

# Gym and tonic: a profile of 100 male steroid users

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## Abstract

**Objective**—To identify unsupervised anabolic steroid regimens used by athletes.

**Methods**—100 athletes attending four gymnasia were surveyed using an anonymous self administered questionnaire.

**Results**—Anabolic steroid doses ranged from 250 to 3200 mg per week and users combined different drugs to achieve these doses. Injectable and oral preparations were used in cycles lasting four to 12 weeks. Eighty six per cent of users admitted to the regular use of drugs other than steroids for various reasons, including additional anabolic effects, the minimisation of steroid related side effects, and withdrawal symptoms. Acne, striae, and gynaecomastia were the most commonly reported subjective side effects.

**Conclusions**—Multiple steroids are combined in megadoses and self administered in a cyclical fashion. Polypharmacy is practised by over 80% of steroid users. Skeletal muscle hypertrophy along with acne, striae, and gynaecomastia are frequent physical signs associated with steroid use.

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Keywords: anabolic steroids; drug regimens; polypharmacy; physical signs.

Anabolic/androgenic steroids can promote increases in muscular size and strength when combined with the appropriate training and diet.<sup>1-3</sup> Their use for this purpose is deemed unjustified by the medical profession because of numerous adverse effects. Despite this advice, athletes in sports where size and strength are paramount continue to use steroids, seeking a competitive edge. Indeed, up to 35% of athletes attending weight training gymnasia in the United Kingdom use anabolic steroids,<sup>4</sup> and 4% of males at a British college of technology admitted using these drugs.<sup>5</sup> The increasing number of published case reports also suggests that steroid users often present to medical practitioners. However, as a source of reference, documentation of these unsupervised steroid regimens is poor. This study provides a profile of 100 steroid users, revealing the drugs and dosages currently being used in the United Kingdom. Subjective side effects, withdrawal symptoms, and physical signs associated with steroid use are also identified.

## Methods

Athletes currently using weight training gymnasia in South Wales were chosen as the target

Table 1 Age distribution of steroid users

Age (years)	% of steroid users
16-19	10
20-24	27
25-29	36
30-34	14
35-39	10
40+	3
Total	100

population. A questionnaire was designed with a simple, easy to answer format, to obtain specific information from users of anabolic steroids (fig 1). A cover note accompanied each item providing additional information and assuring confidentiality and anonymity. Questionnaires were distributed to four privately owned gymnasia in three neighbouring counties, namely South Glamorgan, Mid Glamorgan, and Gwent. Permission was granted in each case from the gymnasium proprietor. Respondents were requested to seal completed forms in an envelope before depositing them in a collection box at the gymnasium reception area. The questionnaires were left for 14 days in each institution. It was evident at this stage that the self administered questionnaire would produce a self selected group and a degree of bias. This should not, however, affect the main objectives of the study.

## Results

The first 100 completed questionnaires were entered into the study. All responders were male and the age range is shown in table 1. Thirty three per cent were competitive bodybuilders and 67% recreational athletes. Twenty one per cent of the group had been using steroids for less than one year and represent "new" users. Sixty four per cent admitted a committed steroid use of between one and five years, and the remaining 15% had been using steroids for six to 12 years (table 2). A weekly steroid dosage of less than 500 mg was used by 50% of the athletes in this sample, while 38% used between 500 and 1000 mg per week, and the remaining 12% took in excess of 1000 mg weekly. Combinations of different anabolic steroids were taken to achieve such doses by

Table 2 Duration of steroid use

Duration (years)	% of users
< 1	21
1-2	13
2-3	26
3-4	15
4-5	10
> 5	15
Total	100

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Table 3 List of anabolic/androgenic steroids used (proprietary names in brackets)

Anabolic steroids	Androgenic testosterone esters
Nandrolone decanoate ( <i>Deca-Durabolin</i> )	Testosterone cypionate
Stanozolol ( <i>Winstrol</i> )	Testosterone propionate ( <i>Virormone</i> )
Methandrostenolone ( <i>Dianabol</i> )	Testosterone blend ( <i>Sustanon 250</i> )
Methenolone ( <i>Primobolan</i> )	Testosterone heptylate ( <i>Theramex</i> )
Trenbolone ( <i>Parabolan</i> )	Testosterone enanthate ( <i>Testaviron</i> )
Oxandrolone ( <i>Anavar</i> )	Testosterone undecanoate ( <i>Andriol</i> )
Oxymetholone ( <i>Anapolon</i> )	
Drostanolone ( <i>Masteron</i> )	
Boldenone ( <i>Equipoise</i> )*	

\* Veterinary steroid.

Table 4 Polypharmacy: drugs other than anabolic steroids used by athletes

Drug	% of users
Clenbutarol	70
Ephedrine	57
Human chorionic gonadotrophin	49
Tamoxifen	45
Growth hormone	12
Diuretics	22
Nalbuphine ( <i>Nubain</i> )	6
Insulin	2
Thyroid hormone	2
Aminoglutethimide ( <i>Orimeten</i> )	3
Esiclone	5
None	14

Table 5 Subjective side effects associated with steroid use

Symptom	% of users
Acne	54
Gynaecomastia	34
Striae	34
Testicular atrophy	40
None	12

the majority of users (88%). The lowest recorded weekly dose was 250 mg and the highest was 3200 mg. The duration of steroid administration (steroid cycle) was reported as follows: 4-6 weeks (28%), 8-10 weeks (39%), 12 weeks (33%). Forty eight per cent of the sample stated that their annual steroid use was less than six months, while the other 52% used steroids for more than six months each year. Three athletes admitted continuous steroid use for 52 weeks of the year. Table 3 is a complete list of the anabolic/androgenic steroids used by

the athletes in this sample. The most popular agents were intramuscular nandrolone decanoate (84%), testosterone esters (75%), and oral methandrostenolone (68%). Eighty five per cent used both parenteral and oral preparations, 11% used solely injectable preparations, and 4% used tablets only. Most self administered intramuscular injections were sited in the gluteal region, but the thigh and deltoid were also used.

Drugs other than anabolic steroids used by this group are given in table 4. The frequency of subjective side effects resulting from steroid use is shown in table 5; only 12% denied any adverse symptoms. Less frequently reported side effects included dyspepsia, exacerbation of asthma, and tendon rupture. Eighty eight per cent of users admitted withdrawal symptoms on cessation of steroid administration, with a reduction in muscle size and strength reported by 72%, and reduced libido by 33%.

The exact population size could not be determined accurately as attendance figures for the two week period in each gymnasium were not recorded.

## Discussion

Two broad groups of testosterone derivatives are used by athletes: anabolic agents are synthesised with reduced androgenic activity, whereas testosterone esters retain their full androgenic effect (table 3). Scientific studies have attributed gains in muscle size and strength to anabolic steroids, provided they are used in conjunction with an appropriate training programme and a high protein diet.<sup>1,3</sup> Even in the absence of such clinical data, 50 years of steroid use by athletes would imply a positive benefit.<sup>6</sup> The anabolic action of these drugs is mediated in two ways. An anticatabolic effect is achieved by minimising the catabolic action of corticosteroids released during stress (athletic activity). The second action is the maintenance of positive nitrogen balance by improving utilisation of ingested protein. Anabolic steroids also have motivating effects, inducing a state of euphoria and diminished fatigue, thereby enhancing training capabilities.<sup>2</sup>

Figure 1 Gymnasium user questionnaire

Please tick, delete or write answers where appropriate.

AGE \_\_\_\_\_ MALE/FEMALE \_\_\_\_\_ DO YOU COMPETE? \_\_\_\_\_

HAVE YOU EVER USED ANABOLIC STEROIDS? Yes \_\_\_\_\_ No \_\_\_\_\_

WHEN DID YOU FIRST START USING THEM? \_\_\_\_\_

WHICH STEROIDS DO YOU NORMALLY USE/PREFER?

Dianabol \_\_\_\_\_ Deca \_\_\_\_\_ Testosterone \_\_\_\_\_ Winstrol \_\_\_\_\_

Others \_\_\_\_\_

DO YOU USE: Tablets \_\_\_\_\_ Jabs/Injections \_\_\_\_\_

HOW MANY WEEKS DO YOU STAY "ON" STEROIDS? \_\_\_\_\_

HOW MANY WEEKS DO YOU TAKE "OFF"? \_\_\_\_\_

HOW OFTEN DO YOU USE STEROIDS EACH YEAR? \_\_\_\_\_

GIVE AN EXAMPLE OF YOUR TYPICAL COURSE/STACK:

\_\_\_\_\_ jabs of \_\_\_\_\_ every \_\_\_\_\_

\_\_\_\_\_ jabs of \_\_\_\_\_ every \_\_\_\_\_

\_\_\_\_\_ tabs of \_\_\_\_\_ every \_\_\_\_\_

WHERE DO YOU INJECT? Buttock \_\_\_\_\_ Thigh \_\_\_\_\_ Shoulder \_\_\_\_\_ Other \_\_\_\_\_

DO YOU GET ANY OF THE FOLLOWING?

"Gyno" \_\_\_\_\_ Stretch marks \_\_\_\_\_ Acne spots \_\_\_\_\_ Testicle shrinkage \_\_\_\_\_

WHAT HAPPENS WHEN YOU COME OFF STEROIDS?

Lose size \_\_\_\_\_ Lose strength \_\_\_\_\_ Reduced sex drive \_\_\_\_\_ Other \_\_\_\_\_

WHICH OTHER DRUGS HAVE YOU USED?

Ephedrine \_\_\_\_\_ Clenbutarol \_\_\_\_\_ Growth hormone \_\_\_\_\_ Insulin \_\_\_\_\_ HCG \_\_\_\_\_

Tamoxifen \_\_\_\_\_ Diuretics \_\_\_\_\_ Thyroid \_\_\_\_\_ Nubain \_\_\_\_\_ Others \_\_\_\_\_

Table 6 Examples of drug regimens administered by new and veteran steroid-users, and a typical precontest protocol. Approximate cost on the black market is provided in £ sterling

New user	Dianabol 25 mg/d PO	£40
	Nandrolone decanoate 100 mg/week IM 4 weeks	
Veteran user	Sustanon 250 mg/week IM	£140
	Nandrolone decanoate 200 mg/week IM 4 weeks	
	Testosterone propionate 300 mg/week IM	
	Stanozolol 150 mg/week IM 4 weeks	
	Tamoxifen 20 mg daily throughout course	
Competitive user	HCG 6000 mg at end of course 4 weeks rest period	£370
	Sustanon 500 mg/week IM	
	Nandrolone decanoate 200 mg/week IM	
	Dianabol 40 mg/d PO 4 weeks	
	Testosterone propionate 300 mg/week IM	
	Primobolan 300 mg/week IM	
	Clenbutarol 4 tablets (80 µg)/d + ephedrine 75 mg/d 4 weeks	
	Stanozolol 150 mg/week IM	
	Masteron 300 mg/week IM	
	Primobolan 300 mg/week IM Clenbutarol + ephedrine as above 4 weeks	

PO, orally; IM, intramuscularly.

#### ANABOLIC STEROID DRUG REGIMENS

Cyclical drug administration was practised by almost all the athletes in this study (97%). The steroid cycle was usually a period of between four and 12 weeks, and was guided by personal experience or anecdotal evidence. After this period, athletes reported a plateau in subjective benefits which might be explained by steroid receptor saturation and downregulation. Side effects also become more apparent with time, and toxicity may force termination of steroid administration. The time interval between steroid cycles is more variable. Regular users will allow a four to six week gap to "clear the system", whereas less frequent users may remain drug-free for months. This steroid gap appears to be influenced by a range of personal and financial factors.

Steroid dosages are also variable, as might be expected with unsupervised drug administration. In this sample, 50% of steroid users chose doses of less than 500 mg per week. Of the remainder, 38% use a weekly dose of between 500 mg and 1000 mg, whereas a smaller group (12%) of mainly competitive bodybuilders were using in excess of 1000 mg per week. Some athletes reported using 1 mg kg<sup>-1</sup> per day as a basic regimen.

Combining two or more different types of steroid was practised by 88% of the users in this sample. Steroid "stacking" affords larger doses and theoretical synergistic actions. Popular combinations used by this group include anabolic and androgenic agents, injectable and oral preparations, and long and short acting drugs. Individual steroid regimens were based on personal experience, information obtained by word of mouth from other users, or from various steroid handbooks.<sup>7-9</sup> Black market drug availability may also affect choice.

Examples of administration protocols are provided in table 6, which compares the regimen of a new user with that of a veteran user, and also shows the precontest drug protocol of a competitive bodybuilder. Veteran

users report using techniques such as loading doses and pyramidal dose tapering. Longer acting agents, for example Sustanon (a mixture of testosterone propionate 30 mg, phenylpropionate 60 mg, isocaproate 60 mg, and decanoate 100 mg), used in the initial weeks, are substituted by shorter acting drugs mid-cycle to prevent continued steroid action during the off-cycle. Steroids which, anecdotally, cause less water retention, for example Primobolan and Stanozolol, are chosen for precontest regimens.

#### POLYPHARMACY

Illicit drug use by the athletes in this study was not confined to anabolic steroids, and 86% admitted using other drugs for different reasons (table 4). This figure is greater than previous estimates,<sup>4</sup> and indeed the use of certain drugs listed below has not previously been documented in athletes. These "steroid accessory" drugs can be grouped according to their desired effects.

Non-steroid agents with anabolic properties include clenbutarol, growth hormone, and insulin. Clenbutarol is a  $\beta_2$  receptor agonist used by 70% of this group for its ability to stimulate protein deposition in skeletal muscle (so called "repartitioning agent"), and also for its thermogenic properties, which increase energy expenditure, thereby reducing body fat.<sup>10,11</sup>

Growth hormone is taken by a smaller number of steroid users (12%), probably because of its high black market price. One competitive bodybuilder reported using subcutaneous injections of 2 IU daily, which costs around £400 per month. Insulin, for example 1-2 units with meals, was also being used by two competitors for a supposed anabolic effect.

It appears that the athletes in this sample used steroids as their primary anabolic agent, with clenbutarol, growth hormone, or insulin being used as secondary anabolic drugs.

Ephedrine is a  $\beta_2$  receptor agonist used medically as a bronchodilator and vasoconstrictor sympathomimetic during anaesthesia. Fifty seven per cent of the athletes in this sample used ephedrine as a stimulant to aid athletic performance, and also as a thermogenic fat reducing agent.

Anticatabolic agents are also used to provide anabolic-like effects. Aminoglutethimide (Orimeten), used by 3% of the sample, is a steroid antagonist which preferentially blocks corticosteroid pathways, shifting the testosterone to cortisol ratio in favour of anabolism. The parenteral analgesic nalbuphine (Nubain) was used by 6% to relieve musculoskeletal pain and for a proposed "stress reducing" anticatabolic action. As with all morphine derivatives, however, repeated administration may cause drug dependence.<sup>12</sup>

Additional drugs are used before bodybuilding competitions to enhance skeletal muscle visibility. L-thyroxine (for example, 200 µg daily) may be used in the four to six weeks leading up to a contest to reduce the amount of subcutaneous body fat. Clenbutarol and ephedrine have thermogenic effects and are also

used for this purpose. Diuretics (for example, frusemide 20–40 mg) alleviate steroid induced water retention on the day of competition. Esi-clene (formebolone) is injected directly into a muscle belly, causing local inflammation and thereby temporarily increasing its size over a period of 24 to 48 hours.

Medication is also used to reduce side effects and minimise withdrawal symptoms associated with steroid use. The antioestrogen drug tamoxifen was used by 45% of the athletes in this sample to prevent or treat gynaecomastia. Human chorionic gonadotrophin (HCG) is used at the end of a steroid cycle to kick start suppressed endogenous testosterone production in an attempt to reduce withdrawal symptoms.

It is apparent that the use of certain drugs listed above for medically unsound reasons may be of more concern than the use of anabolic steroids. The unsupervised use of diuretics, insulin, thyroxine, clenbutarol, and nubain may precipitate a range of acute medical emergencies.

#### ADVERSE EFFECTS AND WITHDRAWAL SYMPTOMS

Numerous side effects have previously been associated with anabolic steroids, including liver enzyme derangement,<sup>2</sup> altered serum lipids, hypertension,<sup>13</sup> clotting abnormalities,<sup>14</sup> prostatic hypertrophy,<sup>15</sup> and behavioural changes.<sup>16</sup> Such effects are reversible on cessation of drug use, but may not be obviously apparent to the steroid user. The athletes in this study, however, frequently noticed subjective side effects including acne (54%), gynaecomastia (34%), striae (34%), and testicular shrinkage (40%). Even though such symptoms are common, they are usually considered minor and acceptable to the steroid user. Only 12% denied any steroid induced side effects. The striae are usually sited in the deltopectoral and axillary regions (fig 2). Case reports have also linked steroids with liver tumours,<sup>2</sup> myocardial infarction,<sup>17</sup> cardiomegaly,<sup>18</sup> tendon rupture,<sup>19</sup> and subfertility.<sup>20</sup> Injection site problems may also occur.<sup>21</sup>

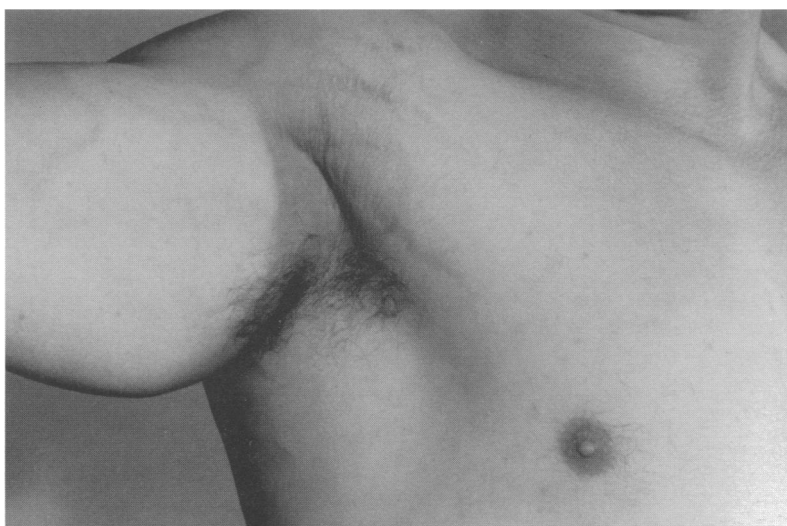


Figure 2 Steroid related deltopectoral striae.

Discontinuation of anabolic steroids can result in symptoms of withdrawal and dependence.<sup>22,23</sup> Seventy per cent of this group reported subjective loss of muscle size and strength with cessation of steroid use, and such dissatisfaction with body size and “reverse anorexia” represent potent psychological fuel for resumption of steroid administration.<sup>24</sup> Depression has also been associated with steroid withdrawal.<sup>23</sup> The androgenic actions of these drugs enhance sexual desire,<sup>25</sup> and as would be expected, drug discontinuation caused reduced libido in one third of this sample.

#### PHYSICAL SIGNS

Skeletal muscle hypertrophy and the triad of acne, gynaecomastia, and striae (fig 2) are physical signs present in one third of this group of steroid users. Indeed, combinations of these features appear in over 80% of this sample. Testicular atrophy may represent an additional sign of steroid use.

With 88% of steroid users experiencing steroid related side effects and 86% misusing other drugs, users may often have reason to seek medical advice. However, given its covert nature, an individual may not admit to unsupervised drug use. Identifying the physical signs of steroid use should arouse suspicion and direct the clinician to the source of the problem.

#### CONCLUSION

Medical practitioners should be aware of the patterns of anabolic steroid use, and of the other drugs used unsupervised to enhance athletic performance and body image. Recognising physical signs and making an appropriate drug inquiry will allow a more complete clinical assessment by the doctor confronted by a steroid user.

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