 wks (mean 2.9; SD 1.46) | |
| Restlessness | 10 | median = 2 wks (mean 2.8; SD 1.46) | |
| Headaches | 6 | median = 4wks (mean 7.1; SD 9.25) | · *headache tablets* |
| Suicidal thoughts | 2 | (one subject = 12 wks) | |
| Nausea | 2 | (one subject = 6 wks) | |
| Chills, sweating, nosebleed, sickness, decreased sex drive | 1 | (no information provided) | |

* Not all subjects could give indications as to duration of symptoms

** Most reported doing 'nothing specific'; included here if different.

*3.4.5 Future plans*

Nearly three quarters of the sample (73%) believed that the benefits outweighed the side effects, 10% did not, while the remainder (17%) were not able to say at the time. In view of the large majority who saw the benefits as more important, subjects were asked what might deter them from using. The main deterrents to AAS use were 'general ill health' and 'steroid side effects'. These are summarised in Table 3.26.

**Table 3.26 - Deterrents to AAS use**

| Deterrent | Extremely Likely | Likely | Don't Know | Unlikely | Extremely Unlikely |
|---|---|---|---|---|---|
| Cost doubling | 10 | 19 | 17 | 42 | 12 |

| | | | | | |
|---|---|---|---|---|---|
| Increased criminal penalties | 9 | 12 | 15 | 44 | 20 |
| Greater police attention | 7 | 16 | 17 | 45 | 15 |
| General ill health | 45 | 36 | 10 | 5 | 4 |
| Steroid side effects | 31 | 37 | 15 | 11 | 6 |
| Lack of public acceptance | 3 | 7 | 14 | 37 | 39 |
| New information on dangers | 11 | 36 | 32 | 13 | 8 |

A number of other deterrents were offered by the sample including:

- *"if I felt psychologically dependent";*
- *"invention of better anabolic substance';*
- *"family [and/or] parents found out';*
- *"if training partner experienced bad side effects";*
- *"the availability of real steroids was negligible";*
- *"if I met my goals";*
- *"put my relationship in danger" and "partner asked me to stop";*
- *"if everyone stopped"*; and
- *"if I woke one day looking fabulous".*

Examining the issue of doctor prescription of AAS for non-medical purposes, the anticipated changes to behaviour following a hypothetical reversal of the current situation were explored. These are summarised in table 3.27. Only 8 subjects indicated that they would not seek medically prescribed AAS.

Looking towards the future subjects were asked how long they planned to continue to use. Fifteen percent of the sample had already ceased use. Reasons offered for ceasing use included, "it was harmful", "already achieved the goals set", "retired from competitive bodybuilding", "it was not the way to win", "lack of interest", "other priorities", "cost", "couldn't get a doctor to prescribe", or "compete in a drug tested competition". More than one fifth of the sample (21%) planned to use for up to 2 years, 15% for 2.5 to 5 years, 9% 6 to 10 years, 14% 11 to 40 years, 10% 'indefinitely', while 21% were 'not sure'.

**Table 3.27 - Behavioural changes with doctor prescription (non-medical) of AAS**

| Behaviour | Extremely Likely | Likely | Don't Know | Unlikely | Extremely Unlikely |
|---|---|---|---|---|---|
| Increase amount taken | 6 | 10 | 12 | 52 | 17 |
| Seek medically prescribed AAS | 59 | 27 | 6 | 5 | 3 |
| Be more discerning about what you take | 40 | 26 | 17 | 13 | 7 |
| Be more open about AAS use | 20 | 23 | 21 | 31 | 5 |

# 4.0 DISCUSSION

This sample of anabolic-androgenic steroid users are a unique sub-group of the illicit drug injecting population in Australia. AAS users systematically differ in demographic profile and patterns and reasons for their drug use. In common with other illicit drug users, however, in addition to the perceived benefits of the drug, they experience significant negative health and psychological effects of their AAS use. In a small, but important, proportion of AAS users this includes the development of problems with dependence and withdrawal and irreversible side- effects.

## 4.1 Characteristics of the Sample

### 4.1.1 *Demographics*

This sample of anabolic-androgenic steroid users are more likely to be male, homosexual, in a stable relationship, well educated and in full or part-time employment than other groups of injecting drug users recently studied in Australia (e.g. Darke , Ross & Hall, 1996; Topp & Darke, in press). This sample also had a substantially higher disposable income than the general Australian community, with only 27% earning less than $30,000 per annum. Please see section 4.8 for a discussion of the study limitations.

The AAS users involved in the present study are an older sample of illicit drug users. This is consistent with other Australian based studies, in Canberra (Plowright, 1994), and Perth, Western Australia (Beel, 1996). Although there are a number of anecdotal reports suggesting that adolescent AAS use is increasing, the general population of AAS users is typically older. AAS use among the gay community has been identified in this study as being of considerable size, with a little over one quarter of respondents preferring same sex partners.

#### 4.1.1.1 Occupation

A high proportion of the sample having some form of post-school education coupled with numerous positions of leadership and responsibility. While approximately 40% indicated that they had had a job where muscular strength or physical appearance were important for their employment, far fewer maintained such positions as their main occupation. Although occupations were not presented by Plowright (1994), a comparison of the salaries of the two samples is consistent, with a large proportion (greater than 70%) earning in excess of $30, 000 per annum.

## 4.2 Alcohol and Other Drug Use

While high levels of poly drug use are common among other illicit drug using populations (e.g. Swift, Hall & Copeland, 1997; Darke & Hall, 1995), concurrent other drug use was low among the majority of the sample. More than two thirds of the sample were non-smokers, drank alcohol on a monthly or less basis, and did not use other illicit drugs throughout the preceding 12 months. Of the group that did, alcohol use per occasion was low, and other illicit drug use was usually confined to fewer than 5 times per year. Amphetamine, cocaine, ecstasy and marijuana were the preferred choice of those using in a typical year. The main sub-group responsible for the levels of poly drug use in the study were the homosexual subjects who were significantly more likely to have ever used a wide variety of illicit drugs.

## 4.3 Expectations and Motivations of AAS Use

The present data indicate that the main motivations to use AAS are physical in nature, that is improved appearance and increased size. While psychological expectations are reported, such as improved self-esteem and approval from others, they are not regarded by the present sample to be of higher, or even equal, importance to the physical expectations. In addition, it seems that while users' main motivations are reasonably constant with time, their expectations regarding forthcoming AAS cycles become fewer with experience, perhaps the result of a narrowing of their focus and goals.

The frequency of training and the financial outlay by most of the sample is testament to their commitment to the expected rewards of AAS use and to the lifestyle that is required to achieve it.

## 4.4 Patterns and Correlates of AAS Use

### 4.4.1 *AAS initiation*

The mid-twenties is reasonably old to be experiencing a particular illicit drug for the first time. Although there is little published research on adolescent use in NSW, or even Australia, studies from the United States, particularly by Yesalis and colleagues (1993), have identified adolescent use, experimentation and regular use. The 1995 Australian National Household Survey reported that 22% of people had tried AAS before the age of 16 years which is up from 9% in 1993 (Commonwealth of Australia, 1996). The low representation of adolescents in the present study (2%) means that no generalisations to the adolescent population can be made. There is anecdotal evidence from a variety of sources that AAS use is an increasing problem for schools and in juvenile justice settings and future research with this group is urgently required as the side effects of AAS use, such as premature cessation of long bone growth and virilization of young females, are irreversible.

It would appear that AAS users like most other drug users, do not simply start using and continue their use from that point. There seems to be a period between their first use and when they consider themselves to be regular users. This may be a time of reflection whereby they are considering the relative positive and negative effects before continuing. Further understanding of the process of deciding to pursue or discontinue AAS use can only assist in establishing strategies for prevention and/or harm reduction.

### 4.4.2 *AAS information*

Although there are a number of possible reasons for the waiting period before the first and second cycles, it is clear from the present study that the AAS user is actively involved in the seeking out of information that is relevant to their patterns of use, with the objective of increasing the benefits and reducing the side effects. In addition, they do not necessarily limit themselves to a sole source of information, seeking out a number of places to expand their knowledge. It could, however, be argued that their the most common sources of information are not entirely reliable, as many people question the content reliability of health and fitness magazines and the steroid handbooks (eg. Phillips, 1993). Interestingly, despite the plethora of information on AAS available on the electronic medium of the Internet, this was not a common source of information accessed by AAS users in this study.

The current information seeking behaviour only reflects the availability and accessibility of well informed medical practitioner. Many users in this study expressed a desire to access a well informed medical practitioner as their most preferred source of information, if they were able to. Women in the sample preferred traditionally authoritative sources of information such as medical

practitioners and the medical literature, whereas men were also looking to trainers and gymnasia as sources of information on AAS use.

### 4.4.3 *Supply*

This study did not explore the drug economy of anabolic-androgenic steroids directly and the subjects generally reported a supply network among friends and acquaintances without being aware of the primary source. While some participants did identify a primary supplier such as medical practitioners, veterinarians or horse trainers, most of the sources described were secondary. There was considerable use of agricultural products such as Coopers Banrot and other veterinary preparations which suggests that a study of the drug economy and consideration of supply reduction activities would be an appropriate harm reduction strategy.

Of growing concern regarding AAS supply is the issue of counterfeit AAS. This was a major reason that the participants endorsed a change in the current prescription laws. Currently counterfeit AAS are an area of concern for users, particularly for the inexperienced user, and those using in isolation. Although this sample suggested that the negative consequences of counterfeit AAS use are limited, there is still concern about their increasing production in an environment of greater demand for AAS.

### 4.4.4 *Injecting*

Injecting practices of the present sample, for the most part, were not conducive to the transmission of HIV and other blood borne viruses. While there were reported cases of needle sharing, and needle reuse, the overall figures are consistent with those of Plowright (1993). Plowright suggested that the low incidence of needle sharing is due to the fact that AAS injecting is not a social activity. Although this is probably an important factor, the present study indicates that it is not the sole reason, with only 65% of users in the present sample injecting alone. An additional hypothesis would be that the education strategies regarding safe injecting practices and free access to needles, syringes and other injecting equipment are effective in reducing risky injecting practices.

A further issue regarding injecting practices is the high incidence of specific site injections, such as those directly into the biceps and calf muscles. While many believe in the efficacy of specific site injections, in addition to the recommended safe sites of the buttocks, or outer thigh, very little research attention has been paid to this practice. The present study has indicated that it is a common practice and is certainly worthy of further research, if AAS users can be convinced that this often painful practice is unnecessary.

### 4.4.5 *Patterns of use*

As can be seen from the discussion of specific patterns of use, a great deal of variation exists among the AAS users regarding their patterns of use. Although there are similarities in the specific preparations used, the way in which they are used can vary dramatically: in the duration of use; amount administered each week; and other AAS used in combination. However, many of the AAS users who participated in this study do not simply administer the drug, go to the gym and wait for the benefits. In most cases there is often a thoroughly planned routine by which they will administer AAS, conduct their training sessions and control their diet; during many of the interviews with the first author, a number of participants referred to computer spreadsheets packages (or electronic organisers) detailing the day-to-day routine of AAS administration, training sessions, dietary intake, and body measurements throughout any given cycle.

Adding to the complicated nature of AAS administration, is the use of other drugs for the management of side effects and to assist with training. Many of these drugs have a number of risks attached to their use such as, diuretics and clenbuterol. The self-treatment of AAS side effects has been reported in other studies. For example, Friedl et al (1989) examined the self-treatment of AAS induced gynecomastia in four male users, concluding that neither an oestrogen inhibitor (antagonist), *mesterolone* (proviron) or human chorionic gonadotrophin (hCG) were successful treatments for this condition. In the present study, however, an oestrogen antagonist (*tamoxifen*) was the only drug used for specifically for this purpose, by 19% of the sample, with some self-reported success.

Many subjects reported using multiple AAS preparations, other drugs for training or side effects, and nutritional supplements. There are a number of possible adverse interactions between them, of which the users were largely unaware. While many of these substances are, taken alone, relatively harmless there is the potential of adverse interactions. There is a need for these interactions to be investigated in clinical settings and the appropriate harm reduction messages conveyed to the AAS users

Finally, the allocation of participants into either the LOW, MEDIUM or HIGH dosage group indicated that apart from the defining criteria, the amount of AAS used, there was little difference between the groups. While the maximum method (ie. the maximum dosage administered in any given week) was more likely to identify users as HIGH dosage users than the average method (ie. the average weekly dosage administered over the entire cycle), this did not significantly alter the profile of the

groups. Nevertheless, given the variation of AAS administered within any given cycle, it may be that the allocation to groups of this type may be more accurate using a method based on an average calculation than the extreme measure. One of the sub-groups who used significantly lower doses and for fewer cycles were the homosexual group. Despite using at this level, the gay group appeared to have been satisfied with the results they achieved.

## 4.5 Benefits and Side Effects Reported

### 4.5.1 *Benefits*

Unlike many other illicit drugs where the reported benefits are mainly psychological, and directly attributable to the drug effect; the same can not be said for the psychological benefits of AAS. The most important benefits reported by this sample were increased size and improved appearance. However this is not to say that psychological effects directly attributable to AAS are not possible. Mood swings and increased irritability were experienced by more than half of the sample, whose manifestations may indeed be attributable to the drug effect. Nevertheless, the more commonly reported psychological effects, such as increased motivation and confidence, appear to be more likely to be secondary to physical improvements.

### 4.5.2 *AAS related aggression*

One of the more highly publicised psychological or behavioural effects of AAS is increased aggression. In other studies investigating changes in aggression levels, contrasting results have been found when assessed on various psychometric measures (eg. Yates et al, 1992; Bahrke et al, 1992; Bahrke, Yesalis & Wright, 1990). In suggesting reasons for this disagreement, Yates et al (1992) point to the enormous variability that is seen in the individuals who have participated in the respective studies.

Nearly half of the participants in the present study indicated that their behaviour was more aggressive while using AAS. Based on the responses given by these subjects, AAS may be placing users closer to the point of aggression, thus less provocation is required to become angry and/or aggressive. This was also reflected in the subjects' descriptions of the 'roid rage'. One of the female subjects described her irritability and aggression while using AAS as not only a lowering of the threshold for anger but feeling more combative generally and lacking empathy for those she displayed aggression towards. This subject took the precaution of never physically disciplining her children while using AAS for fear of accidentally hurting them with her increased

strength or losing control and seriously injuring them. Although it is likely that some users do, and will always, abuse this greater propensity towards aggression, it is possible that such behavioural effects could be reduced through greater awareness of what is happening and strategies to assist in their management.

In support of this hypothesis, a series of controlled investigations involving non-human primates suggests that the "mechanisms underlying changes with AAS are not purely pharmacologic; it involves the interactive effect of the drug, personality and social factors" (Gregg and Rejeski, 1990).

'Roid rages' have become a topic of recent media and legal attention. To date little has been done to attempt to define the 'roid rage' and delineate its boundaries. While a number of the users in this study did not believe in the concept of `roid rages', the examples given by some have identified aspects worthy of further consideration. Firstly, the environment in which they occur are common areas where aggressive behaviour is manifested in the absence of AAS, namely, domestic situations and while driving a motor vehicle. Secondly, there is often an impulsive aspect where the rage is expressed without control, or a view to the consequences. Thirdly, the length of the 'roid rage' is often described as being short, suggesting that it may reflect the final action in a build up of tension and anger; conversely this could indicate a very sudden onset, without any sense of mounting strain. Finally, an external trigger is usually described. This trigger may be real or reconstructed to explain their behaviour. All of these factors provide some insight into this phenomenon and are suggestive of the need for further research into the aetiology and management of `roid rage'.

### 4.5.3 *Physical side effects*

While physical side effects were experienced across the board, many of the subjects were not reportedly experiencing serious problems. The low incidence of heart, liver, and kidney problems reported may be due to the fact that they require medical testing to identify and are longer term consequences of AAS use.

Regardless of the accuracy of self-reported symptoms of AAS use, the sample did indicate that the most likely deterrents to using AAS were health related, either from specific side effects or general ill health. With this in mind, there is the suggestion that this group of current users were not experiencing the side effects at a point that was causing them concern. Of the sample that had indicated that they were not planning to use again, most, although not all, of the reasons offered were due to a shift in priorities or ethical standpoint, retirement or lack of interest, and not because

of the negative side effects experienced. This certainly has implications for education strategies where a concentration on the negative side effects is used.

## 4.6. Dependence and Withdrawal

There is a considerable amount of research supporting the concept of AAS dependence (see Brower, 1993). A number of studies, using small sample sizes of male bodybuilders have examined this issue using the criteria set by the American Psychiatric Association (1987; 1994) in *The Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R; DSM-IV). The present study also used this criteria, identifying 13 subjects who met the requirements for dependence. In contrast, in a study of 49 AAS users recruited from gymnasiums in Michigan, U.S., 57% met the requirements for dependence (Brower et al, 1991). The lower rates of DSM IV dependence found in this sample may arise from the broader sampling base, gender mix and larger sample size of this study.

This study, however, demonstrated the first instance of anabolic-androgenic steroid dependence in a female using a variety of measures. This demonstration of dependence at relatively low levels of steroid use (lifetime use of 12, 6-8 week cycles usually of 5.5mg/week of Stanazol), with irreversible side-effects of deepening of the voice and clitoral enlargement, and reports of `roid rage' suggest particular caution should be exercised by women wishing to use AAS. This finding suggests that AAS may follow the pattern that is found with other drugs; that is the development of dependence at lower doses and in shorter periods of time among women than men (Hasin, Grant & Weinflash, 1988; Didcott, Reilly, Swift & Hall, 1997). Given the absence of research into women and AAS use, there is an urgent need for further investigation of this sub-group of AAS users.

Associated with dependence is the manifestation of withdrawal symptoms following cessation of use. The present study identified a number of symptoms that were mainly psychological, possibly reflecting a self-perceived reversal of some of the physical effects of AAS (ie. reduced size); a dissatisfaction with the body image, desire for more AAS and depression are examples of this kind. These findings highlight the importance and need for adequate psychological awareness on the part of the user, to prepare and deal with many of the withdrawal symptoms of AAS use.

## 4.7 Overview of the Study Objectives and Recommendations

### 4.7.1 P*atterns and reasons of use*

The first objective of the study was to identify patterns and reasons of use among subgroups of anabolic-androgenic steroid users. The sample appeared to fall into two main sub-groups: those who used AAS to improve their appearance (aesthetes), or to increase size and strength (athletes). Homosexual subjects appeared to be a sub-group of the aesthetes who began use at a later age, at lower doses and in the context of a poly drug using lifestyle. There was a large variation between users, however, that was not bound by the AAS user group that he/she identified with. While specific preparations used may be consistent across individuals, there were other variables that influenced the total pattern of use. These included the dosage management technique used, the duration of the cycle and the subsequent rest period, concurrent use of other AAS preparations within the same cycle, and the use of other drugs and supplements to assist with training or to manage, and/or to prevent, side effects.

While expectations regarding the effects of AAS were numerous and involve both psychological and physical effects, the main motivations to use were physically based and reasonable constant with time, although there is likely to be a narrowing of the focus as they get more experienced.

### 4.7.2 *Harms associated with anabolic-androgenic steroid use*

This sample reported a number of side effects associated with the use of AAS. While the most commonly reported were increases in appetite and sex drive, more problematic side effects such as: acne, high blood pressure and liver problems by both male and female participants; clitoral enlargement, facial hair and menstrual irregularities for women; and, shrinking testicles and gynecomastia for males were reported by a number of the subjects. In addition, many reported behavioural changes which were a cause for concern and replicate previous studies including mood swings, increased irritability and aggression, and depression. Further evidence for elevated aggression levels in AAS users is given by this study, with a number having reported experiencing a phenomenon they described 'roid rage'.

A number of activities that the AAS users in the present sample engaged in were potentially harmful, although there is no clear understanding of the effects of these practices at present. These include self-taught injection procedures; injecting specific muscles for localised muscle growth (calves, biceps); concurrent use of AAS (stacking) and use of high doses; use of other drugs such as clenbuterol, thyroxine, insulin and human growth hormone, nutritional supplements; and concurrent use of recreational drugs, both licit and illicit. These are all areas in need of further attention as there is little information dealing with these activities.

### 4.7.3 *Identification of gender differences*

The number of female AAS users who volunteered to participate in this study was low, although this is not dissimilar to other studies. While this may reflect the relatively low levels of AAS use among women, it may also be as a result of the heightened stigma associated with AAS use among women. The few women participating in the study did not discuss their AAS use with anybody else and were more likely to have accessed AAS through a medical practitioner. The women were particularly sensitive to the notion of using a drug that made them more like a man and that it was not consistent with the prevailing notion of femininity. The women were also conscious of the macho sub-culture of AAS use and body building generally and preferred to be injected with AAS by a medical practitioner than their trainer or male training peers. Women were also more likely to identify medical practitioners and medical texts as their preferred source of information on AAS.

As previously stated, the first documented case of AAS dependence in this study highlights the importance of further investigation of AAS use among women, particularly adolescent girls.

### 4.7.4 *Experience of adolescent AAS users*

There were only two adolescent participants in the present study. The low number of adolescents may represent their actual number in the AAS using population, or be as a result of the method of recruitment. Adolescent AAS needs to be studied where subjects are recruited in schools and juvenile justice settings, as their patterns of use may be more erratic and less structured than adult AAS use and training activities. As very little is known about the use of AAS by adolescents in Australia, it is not possible to identify the harms experienced by this group of users. It is hoped that future research will produce the knowledge and understanding to address the issue, which, given the risks identified earlier, such as the premature closure of epiphyses of long bones, is likely to present clearer methods for harm reduction and prevention.

### 4.7.5 *Identification of knowledge, attitudes and behaviours around harm reduction strategies for anabolic-androgenic steroid use*

As with any injecting drug user, safe injecting practices are very important in the prevention of HIV and other blood borne viruses. Confirming other studies in NSW (eg Plowright, 1994; and Stathis, 1994), AAS do not share or reuse injecting equipment, although there were the usual small number of exceptions. Whether this reflects an understanding of the reasons for safe injecting, or the availability of clean equipment is not clear. It is clear, however, is that AAS users were actively seeking information about aspects of their drug use. The most commonly used sources of information were friends, handbooks and magazines which were of doubtful

scholarship. The most preferred sources of information, however, was a well informed medical practitioner. This preference for the medical profession is interesting given the historical animosity between AAS users and the American medical establishment who, until recently, denied that AAS use had any benefits for the body builder. A further reason for the gap between most commonly used and preferred sources of information may be that medical practitioners are not systematically provided with accurate AAS data and are strongly discouraged by their professional bodies from prescribing AAS for non-medical purposes.
When asked whether they believed that medical practitioners should be able to prescribe AAS for other than medical purposes, many of those that said yes indicated that this would be safer and allow their use to be monitored. Many users were already being monitored by doctors

### 4.7.6 *Identification of appropriate health promotion and harm reduction strategies for anabolic-androgenic steroid users*

This study has highlighted a number of potentially risky behaviours this group of AAS engaged in including: specific muscles for localised muscle growth (calves, biceps); concurrent use of AAS (stacking) and use of high doses; use of other drugs such as clenbuterol, thyroxine, insulin and human growth hormone and nutritional supplements; and concurrent use of recreational drugs, both licit and illicit. These are also sub-groups of users for whom messages need to be specifically targeted. These include adolescents, women and gay men. There appears to be no problem with AAS users attitudes and behaviours regarding information seeking, therefore, health promotion and harm reduction strategies should be readily taken up by this highly motivated and largely well educated and socio-economically stable group.

The two main activities that should be undertaken are the development of a primary prevention pamphlet and a harm reduction booklet for current or potential AAS users. The primary prevention pamphlet on the harms associated with AAS use should provide a brief outline on what AAS are and contain particular reference to the premature completion of bone growth and virilization of young girls. The harm reduction booklet for current or potential AAS should provide accurate, balanced scientific findings on the pro and cons of steroid use; tips on how to use more safely e.g. safe injecting practices and use of bladders and managing withdrawal and dependence; and how to manage critical incidents when using hypoglycaemic agents such as insulin.

The study also identified the need for further research into AAS use for a number of groups. These include:

- a study of the anabolic-androgenic drug economy to identify potential supply side activities to reduce the levels of veterinary and counterfeit AAS on the blackmarket;

- research into the patterns of use and harms experienced by adolescent AAS users, with particular reference to the relationship between AAS use and delinquency;

- a survey of general medical practitioners to identify their levels of knowledge, attitudes, and prescribing behaviour with AAS and their preferred management techniques and sources of AAS information;

- a study of rural AAS use, particularly regarding agricultural products and harms associated with their use;

- a study of the experiences of women using AAS, particularly the development and management of dependence and aggression; and

- research into `roid rage', preferably with a prospective study of AAS users examining the patterns and correlates of aggression associated with their AAS use using matched controls of non-AAS users.

## 4.8 Study Design Limitations

A cross-sectional survey, that included a chain sampling component, of current anabolic-androgenic steroid users is limited in the type of inference that can be drawn from the study findings. This is particularly the case regarding the prevalence of AAS use among gay men, women and adolescents in the present study. As this study included a peer interviewer for the homosexual subjects that group *may* be significantly over-represented in this sample. While a random sample of the unknown population of AAS users is not feasible, this sample may well represent a group of satisfied AAS users and may, therefore, under-represent the level of negative effects on health and well-being of AAS users. As the selection criteria included only current users in the study, those dissatisfied users who had ceased use have also not have been represented. Finally, as the mean age of subjects was 29 years and average length of use was only four years this sample also may under-represent any long-term health effects of AAS use.

All of these limitations must be kept in mind in interpreting these data. Nonetheless, for all the imperfections of the methodology, this study provides one of the first

Australian data on AAS users employing a variety of recruitment methods and venues. These data also serve the role of generating hypotheses about the potential social, psychological and health consequences of AAS use that can be more rigorously tested in future research.

## 4.9 Conclusions

The present study of 100 anabolic-androgenic steroid users has identified them as a very discrete sub-group of illicit drug users. This sample of AAS users are more likely to be male, homosexual, in a stable relationship, well educated and in full or part-time employment than other groups of injecting drug users recently studied in Australia. This sample also had a substantially higher disposable income than the general Australian community, with only 27% earning less than $30,000 per annum. In common with other illicit drug users, however, in addition to the perceived benefits of the drug, they experience significant negative health and psychological effects of their AAS use. In a small, but important, proportion of AAS users this includes the development of problems with dependence and withdrawal and irreversible side-effects. This study also reported the first documented case of AAS dependence in a women using a variety of measures.

Although the majority of subjects in the study felt that the benefits of their AAS use outweighed any negative aspects of use, there were still significant numbers of side effects reported by the sample. These included irreversible side-effects in women of deepening of the voice and clitoral enlargement and nearly half of the participants reported that their behaviour was more aggressive when using AAS.

AAS users tend to be a very health conscious group who use low levels of other psychoactive drugs and engage in rigorous physical exercise and training on a regular basis. As subjects reported that the most likely deterrent to AAS use was health concerns these are an important issue to be discussed in harm reduction activities.

A number of activities that the AAS users in the present sample engaged in, however, were potentially harmful. These include self-taught injection procedures; injecting specific muscles for localised muscle growth (calves, biceps); concurrent use of AAS (stacking) and use of high doses; use of other drugs such as clenbuterol,

thyroxine, insulin and human growth hormone, nutritional supplements; and among the gay group in particular, concurrent use of recreational drugs, both licit and illicit.

The AAS user is actively involved in the seeking out of information that is relevant to their patterns of use, with the objective of increasing the benefits and reducing the side effects. Many users in this study expressed a desire to access a well informed medical practitioner as their most preferred source of information. The most common sources of information utilised, however, were not entirely reliable. There is much scope, therefore, for the improvement of harm reduction information to this eager group.

The present study has suggested a number of fruitful avenues for further research and intervention activities which will assist in the reduction of harm experienced by anabolic-androgenic steroid users.

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## 6.0 APPENDIX A (Consent Form)

## 6.0 APPENDIX B (Structured Interview)