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The knowledge, attitudes and use of performance enhancing substances and supplements among male high school first- and second team athletes in the central metropolitan area of Cape Town, South Africa

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University of the Witwatersrand

Centre for Exercise Science and Sports Medicine

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Research Report

THE KNOWLEDGE, ATTITUDES AND USE OF PERFORMANCE ENHANCING SUBSTANCES AND SUPPLEMENTS AMONG MALE HIGH-SCHOOL FIRST- AND SECOND TEAM ATHLETES IN THE CENTRAL METROPOLITAN AREA OF CAPE TOWN, SOUTH AFRICA.

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Submitted in partial fulfilment of the requirements for the degree

MSc (Med) in Biokinetics

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DECLARATION

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This research report has been presented by me for examination in partial fulfilment of the degree Master of Science (Medicine) in Biokinetics.

Signed _____ Date _____

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ABSTRACT

Title: The knowledge, attitudes and use of performance enhancing substances and supplements among male High-school first and second team athletes in the metropolitan area of Cape Town, South Africa.

Objective: Pressure to perform and to achieve success is to many high school athletes the overbearing goal and reality. Many are willing to use substances to achieve their goals even at the expense of their health and wellbeing. Four objectives emanated from this research: To determine the most frequently used sport performance enhancing substances and supplements (PESS) by male high school athletes; to evaluate the prevalence and use of PESS; to determine the main sources of information on PESS to determine the knowledge and lastly to determine the perceptions and attitudes of male high school athletes on PESS usage.

Design: This study used a prospective cross sectional survey design. A self-administered questionnaire was employed to assess the participant's knowledge, perceptions, attitude toward and use of PESS. The selected sample was male athletes in high schools in the central metropolitan area in Cape Town that were involved in competitive sports at the first and second team level.

Results: One hundred and twenty two male athletes from four schools in the central metropolitan area of Cape Town participated. No serious PESS use was found. The main first choice of reported sources of information regarding PESS was pharmacists (21.3%), biokineticists (16.4%) and the internet (16.4%). The participants' knowledge, perception and attitude toward the use of PESS was found to be poor.

Conclusion: Most athletes reported to gather information from pharmacists (21.3%) and biokineticists which is encouraging since it is expected of these professionals to provide sound advice. It is suggested to create awareness among such professionals regarding use of PESS by this population and to incorporate organizations such as SAIDS and WADA as part of this dissemination of knowledge. The knowledge, perceptions and attitude toward PESS use by male high school athletes appears to be lacking thus indicating the need for more education on PESS.

CHAPTER 1 – INTRODUCTION

Due to the ever increasing pressure on high-school athletes to perform and the increased competitiveness of sports, many athletes are adding pharmacological agents such as performance enhancing substances and supplements (PESS) to their training and nutritional eating plans to achieve increased performance levels. [1] [2] Where sports participation was previously seen as recreational activity, it is now an intense environment for the adolescent athlete, placing high demands for performance in order to get drafted into professional sports before they graduate from high school or university. [2]

Very little research has been done in South-Africa regarding the use, knowledge and perceptions toward PESS of any population. [1] [3] Since high-school can be regarded as the breeding grounds for well-developed and balanced athletes, it would be deemed important to research this population and their use or knowledge about PESS to increase the information available in this area of study. [1] [3] We also know little about where adolescent athletes get their information regarding PESS from. It needs to be determined whether these sources the athletes utilise to gather information is evidence based and coming from the medical and dietary expert community or if they prefer making decisions based on infomation gathered from their peers. It could well be that adolescents also fall prey to mass media and strong advertisement by supplement companies to marketing their products. [1] [3]

The usage of PESS studies in high schools is limited and not comprehensive enough in order to implement proper educational programmes. [1] Exercise scientists and sports professionals are often considered as a resource to athletes with regards to the use of performance-enhancing substances. Such professionals therefore play an integral role in the education of athletes and hence knowledge is power. [4]

Background and brief motivation for this study

The prevalence of PESS use among scholars in the Central Metropolitan area of Cape Town, participating in elite sport is not known. Adolescents easily fall prey to mass media marketing strategies and promises of a conditioned physique if they “pop a few pills”. Mixed messages from

medical communities opposing the use of these performance enhancers versus the society's need for better and more spectacular competitions and performances confuse adolescents. Thus there is a definite need for educational information on these ergogenic aids to assist adolescents in making informed decisions. [5]

Schwellnus *et al.* [3] conducted a survey at 13 schools in the Western Cape in 1991, of the 1361 participants who completed the questionnaire 90.3% participated in sports whereas 9.7% were not sports participants. [3] A total of eight respondents from the total sample (N=1361) indicated that they used androgenic anabolic steroids (AAS). A significant higher prevalence of AAS use by male respondents was shown when compared to female participants, but no significant differences in the prevalence of AAS use were found between levels of sport participation or when compared to non-sporting participants. The researchers found the general knowledge about AAS in grade 12 learners to be poor. Respondents indicating use of AAS also indicated that they felt they were under pressure to perform well in sports whereas those indicating not using AAS did not report the same pressure to perform well. The researchers recommended a nation-wide investigation of this subject and that intervention programmes be instated to educate pupils, teachers, parents and coaches. The characteristics of the AAS user group of this research study are summarized in Table 1.1. [3]

Table 1.1 Summary of characteristics of AAS user group

Sources where AAS was obtained from	**No. Of users (n=8)**
School friends	3
Team friends	3
Gymnasium friends	3
Gymnasium owners/instructors	2
Pharmacists	2
Coaches	1
Reasons for using AAS	**No. Of users (n=8)**
Improvement of endurance	4
Improvement of strength	2
Increased aggression	1
Improvement of physical size	1

Main sports AAS was taken for	**No. Of users (n=8)**
Body building	3
Rugby	2
Karate	1
Weight lifting	1
Tennis	1
Subjective effects on sport performance	**No. Of users (n=8)**
Improved sports performance	7
Improved resistance to fatigue	7
Increased strength	6
Improved endurance	6
Improved size/appearance	5
Improved speed	4
Less prone to injury	3
Improved concentration	2
Negative side-effects of AAS	**No. Of users (n=8)**
Increased aggression	5
Increased appetite	5
Headaches	4
Increased sex drive	4
Increased hair growth	3
Deepening of voice	3
Nosebleeds	3
Increased acne	2
Nightmares	1
Stopped growing	1
Pins and needles	1

From Schwellnus et al. (1992). [3]

In the Western Cape, it is not known where scholar athletes who use PESS get their information on these substances from and whether their sources of information are medically sound and correct. [3] [6] [7] [8] It has been indicated that in some cases adolescents make decisions based on advice from friends, coaches, fitness advisors or the internet, instead of consulting a sports physician or nutritionist. [2] [5] [7] In their study Gradidge *et al.* [7] found that 30% of the high school athletes participating in their study (n=100), used PES on a regular basis and the majority of the PES users indicated that the internet was their main source of information (74%) Other sources of information reported in this study, included personal trainers (33%), information brochures (31%), newspapers (31%), pharmacists (24%) and television and their schools combined (23%). [7] Schwellnus et al. [3] found in their research based in Cape Town that senior high school pupils preferred obtaining AAS from their peers at school or from team mates or other gymnasium members, rather than from experts in the medical or pharmaceutical industry. [3] In a survey done by Kristiansen *et al.* [8] they noticed that Canadian University athletes reported health professionals and the internet as the information sources mainly used, while friends most often recommended they use supplements. Many of the students in the survey also indicated that they would like to receive more information about nutrition and supplements since they felt they had insufficient knowledge about supplements. [8] Other studies have indicated that some adolescent athletes do not seem to acknowledge or might even not be aware of the side effects and possible harm these substances may have on their bodies. [2] [5] [8]

In their study, van der Merwe and Grobbelaar [9] showed that it is possible to fail a drug test by using nutritional supplements. Due to the fact that nutritional supplements are legally available without prescription, it is assumed that they do not contain any prohibited substances, but in many instances this is not the case since supplements are not regulated. [9] [10] [11] [12] [13]

Misleading information is often gathered from the labels of supplements due to prohormone concentrations found in them which are not stated on the label, or which are different to those declared. [10] [13] Geyer *et al.* [10] looked at the extent to which labels on nutritional supplements worldwide were providing misinformation and found that 94 samples out of 634 samples (14.8%) tested, contained prohormones (prohormones of nandrolone and/or testosterone) which were not declared on the label. They reasoned that the low concentrations of anabolic steroids found in these supposed non-hormonal nutritional supplements were not added deliberately, but rather occurred due to cross contamination. Cross contamination easily occurs when a manufacturer does not comply with good manufacturing practices such as those expected from the pharmaceutical industry.

Contamination could easily occur during the processing and transportation of these supplements when tools are not properly cleaned after use. Chances that intended non-hormonal supplements may contain prohormones, not indicated on the label, become higher when the company manufacturing them also manufacture and sell prohormones. [10]

Performance enhancing substances are being used and will be used in the future, yet it is important to understand the athlete's knowledge and perception towards their use. [6] [8] The aim of this study was to ascertain first- and second team male athlete's usage and knowledge about PESS as well as the sources they use to gather information about PESS from. Further the study aimed to determine the athletes' attitudes and perceptions toward PESS, in high schools of the central metropolitan area of Cape Town.

Understanding adolescents' knowledge, the sources of information they use, attitudes and beliefs with regards to the use of PESS is important to be able to not only evaluate the prevalence of use in this population but then to be able to develop effective preventative interventions. [2] [5] [6] [8] [14] [15] [16] The best means of collecting such data is through the use of surveys.

Objectives and purpose of this study

The purpose of this study was to determine the prevalence of use of PESS by Cape Town male high school athletes participating in first team level sport and to evaluate the knowledge, perceptions and attitudes toward the use of PESS. Determining the most frequently used sport PESS and evaluating the main sources of information athletes' use was set as secondary objectives.

Four objectives were chosen for this study:

- To determine the most frequently used sport PESS.
- To evaluate the prevalence and use of sport PESS in five of the major sport codes by male high school athletes.
- To determine the athletes main sources of information on PESS used.
- To determine the knowledge, perceptions and attitudes of high-school boys on PESS usage.

Hypothesis

The researchers hypothesized that the use of PESS by male athletes in high schools in the Western Cape is high. It was further hypothesized that the sources of information they use would not be from medical experts in the medical or pharmaceutical industries, but would rather be from their peers and the internet. Lastly the researchers hypothesized that the athletes' knowledge and attitudes toward PESS would be poor.

Assumptions of study

It was assumed that all the participants would answer the questionnaire truthfully and honestly and that the information obtained is true for the sample tested. The respondents were made aware of the anonymity attached in filling in the questionnaire.

Definitions of terms and abbreviations

AAS

Androgenic anabolic steroids

ADAMS

Anti-Doping Development Management System – a web based coordination system

Anabolic

Tissue building effect

Catabolic

Breaking down into simpler parts

Central Metropolitan area of Cape Town

Geographical location within the city of Cape Town

Doping control officer (DCO)

Persons authorized by WADA to conduct testing and supervise the collection of blood and urine samples from athletes [17]

Elite school performers

High school athletes participating in the first teams for their school, or at national and or international level

Endogenous

Originating or produced within the organism or one of its parts [18]

Ergogenic aid

Any substance taken with the purpose of increasing athletic performance

Ergolytic

Pertains to any substance that impairs performance [18]

Ethics

Philosophy that deals with the distinction between right and wrong and with the moral consequences of human actions [18]

Exogenous

Originating or produced outside of the organism [18]

Gynecomastia

Excessive development of the male mammary glands, due mainly to ductal proliferation with periductal oedema, frequently secondary to increased estrogen levels [18]

Illicit drugs

Any drug or pharmacological agent that is not legal within the jurisdiction of South African law

Inadvertent doping

Non-intentional doping

Interpol

International Criminal Police Organization

IOC

International Olympic Committee

Nutritional supplements

Dietary supplement can contain vitamins, minerals, herbs and/or amino acids [6]

Pharmacological

Relating to pharmacology or to the composition properties and actions of drugs [18]

PES

Performance enhancing substances

PESS

Performance enhancing substances and supplements

Placebo

A medicinally inactive substance given as a medicine for its suggestive effect [18]

Prohibited substances

Any substance on WADA's list not permitted to be used by athletes

RADO

Regional Anti-Doping Organizations, that forms a part of WADA

SAIDS

South African Institute for Drug-free Sport

Stimulant

An agent that arouses organic activity, strengthens the action of the heart, increases vitality and promotes a sense of well-being; classified according to the parts upon which they chiefly act: cardiac, respiratory, gastric, hepatic, cerebral, spinal, vascular, genital etc. [18]

TUE Expert group

WADA's therapeutic use exemptions expert group, provides information to athletes on the legal use of medications for diagnosed illnesses and thus preventing inadvertent doping also ensuring that the International Standard for Therapeutic TUE is maintained and revised as needed, in accordance with the World Anti-Doping Code, and provides guidance to WADA to facilitate its TUE responsibilities, including the process of review and appeal [17]

Sportspersonship

The good attitude or behavior displayed by players of a game, in fairness, determination, winning or losing gracefully [19]

UNESCO

United Nations Educational, Scientific and Cultural Organization

WADA

World Anti-Doping Agency

CHAPTER 2 - LITERATURE REVIEW

Performance-enhancing substances and supplements defined

PES or ergogenic aids are any substance which is taken with the purpose of increasing athletic performance. [2] [20] [21] Three main categories of performance enhancing substances can be defined namely; illegal substances or those only available on prescription and which are banned by some or all sports (e.g. anabolic steroids and cannabis), legally available substances that are banned by some or all sports in general or in competition only (e.g. diuretics and beta-2 agonists), legally available substances that are not banned in sport (e.g. dietary supplements and caffeine). [14] [22] [23] The prevalence of the use of any substance from any of these three categories are important in this study since some of the dietary supplements available over the counter may contain substances that are illegal or that may put the health of the user at risk thus leading to inadvertent doping. [5] [6] [14] [20]

History of doping

Substances or supplements have been used by elite athletes since ancient times. [4] [6] [2] [21] Greek athletes believed eating mushrooms would provide them with power. Aztecs ate human hearts before battle or competition and in South America runners used cocoa leaves to increase their arousal. [2] [21] Post World War II, amphetamines were used to improve endurance and anabolic steroids were introduced as substance of choice to increase muscle mass and became especially common in sports such as weight lifting in countries all over the world. [2]

Due to the health-risk accompanying some of these PES and the fact that they have the potential to create an uneven or unfair sporting advantage, laws to halt the use of them started to arise. [4] When the Amateur Athletic Federation banned doping in 1928, they became the first international federation to enforce an anti-doping campaign. However, due to a lack in scientific knowledge and drug testing, these bans were futile. Years later, when an autopsy revealed traces of amphetamines in Danish cyclist, Knud Enemark Jensen, who died during a competition, it prompted the anti-doping movement again. In 1960, with dramatic advances in scientific techniques they were able to successfully implement drug testing. [4] Drug testing in organized sport was enforced for the first

time at the 1968 Summer Olympic Games in Mexico City. Ever since those Olympics, athletes found using any kind of performance enhancing substance or supplement would be banned by the International Olympic Committee (IOC) and stripped of their medals. [2] With the formation of the World Anti-doping Agency (WADA) in 1999 there has been more consistency with respect to testing methods and disciplinary actions internationally. [2] [17] [21]

Table 2.1: History of Doping Timeline

300 BC	Three men banned from ancient Olympics for eating mushrooms and animal proteins
1928	International Amateur Athletic Federation bans doping in sport
1960	Cyclist, Knud Enemark Jensen dies during competition, amphetamines found in autopsy
1966	International Cycling Union and Fédération Internationale de Football Association (FIFA) test for banned substances
1968	Mexico City Olympic games: IOC test for amphetamine use
1972	Munich Olympic games: Swimmer Rick DeMont tests positive for ephedrine
1973	Anabolic steroids now detectable through radioimmunoassay, gas chromatography and mass spectrometry tests
1976	Montreal Olympic games: Test for amphetamines, anabolic steroids and ephedrine
1980	Moscow Olympic games: Testosterone-epitestosterone ratio screen added to testing protocols
1984	Los Angeles Olympic games: Tests for beta-blockers and diuretics included Testing first four finishers in each event and others at random
1988	Seoul Olympic games: Screen for marijuana – but not officially banned Ben Johnson tests world record in 100m sprint but, tests positive for steroids and stripped of his gold medal
1990	Anabolic Steroid Control Act becomes law in United States Anabolic steroids placed on federal schedule of controlled drugs IOC bans Erytrhopoietin, but no reliable tests
1998	Police find prohibited substances among teams competing at Tour de France [17]
1999	World Conference on Doping in Sport in Lausanne, Switzerland: Creation of World Anti-Doping Agency recommended [17]

2000	United States Anti-Doping Agency (USADA) take over testing and sanctions of U.S Olympic Committee
	Sydney Olympic games: Blood and urine samples tested for erythropoietin
2003	Baltimore Oriole pitcher Steve Bechler dies of heat stroke, autopsy shows ephedra, caffeine and pseudoephedrine
	Tetrahydrogestrinone (THG) identified
2004	Food and Drug Administration announces ban on sale of ephedrine alkaloids and sale of androstenedione
2007	Floyd Landis tests positive for testosterone and is stripped of his 2006 Tour de France medal
	Marion Jones admits to taking designer drugs at 2000 Sydney Olympics and is stripped of her medals [24]

From Woolf (2005). **[4]**

The World Anti-Doping Agency

After several tragic incidents caused by doping in sport, especially in the world of cycling, the International Olympic Committee (IOC) decided to summon a world conference on doping. [4] [17] [25] The conference was held in Lausanne, Switzerland in February of 1999 and produced a declaration on doping in sport. It was this declaration which led to the formation of the World Anti-Doping Agency (WADA) in November of 1999, just in time to be operational at the 2000 Olympic Games held in Sydney, Australia. [26]

WADA originated with the vision to construct a doping-free sporting environment to athletes worldwide. Other activities include the production of scientific research, to educate, to develop anti-doping strategies and to monitor the world anti-doping code. The anti-doping code serves to match anti-doping policies in all sports and in all countries. It serves as an international independent agency and is funded by the IOC and governments of the world. [17] [27]

WADA has set priorities in their fight against doping in sport such as monitoring code compliance worldwide as well as cooperation with law enforcement agencies such as Interpol and UNESCO ensuring laws are in place to fight the production, supply and possession of doping substances.

The agency also endorses global research to find ways to enhance detection of doping substances and methods. Worldwide anti-doping coordination is also a priority and through their Anti-Doping Development Management System (ADAMS), which is a web-based system stakeholders can coordinate their activities with others. In order to promote the development of anti-doping strategies the agency facilitates the coordination of Regional Anti-Doping Organizations (RADOs) by pooling resources in countries' with limited anti-doping activities. They also place a great emphasis on education through different anti-doping education programmes and by reaching out to athletes at multi-sport events.

In short, WADA strives toward preserving the integrity and value of sport and youth, to promote equal participation in sport, and to act independently, professionally and without bias or influence from others.

WADA is governed by a 38-member foundation board, a 12-member executive committee and several other committees such as the education committee, ethical issues expert group, finance and administration committee, health, medical and research committee, prohibited list expert group, therapeutic use exemptions (TUE) expert group, laboratory expert group and gene doping expert group. The foundation board is the supreme decision-making body and delegates the management of the agency. There is an African regional office is in Cape Town and currently run by Director Rodney Swiegelaar and assistant Nathalie Bashala. [17]

South African Institute for Drug-Free Sport

On the South African front the South African Institute for Drug-Free Sport (SAIDS) was created in 1997 as a non-profit organization with the main aim of fighting doping in sport to ensure fair play and to govern an ethical culture within South Africa. [28]

Similar to WADA, SAIDS provides leadership in national anti-doping strategies for sport, develops and implements drug testing programmes for all major sporting codes in South Africa. The agency provides education and information on drugs in sport and consults and collaborates with other anti-

doping agencies worldwide to improve standards and practices in anti-doping campaigns. The Drug-Free Sport Act (Act no. 14, 1997) gives the institute jurisdiction to carry out drug testing across all sporting codes. [28]

The institution emphasizes the need to encourage drug-free sporting heroes that set a suitable example to the younger generation. [28]

Classes of prohibited substances and summary of their health risk effects

Anabolic Agents

The use of anabolic agents is prohibited at all times (in- and out- of -competition) by WADA. [26] These agents include Anabolic Androgenic Steroids (AAS) which can be found either as endogenous or exogenous substances. [26]

By taking AAS increases in muscle size, protein metabolism, collagen synthesis and therefore an increase in lean body mass, is seen even in the absence of exercise. [13] [29] They are even more effective when taken in conjunction with an adequate training programme and a diet high in protein and calories. [29]

Health risks for using AAS include elevations in liver function enzymes which could directly or indirectly lead to transient jaundice, structural lesions of the liver, blood-filled cysts and internal haemorrhage and/or hepatic failure. [29] [30] Health risks to the cardiovascular system include effects such as hypertension due to increased blood volume and fluid retention. Cardiac remodeling can occur due to an increase in septal thickness and left ventricular mass. [29] From a reproductive point of view the use of AAS causes a decrease in luteinizing and follical-stimulating hormones which causes decreased spermatogenesis. Gynecomastia occurs in males following long term AAS use and is irreversible. [29] Collagen fibril alignment is altered due to AAS use which along with an increase in muscle strength may cause increasingly stiff tendons to rupture. Further psychiatric syndromes have been identified in some AAS users showing mood changes of mania and or major depression and aggressive behaviour. [29]

Peptide Hormones, Growth Factors and Related Substances

Erythropoiesis-Stimulating Agents, e.g. erythropoietin (EPO); insulins; corticotrophins; growth hormone (GH) and platelet-derived preparations fall under the umbrella of peptide hormones, growth factors and related substances. [26]

The kidney produces the hormone erythropoietin (EPO) which stimulates bone marrow to produce red blood cells. Originally EPO was developed to treat anaemia associated with certain chronic diseases such as kidney failure. Professional cyclists in the 1980's were however the first to use EPO as an ergogenic aid. Many athletes died shortly after EPO became a popular ergogenic aid and although the death of these athletes cannot be exclusively linked to their use of EPO the suspicion is still there. Today EPO is still believed to be a drug of choice for endurance event athletes such as distance runners, swimmers and tri-athletes. [13]

Growth hormone (GH) is produced by the adenohypophysis of the pituitary gland and serves as an anabolic and lipolytic agent. Bone and cartilage growth and fatty acid oxidation is increased and the breakdown of glucose and amino acids are reduced by GH. The fact that it aids in muscle protein synthesis while at the same time it enhances the breakdown of fat to save glycogen reserves makes it an appealing hormone to take by some athletes. Like any other substance it is not without risk. Until 1985 human cadaver-derived GH was prescribed to children of short stature, but this increased the risk for contracting an infectious incurable and fatal brain-deteriorating disorder, Creutzfeldt-Jakob disease. [30]

Currently a synthetic form of GH is prescribed to treat GH-deficient children. Those who use GH as a performance enhancer run the risk of developing gigantism (in children) and adults run the risk of developing acromegalic syndrome. Other side effects include insulin resistance and possibly type II diabetes, water retention and carpal tunnel syndrome. [30]

Beta-2 Agonists

Beta-2 agonists ($ß_2$-agonists) are normally used by people suffering from asthma to relieve bronchospasm. $ß_2$-agonists have found their way on and off the prohibited list since 1972 due to the assumption that they could in healthy individuals potentially improve performance and thus give such athletes an unfair advantage. [31] Currently, all $ß_2$-agonists (except for Salbutamol and Salmeterol and Formoterol) are prohibited in competition for certain sports such as archery, golf,

motorcycling, shooting, skiing, wrestling, as well as some other sports. Salbutamol, Salmeterol and Formoterol by inhalation is allowed, however when either these substances are found in urine in excess of 1000ng/mL it will be seen as non-therapeutic use and the athlete will have to prove through a pharmacokinetic study that the abnormal result was the consequence of a therapeutic dose. [26]

In their review article Pluim *et al.* [31] looked at the effect of Beta-2 agonists and physical performance. They concluded that there were no significant effects found for this substance in the studies reviewed, on endurance, strength or sprint performance in healthy athletes. The evidence was very weak but only showed a positive effect on physical performance in healthy subjects. They concluded that since athletes with asthma currently have to apply for therapeutic use exemption with WADA (if Salbutamol, Salmeterol or Formetrol is found in their urine in excess of 1000ng/mL) and the fact that there is such a high prevalence of asthma in athletes and the low evidence for increase in physical performance, it is only costing unnecessary money to screen such athletes. [31]

Diuretics and other Masking Agents

Diuretics adjust volume and composition of body fluids by increasing the rate of urine flow and sodium excretion. They are prescribed in clinical settings to individuals suffering from hypertension and several other cardiovascular disorders. Athletes use diuretics for two major reasons, one being to excrete water for rapid weight loss (advantage in sports where athletes compete in weight categories such as boxing). Secondly they use diuretics as a masking agent to prevent the detection of other banned substances. The major health risks to the use of diuretics include the development of a fluid and electrolyte imbalance such as hyponatremia (abnormally low sodium concentration) and extracellular fluid volume depletion. This can lead to hypotension and circulatory collapse. Hypokalemia can develop, which is associated with cardiac arrhythmias, while hyperuricemia may cause gout. Diuretics also affect and alter the plasma low-density lipoprotein cholesterol (LDL) to high-density lipoprotein cholesterol (HDL) ratio negatively. Furthermore they have drug-to-drug interactions with several pharmacological substances and need physician prescription before they are used. [32]

All diuretics are prohibited in sport. There will be no therapeutic use exemption for diuretics and masking agents if an athlete tests positive for this along with another threshold level of an exogenous prohibited substance. [26] [32]

Stimulants

Stimulants are prohibited during competition and can be divided into non-specific stimulants such as amphetamine and cocaine; as well as specified stimulants which include substances such as adrenaline, cathine and ephedrine. [26]

Another stimulant which has been on the prohibited list before, but has been removed since 2004 is caffeine. Caffeine is well known for its stimulant effect and has been shown by Beaven *et al.* [23] to offer some benefit in training due to its anabolic effects on testosterone concentration. This benefit is however counteracted by the increase in cortisol causing a decline in the testosterone:cortisol ratio. Caffeine may serve as a performance enhancer in sports such as cycling, swimming and running and also has beneficial effects on resistance exercises. [23] When taken in high doses caffeine can cause symptoms such as restlessness, headaches, insomnia, elevated heart rate and blood pressure. It is also a strong diuretic and may affect thermoregulation in hot environments. Excessive caffeine intake can even lead to death (>150mg.kg body mass^{-1}). [30]

Narcotics

Examples of narcotics include diamorphine (heroin), morphine and pethidine. Most narcotics are prohibited during competition due to their ability to mask pain and ability to allow athletes to compete with musculoskeletal injuries even though they have no other ergogenic effects. [26] Narcotics which are allowed in competition include but are not limited to; codeine, tramadol and propoxyphene.

Cannabinoids

Cannibinoids are prohibited during competition. Both the natural (e.g. cannabis, hashish, marijuana, or dagga in South Africa) and the synthetic, tetrahydrocannabinol (THC) and cannabimimetics (e.g. Spice) are prohibited. [26]

One would not expect Cannabinoids to be considered as performance enhancers since their use is normally associated with motor- and cognitive disfunction and memory loss which are all thought to be undesirable for performance. However for athletes competing in extreme sports, the use of cannabis could positively contribute to muscle relaxation, reduction in anxiety and momentarily reduce fear by inhibiting previous negative or fear based experiences. Thus, for these athletes cannabis is deemed as a performance enhancer and was placed on the banned substances list in

2004. [33] Some athletes may choose to use Cannabis for its relaxation properties. For athletes who compete in multiple competitions over a short period, Cannabis could enhance their performance due to its propensity toward improving sleep and hence recovery. In other words, although athletes would not be expected to become chronic cannabis consumers or users due to its acute negative effect on sporting performance, the use thereof in their leisure time after competition, may improve recovery and thus performance at the next event. [33]

Glucocorticosteroids

Prednisone and Aldosterone are examples of glucocorticosteroids. All glucocorticosteroids are prohibited during competition phase. [26] Aldosterone is used as a masking agent as well as a diuretic. [19]

Alcohol

Alcohol is prohibited some in sports such as archery, karate, motorcycling and power boating during participation and competition. [26]

Beta-Blockers

Beta-blockers are prescribed to heart patients to treat high blood pressure and other cardiac conditions including angina, arrhythmia and tremor, by reducing heart rate and anxiety. The reduced heart rate contributes to limiting tremors and hence has an ergogenic effect on low-intensity sports and tasks requiring fine motor skills such as archery. [19] The use of beta-blockers, unless specified, are prohibited in-competition in sports such as archery, billiards, bowls, bridge, darts, golf, and shooting. [26]

Ethical issues and health risks

Humans thrive on competition, not only in sport but in all aspects of life including social life and business. Society pressures us into wanting to be the leader in our field, the best, and the winner. The end goal of any competition is also winning. Yet for some winning is the only true goal and something that they are willing to achieve at all costs. The aim or effect of most PESS is to increase performance, not to alter mood or cause euphoria. PESS was therefore developed with the goal of feeding our society's need for more spectacular sporting events. Like discussed in the history of

doping, this need is not new but has been seen since the ancient Greek Olympics. Sporting events aside, society also places high demands on physical appearance. Most males want to be muscular while females prefer to be thin and toned. This wish is further augmented by what we see on television, actors such as Jean Claude van Damme and Sylvester Stalone both sport perfectly chiselled muscular physiques while the likes of Demi Moore and Angelina Jolie are examples of thin beautiful actresses. Adolescents are very vulnerable to the pressures of society and might want to acquire physiques similar to that of these actors and actresses. Yesalis and Bahrke [34] names Arnold Schwarzenegger as an example in their paper. Schwarzenegger became a prominent bodybuilder and actor very possibly partially through doping and the use of AAS. Later he was named chair for the President's Council on Physical Fitness and Sports in America. This sent a very clear message that doping will reward you with fame. This message is the exact example which anti-doping campaigns are trying to fight against, but it is very similar to bringing a knife to a gun fight. Anti-doping campaigns are trying to educate the young through conferences and meetings where knowledge is disseminated. However, the only way this war could be won, is with the assistance of law enforcement. Society should learn that their actions have reactions and consequences. The use of banned substances on WADA's list is unethical because these substances provide an unfair advantage and can therefore be viewed as cheating. [26] [34] [35]

Various reasons exist why athletes would want to take PESS, these include but are not limited to pressures to keep up with competition through enhanced performance and for instance being able to train more intensively, due to a reduced recovery period. Masking the use of other substances they take in order to prevent them from being banned from sport. In sports such as boxing or judo, weight plays an important role and such athletes may choose to use diuretics in order to make a specific weight category. Endurance is vital in sports such as triathlon, cycling, and running and various performance enhancers exist to improve this. In golf, archery and other shooting sports B-blockers can for instance give the competitive edge in steadiness as well as a psychological benefit. [36]

Reasons why it is thought wrong to use PES can be categorised into four arguments; Pre-competition agreements, unfair advantage, harm to the athlete self, as well as social harm.
The first argument stems from the idea that the athlete is expected to have prepared themselves for participation in the competition in an ethical manner, which coincides with the moral basis of sport. This should in turn honour the integrity of the sporting community as well as the trust placed in the

athlete, by members of the public, watching them perform. Should the athlete then use PES secretly, it would be deemed as breaking this rule or law.

The last three arguments form the basis of justification for this first argument. One can not only disallow an athlete to use PES on the grounds that they are seeking to improve their performance, since this is the main aim or reason why they keep training and seek guidance from coaches and sport scientists. However, gaining an unfair advantage through the use of PES, specifically those on the banned list, is seen as illegal, thus they gain an edge over another athlete illegally. (36)

The last two arguments for banning athletes from using PES, stems from the possible harm they cause to themselves as well as others. Due to the secrecy of the use of PES, the manufacturing and medical testing thereof may be jeopardised, leaving one wondering about their safety for human consumption or use. In addition, because some athletes use this potentially harmful PES, it may pressurise other athletes to also use it to keep up with the competition, thus placing a larger pool of the athletic population at risk. (36)

One can also not exclude the public from these arguments in the sense that the public see athletes as role models. When athletes dope or use PES they are modelling to the public that it is a socially acceptable action and therefore many sporting fans are now also using substances which could be potentially harmful since their long-term use effects are not known. (36)

To elaborate further, like mentioned before, Cannabis is not normally seen as a PES, however its legal status in many countries force its position onto the banned substances list automatically (The cultivations, sale, possession and use of Cannabis is illegal in South-Africa, but it may be cultivated and transported legally in Switzerland. The use thereof is not legal in Switzerland, but it has been decriminalised.). Cannabis is also on the prohibited list due to it posing an eminent health risk when used during competition in high risk sports where it can impair the athlete's ability to make critical decisions and impair their vigilance and alertness. (33)

In China they have another ethical issue because the use of herbs and other substances from derived from animal sources is part of their history and their traditional Chinese medicine. For them, some athletes will use substances with a clear vision to win at all costs, while others might use it for medicinal purposes and then inadvertently test positive. Heavy punishment by law is in place for drug users, but there is no law to protect those who use substances for health reasons. (35)

Along with the use of substances arise questions of ethics and potential health hazards. The use of exogenous substances has grown in popularity and is not limited to athletes; numerous nonathletic individuals value their physical appearance so much that they too are willing to use these substances, with little regard to the possible negative health risks. Some may think that the use of exogenous substances would improve their physical appearance and consequently also improve their self-esteem. Adolescents may not understand or acknowledge potential health risks, or risk of inadvertent doping while using performance enhancing substances and supplements. [5] [10] [11] [14] [35] [37] This is further discussed under the adolescent PESS use problems section in chapter two.

Motivational models why athletes use performance enhancers

Donahue *et al.* [38] showed that different motivational models exist for athletes to use or not use ergogenic aids. [38] They proposed that intrinsically motivated athletes seek to satisfy their psychological needs and would therefore try to improve their performance without cheating (using ergogenic aids). For these athletes it is more important to improve their skill and technique than winning at all costs. They also showed strong sportspersonship orientations. The opposite is true for extrinsically motivated athletes. These athletes seek to achieve fame or to get other rewards. They do not focus on the game process but rather the outcome of the game or event. For them winning is everything, a result they are willing to pursue at any cost. These athletes showed low levels of sportpersonship orientations and this was for the first time positively associated with the use of ergogenic aids. [38] Adolescents are at higher risk of using such substances and supplements due to their sometimes extreme concern with their own body image, athletic skills and the need for peer acceptance. [5] [21] [39]

In an interesting article by McClung and Collins [40] they showed that the determining factor for performance was the athletes' belief that when using a substance or supplement it will have a positive effect on their performance. [40] Athletes were divided into four groups. The first group was told that they would receive a performance enhancing supplement, and really did receive it. The second group was also told they would receive a performance enhancing supplement, but received a placebo instead. The third and fourth groups were told that they are not receiving a performance enhancing supplement, but the third group did in fact receive the performance enhancing supplement and the fourth group received the placebo. Results showed that those who believed to

receive a performance enhancing supplement's performance were far better than those who did not believe that they received a performance enhancer. This is an important finding since it shows that developing a positive self-belief and attitude will affect the athlete positively. Thus coaches and parents should rather encourage their athletes to set realistic goals and expectations. Athletes should also believe in themselves as being superior athletes. It should be explained to athletes that improved performance associated with taking performance enhancing substances or supplements may not only be due to their pharmacological action, but rather due to their own belief in it. [40]

Possible motivating factors why adolescents may choose to abuse AAS may include poor academic performance, participation in sports requiring strength and power such as wrestling, football and athletics. If they participate in school-sponsored athletic programmes the need to use AAS might be even higher. The need to acquire an attractive physique quickly is also a popular reason for choosing to use AAS for a learner who perceives himself to be smaller than his peers. [29] [39]

Zelli *et al.* [41] investigated Italian adolescents' drive for muscularity and drive for thinness and compared these to their doping attitudes and doping intentions. They hypothesized that a strong drive toward muscularity and thinness would increase positive attitudes toward doping in both males and females in different levels of sport involvement. They collected two separate questionnaire based data from high school adolescents four months apart. They found highly significant differences between boys and girls such as boys reporting a stronger concern toward muscularity than girls. Although girls showed a greater concern toward thinness compared to boys this was not as strongly correlated to positive attitudes toward doping for girls. Level of sports participation influenced concerns toward muscularity in the sense that those who participated at a competitive level had a significantly stronger drive toward muscularity than those who did not participate. Boys also showed a significantly higher and more positive attitude toward doping than girls increasing the chances that they might use doping substances in future. [41]

In Sweden, Kindlundh *et al.* [42] investigated the risk factors such as socio-demographics and sporting activities associated with adolescent use of doping agents, specifically AAS. They administered a questionnaire to 2742 high school students. They found those at the highest risk for doping to be males who reportedly lived alone, were absent from school once or more per week, did strength training, used tobacco and alcohol more than once per week or those who used psychotropic substances.

Living alone at high school is not normal for high school adolescents. The researchers speculated that those who did, probably did so due to family problems or socio-economic status. Kindlundh *et al*. [42] did not find a correlation between doping and living in a larger city, although other studies have shown this. They did however find a strong correlation between bunking school at least once a week and the use of doping agents and even other risk behaviours such as using psychotropic drugs. They found however that reasons such as acquiring a more attractive physique, enhancing sporting performance or using because their friends do were still the main causative factors for doping rather than living alone or bunking school.

Those who did regular strength training were also at higher risk for doping. They found that strength training was not limited to body building or weight lifting athletes, but was also performed by those longing for an improved physique and larger musculature.

Lastly they found strong associations between the use of AAS and the use of cannabis oil, LSD, amphetamines and opiods, meaning that if the adolescent was using AAS he or she was at increased risk to use psychotropic drugs later and vice versa. [42]

In conclusion, competitiveness and pressure for success, a poor self-esteem and self-concept and sport deviance is discussed as the main motivating factors why athletes would use PESS. Athletes feel pressures to perform from their peers, spectators, coaches and parents. Self-concept can be divided into seven categories: social, religious, work, knowledge, physique, family and sport. Each individual will place more emphasis on one of these categories they deem as most important and satisfying in their lives. If sport is one of the emphasized aspects in their lives then failure to be successful in their sport may be perceived as humiliating and therefore the person will do anything to avoid failure even if it includes cheating. This is naturally very unhealthy thinking and athletes with such a self esteem should be identified and helped to find a more balanced outlook. Sport deviance can be categorized as positive or negative even though deviance, i.e. breaking rules, on its own sounds negative. For example someone performing a sport skill in an unconventional style or way could be considered as using positive sport deviance. When an athlete runs up behind his opponent and intentionally trips the opponent during play, in order to score a goal for example, it is seen as using negative sport deviance. If that athlete wanted to score a goal by running up behind the opponent and therefore running the risk of tripping his opponent it is seen as positive sport deviance. Some sociologists will argue doping which is a negative behaviour, as positive sport deviance due to the fact that the athlete is merely trying his best to be successful in his sport in response to the pressure to perform. [19]

Adolescent PESS use problems

Adolescent use of any PESS is disturbing since there is very little control and prevention of use strategies within this population. Very limited information about the prevalence of use of these substances among adolescents is available. [5] [6] [8] [14] [15] [37] Most of the studies done within this population group have focused on a single supplement such as the use of creatine or anabolic steroids. [6] [14] [15] For sports physicians this is problematic since they need accurate information with regards to efficacy, possible negative health risks as well as the prevalence of use among adolescents to counsel them in making informed decisions. [5] [6] [8] [14]

Metzl *et al.* [15] concluded in their New York city based study that the prevalence of creatine use in high-school athletes in grades 11 and 12 are approaching the levels of use reported by collegiate athletes (up to 28% collegiate athletes acknowledge using creatine). [15] They summarised a few possible reasons why adolescents might choose to use creatine. These included widespread advertisement of creatine through media such as the internet, television and magazines. Creatine is very easily obtainable, over the counter at pharmacies or even through internet order. Also, the use of creatine (and other performance enhancing supplements or nutritional supplements) is advertised as a safe and "natural" way to improve performance. The young athlete's mind is also much more susceptible to these aggressive promotions of a supplement. [15]

The largest problem with this growing number of creatine consumers in the adolescent population is that the safety of creatine use is still unknown and the use thereof is not recommended to those younger than 18 years. Metzl *et al.* [15] also speculated that adolescents who use performance enhancing supplements may later have a shift in attitude and then approve of using the more dangerous PES such as AAS. [15] This is similar to the "gateway hypothesis" proposed by Backhouse *et al.* [16] which will be discussed in more detail later.

In another study by Ray *et al.* [37] it was shown that of the 469 adolescent male athletes who partook in their study in Georgia and Tennessee, 106 (23%) were using creatine while only 2% of the female participants (n=205) used creatine. They reported that the percentage creatine use increased with age and grade. [37] Further it was reported by Ray *et al.* [37] that more than 40% of the survey participants used an incorrect loading method of which 70% were taking excessive doses and the rest were using doses below the recommended dose of creatine based on scientific literature. [37] This is happening whilst the long term effects of creatine use in adolescent athletes, is still unknown. [37] [15]

Woolf and Swain [43] investigated the use of AAS by high school athletes participating in American high school sports and the drug testing policies developed in the State of Texas. An AAS testing programme was authorised in 2007 after it was thought that too many high school athletes were using AAS. They aimed to test three percent of the estimated 742 341 high school athletes (20 000 – 25 000 athletes) each academic year, which would cost the state approximately $3 million per year. Public and political criticism followed when by 2009 only 19 positive tests were yielded from 45 193 tests. Three tests were unresolved and 137 were protocol positive (which includes violation of the AAS testing protocol through absence, refusal to participate or incomplete protocols). The programme faced serious budget cuts, but continued testing. The last reports produced less than 0.5% positive or unresolved outcomes (22 positive and 154 unresolved, out of 53 818 tests). Their AAS testing policy suddenly proved to be problematic due to this very low rate of AAS use. [43]

However, this AAS testing policy proved that even with a substantial budget they were still only able to test for 10 of the more than 40 varieties of AAS due to financial constraints. This was the first criticism on the testing protocol. Further it was found that urine sample collection did not always follow normal protocol procedure whereby the urine sample must be produced whilst the doping control officer (DCO) observes. This could allow the athlete to produce a fraudulent but clean sample. Lastly, this substantial budget was still not enough to test enough athletes, which prevents the accurate prediction of high school AAS use. Interestingly Woolf and Swain refers to self report studies which were conducted in 2010 and 2011 where the self reported use of AAS was higher than what was found through the AAS testing programme. These self reported use varied between 1.5% and 7.2%. [43]

Other substance abuse

In a study by Ford, [44] concerned with substance abusing college athletes it was found that male athletes were 54% more prone to binge drinking than female athletes. [44] His study showed that male athletes tended to use marijuana 26% to 28% more than female athletes and that these male athletes also used other illicit drugs 12% to 13% more than the female athletes. These results were significantly higher than non-athletes for both genders. Ford [44] was more interested in researching differences in drug and alcohol abuse of athletes competing in different sports and team affiliations

and found significant differences. He found that male hockey players and baseball athletes reported higher binge drinking episodes than runners or soccer players. The same trend was noticed for marijuana and illicit drug use. In females he noticed that soccer players were more prone to report binge drinking, marijuana use and illicit drugs. The runners, swimming and diving female athletes reported lower levels of binge drinking, marijuana use and illicit drug use. He therefore built on previous research indicating that athletes are at higher risk for substance abuse and connected this trend to sports participation and affiliation and peer pressure. Since athletes spend a large amount of their free time exercising their specific sport and thus spend more time with other athletes in their specific sport, the peer pressure to perform or to be socially accepted is so much higher. Therefore when the group or team does use substances as a norm, individuals may feel obligated to also use such substances. Ford [44] regressed that it seems plausible that some sports or teams may place more pressure on members to conform to this norm of using substances than will other sports or teams. [44]

In South Africa, there is also a lack of data on the use of other substances not related to sports performance such as alcohol, cannabis, tobacco and others. Peltzer and Cherian [45] found in their research among rural and urban secondary school pupils in the Northern Province of South Africa that the three most predominantly used substances; were alcohol, tobacco and cannabis. They found that urban students reported a higher percentage of use of tobacco, cannabis and amphetamines or other stimulants when compared to the rural sample. [45] The rural sample tended to use more alcohol, used snuff to get high and cocaine. They also compared their results (found in Pietersburg now Polokwane) to other studies done in Cape Town, Ilorin and Perth and found that the substance of choice for all four cities was alcohol, followed by tobacco (except in Perth where Cannabis was second) and then cannabis. [45]

Use of performance-enhancers internationally by elite athletes

Ben Johnson was stripped of his gold medal and world record after testing positive for the use of steroids at the 1988 Olympic Games. At other events later he simply did not achieve the times he did then and also tested negative for steroid use, which proves that the use of anabolic steroids does in fact work. [13]

China is seen as a strong competitor at all Olympic Games, since they rejoined the international sporting community and attended the 1984 Olympic Games in Los Angeles where they came fourth on the medal table after an absence of 32 years. When they competed in 1988 at the Winter Olympic Games, two female athletes tested positive and were disqualified. At the summer Olympics of that year four of their swimmers tested positive for banned substances. In 1994 history repeated itself when seven of their swimmers tested positive for dihysrotestosterone, and in 1998 a swimmer was caught with Human Growth Hormone at the Sydney airport and again four female swimmers tested positive. In 2000 just before the Sydney Olympic Games, seven rowers tested positive for banned substances leading to the exclusion of 30 athletes and coaches from the Olympic team. Two Chinese swimmers tested positive for anabolic steroids in 2002, one of which was part of the world-record-setting 4x100 freestyle team. Ma Junren, one of China's famous athletics coaches and six of his runners were excluded from the Olympic team along with 33 other athletes when their blood test showed suspicious results. [35]

Possibly one of the most well known doping cases involves American sprinter Marion Jones, who in 2007 was stripped of five of her medals that she won at the Sydney Olympic Games in 2000 after allegations made by Mr. Victor Conte against Jones for doping offences. She accepted a two year ban from competing in any athletic event in 2007. [24] [46]

Further an American sprinter, Kelli White, was stripped of her medals in 2004 after admitting to using tetrahydrogestrinone and erythropoeitin. [17]

Nicholas Delpopolo, an American who participated in the men's 73kg judo event at the 2012 Olympic Games held in London and placed 7th was disqualified after a urinary sample tested positive for a prohibited substance (11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid). Another disqualification for doping at the same Olympic games was in the Syrian camp when Ghfran Almouhamad tested positive for methylhexaneamine after placing 8th in heat two of the first round, in the 400m women's hurdles event. [46]

Use of PESS in South Africa by adolescent athletes

Gradidge *et al.* [7] found 30% (n=100) adolescents boys from Johannesburg high schools who acknowledged that they use Performance-enhancing substances (PES) on a regular basis. Figure 2.1

shows the performance-enhancing substances found to be used by this sample. Noteworthy, is the use of three banned substances by this sample with; 4% (n=100) using anabolic androgenic steroids, 5% (n=100) using growth hormone and 5% (n=100) using adrenaline also known as ephedrine.
In terms of non-prohibited supplements 57% were using caffeine supplementation, 32% were using creatine, 54% were supplementing with carbohydrates, 61% were supplementing with protein and another 61% were using vitamin supplementations. [7]

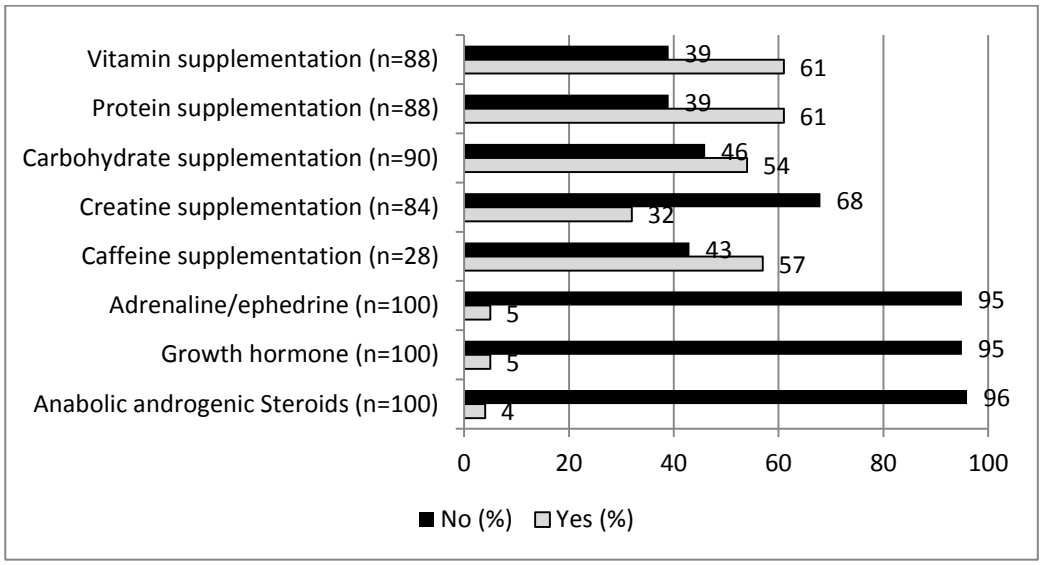


Figure 2.1: Prevalence of substances used to enhance performance (n=100).[7]

In another South African article by Gradidge *et al.* [1] they showed that 91% of the athletes who completed their questionnaire on the attitudes and perceptions toward PES in Johannesburg high school sport, believed that the use of PES in sport is on the increase and 84% of the athletes felt they were being pressured to use PES in order to win. [1] The most popular reason (68%) indicated for using PES was "it helps to improve the way I perform in sport", whereas 32% of the participants felt it will help to reduce food cravings and therefore decrease body weight, and another 29% indicated that they use PES to assist in coping with the stresses of sport. When asked whether they thought the use of PES was unfair, 32% of the participants agreed strongly, 29% agreed, 21% disagreed and 18% disagreed strongly. [1]

Peltzer and Cherian [45] hinted at the factors contributing to differences in the types of substances used by urban- and rural adolescents. Gauteng, and therefore Johannesburg is the economic heart of South-Africa, generating 33.9% of the Gross Domestic Product (GDP) in South-Africa. After Kwazulu-Natal (generating 16.1% of GDP), Cape Town follows suit at generating 14% of the GDP.

Even though Cape Town can by no means be classified as rural, it generates almost 50% less of the GDP when compared to Johannesburg, within South Africa.[47] Since the schools selected to participate in the Johannesburg-based studies and participated anonymously, there is no way to know from which part of Johannesburg they resided. Similarly schools from this study were not selected based on their sporting prowess or socio-economic status, but rather for their geographical position within the central metropolitan area in Cape Town and their willingness to participate. Although this research sample if too small to extrapolate the findings to represent Cape Town in general, we will assume that it is the difference in socio-economic status that drives the differences found between the Cape Town-based and Johannesburg-based samples.

Sports Illustrated [48], a national popular sports magazine, surveyed 110 rugby players from first teams, playing for 19 of the top Schools in South Africa and personally interviewed 18 of these players. Between managing with injuries, matches or pressure, the training was voted the toughest part of playing first team rugby by their respondents. All the respondents (N=110) with the exception of two were 18 years old or younger. Despite their young age, 63% of the respondents reported to be able to bench-press more than 100kg and 22% of them said they could bicep-curl more than 50kg. For such a young age, they flaunt great strength, almost equal to that of a matured adult male. They also reported that muscle bulk was one of the premium ways to survive the heavy demands of playing contact rugby.

The players who were interviewed personally (N=18) unanimously thought there was major problems with PES use among schoolboy rugby players, even though only four positive doping cases were reported during the 2011 Craven Week where 47% of all the players were tested. In reaction to this, one of the interviewed players said: "*We need more testing, obviously. The guys take heavy stuff. It's a size issue and it's not fair for the guys who don't take stuff."* Similar statements were made by the other players who were interviewed personally.

From the surveyed sample (N=110) 67% of the players reported to know of other schoolboys who used PES or doped for recreational reasons while 57% said they know of other players who used PES specifically. The PES of choice reportedly used by other players was steroids (37%) and stimulants (not quantified). A total of 17% (from the 110 surveyed) admitted to have used PES before, while 25% of them said they used recreational drugs and alcohol. Most of the 110 players that responded hoped to play professional rugby after school and 69% thought they played well enough to one day be included in the Springbok team. Almost the whole sample (96%) hoped to go to university or college even though 53% thought rugby was negatively affecting their school work. [48]

In a longitudinal South-African study it was shown that the use of banned substances in sport in South-Africa is on the increase. Urine samples (N=2066) were obtained at 17 different sporting events over a duration of six years and in the first year of testing (1986) 5.3% of samples tested positive for banned substances, in the following year (1987) it dropped to 3.7%, but thereafter it went up to 5.2% of samples testing positive in 1988, 5.5% in 1989, 5.6% in 1990 and 5.9% of samples tested positive in 1991. The researchers concluded that it is necessary to continue monitoring the use and abuse of drugs in sport since even though they attempted to educate competitors, coaches and doctors about the dangers of banned substances there still was no decline in the use of these banned substances during their study period. [12]

Performance enhancing- and Nutritional Supplements

Nutritional supplement sales increases yearly and it is a multibillion dollar industry. [14] [20] This increase in supplement production and sales correlates directly with increased supplement use among athletes of all ages. [2] [13] [20] Adolescent athletes may not hold negative beliefs about the appropriateness of the use of such substances. [5] [14] Dietary supplements are manufactured and marketed freely with minimal requirement or regulations and are available from many health stores or other retailers. [6] [10] [11] These days, most if not all dietary supplements and PES can be ordered from the internet as well. [2] [8] Dietary supplements are said to contain one or more of the following ingredients: vitamin, a mineral, an herb, an amino acid, all of which intended to supplement the diet. They may be found in the form of capsules, powder, soft gels, gel caps etc. These substances are consumed to maintain general health, increase muscle mass and in some cases to improve athletic performance. [6] [10] [11] [14] [20] [22]

Popular performance enhancing supplements include but are not limited to agents such as glycerol, medium chain triglycerides, branched chain amino acids, L-tryptophan, chromium picolinate and vitamins. Other amino acids such as arginine, ornithine, lysine and glutamine are also popular. [13]

There is a large problem concerning the use of nutritional supplements because supplements are not under such strict control. [5] [10] [11] [22] Some supplement products have been tested and have been shown to contain potentially risky substances or impurities such as lead, broken glass or animal

faeces due to poor manufacturing procedures. In a study done by Geyer *et al.* [10] they show that almost 15% of 634 different supplements purchased in various countries in 2000 and 2001 contained varying levels of anabolic steroids that was not indicated on the supplement's label. The presence of these unlabelled prohibited substances pose a definite problem to athletes using these supplements, since it would almost certainly lead to them testing positive unintentionally for banned substances. [9] [10] [11] [22] Thus it is of utmost importance for athletes to use safe supplements and to seek assurance that the quality of the supplement is indeed that what the manufacturer claim on the label. [9] [10] [11] [22]

Aside from the concern about inadvertent doping due to the use of nutritional or performance-enhancing supplements, comes the concern that the use of supplements might later shift adolescent athletes' attitude toward thinking that the use of PES will also be acceptable. Backhouse *et al.* [16] found support for a "gateway hypothesis" in their research among competitive collegiate athletes. This hypothesis supports the notion that the use of nutritional supplements (or other "soft" drugs such as cannabis and alcohol) could increase their risk toward transitioning to PES (or other "hard" drugs such as steroids or even cocaine and LSD). Between non-users and regular nutritional supplement users, significantly more of the supplement users reported that they doped (22.9% vs 6% doping in the non-user sample). A more postitive attitude toward the use of PES was found from the supplement user sample. They were more in favor of using PES when a senario was given that PES was effective and would increase their chance of winning. [16]

In a study done by Kristiansen *et al.* [8] they reported that 51% of the male University athletes and 42.7% of the female athletes used a protein supplement, while only 23.3% of the male control group (non-athletes) and 16.6% of the female control group used protein supplements. The male athletes gave enhanced recovery and greater muscle strength as reasons for using protein as a supplement. [8]

In another study by Morrison [49] the use of dietary supplements among people who exercise at a commercial gym was investigated. Participants completed a survey concerning their age, gender, education, employment and health status as well as the type of supplements they use and the reasons for using. Their sample was divided into three age groups; group 1: participants were 18 to 30 years old, group 2: participants between the ages of 31 to 45 and group 3: were 46 years or older. It was found that those in the younger age group consumed creatine more frequently while those in the older groups consumed multivitamins and mineral supplements more regularly. The six main reasons provided for using supplements included; to build muscle (49.1%), to prevent future illness (38.4%), to increase energy (36.1%), to improve sporting performance (24.4%), to gain strength

(22.4%) and to aid in recovery (20.5%). When participants were grouped by age the reason for taking supplements varied significantly. The youngest group took supplements to build muscle and to gain strength when compared to the oldest group. While the oldest participants preferred to take supplements to prevent future illness or disease when compared to their younger counterparts. Participants were also asked where they gathered their information regarding the use of supplements. The majority of the participants indicated they chose magazines (65.8%), family or friends (63.1%). Other options for sources of information included; staff at a health food store (55.7%), books (54.5%), the media (45.5%), and personal trainers (38.7%). Interestingly the smallest percentage participants chose to go to their physician for advise on the supplements they use (33.8%), or to their dietician (28.4%) or pharmacist (17.1%). [49]

CHAPTER 3 - RESEARCH DESIGN AND METHODS

This chapter will discuss all topics concerned with the research design and methodology that was followed to execute the research. Topics concerning the selected population to participate will be discussed under the following headings; site of study, study population, sampling, recruitment of subjects and the inclusion and exclusion criteria for participation. Ethical considerations will then be described followed by the topics concerning data which are; data collection methods, tools and instruments and finally data analysis. The questionnaire; letters to principals, -parents and guardians and the athletes as well as the permission letter from the department of education can be found attached to this research report as addendums.

Research design

This prospective cross sectional survey study employed a validated questionnaire (Addendum A) in order to assess the male high school athlete's knowledge, perceptions and possible personal use of PESS. [(1)]

Site of study

The study took place at selected high schools in the central metropolitan area of Cape Town, South Africa.

Study population

Only male athletes participating in the first and second teams for their schools in one of the following sports codes namely: rugby, cricket, soccer, hockey, athletics and swimming from selected high-schools in the central metropolitan area in Cape Town that were willing to participate, were invited to participate in this study. The participants' ages ranged from 15 to 19 years of age in this sample.

Sampling

The selected sport codes include rugby, cricket, soccer, hockey, athletics and swimming. All the high schools in the central metropolitan area in Cape Town were searched on the Department of Education's website where 90 schools were found. Forty-seven high schools were randomly selected out of this sample. Four monastic boys' schools in the area was automatically selected to participate, therefore their inclusion in the sample was not random selection, however not all of these schools opted to participate.

Recruitment of subjects

With the Department of Education's consent (Addendum E) to admit the questionnaire in schools, appointments were made with the principals of the schools to explain the study and seek their permission to volunteer to participate in the study (Addendum B).

Once the principals of the selected high schools gave permission to conduct the survey at their schools, the first and second team participants of the selected sports were invited to participate in the study. Those who volunteered were given an information sheet and informed consent form (Addendum C) which was signed by their parents or guardians. The volunteers were given a child assent form (Addendum D) to sign showing their agreement to participate. Participation in this study was entirely voluntary and participants were allowed to withdraw at any point in time.

Inclusion and exclusion criteria

Athletes had to be male and must have been participating in their sport for at least six months at first- or second team level to be included in this research survey.
Those who have not been competing in their sport for at least six months at first or second team level were excluded from this study.

Ethical concerns

Ethical clearance to admit the questionnaire in schools was granted by both the Human Research Ethical Committee of the University of the Witwatersrand, Johannesburg and the Western Cape

Department of Education (Addendum E). Forty-seven schools in the central metropolitan area of Cape Town, South Africa were randomly selected and contacted via email and telephone and a letter of information (Addendum B) was provided. This briefly described the purpose of the study and asked for permission to be granted to conduct the research at their school. Only four schools elected to participate in the research study. Each of the schools principals and sport administration staff were contacted and arrangements were made to distribute the questionnaires (Addendum A) at a convenient date and time. Minor assent (Addendum D) and parental informed consent forms (Addendum C) were then distributed to willing male first and second team athletes. The main sporting codes that were looked at included rugby, cricket, soccer, hockey, athletics and swimming, but athletes participating in other sporting codes (such as karate and water-polo) were also allowed to participate. After minor assent and parental consent were obtained each participant completed a questionnaire. Participation in this study was entirely voluntary and participants were allowed to withdraw at any time. Upon completion the questionnaires were given to the researcher to ensure confidentiality.

Data collection methods

A questionnaire (Addendum A) was administered in order to assess the athlete's knowledge, perception and possible personal use of performance enhancing substances and other supplements.

Tools and instruments

The questionnaire (Addendum A) comprised of four sections. In section one, background information on the athlete was gathered regarding his age, grade and sport that he participates in. In section two, information about perception and knowledge of prohibited substances was gathered. Questions were structured to include the participants' thoughts on ethics, the perceived prevalence of substance use, and awareness of possible punishment for doping offences in sport and sources used to gather information about doping in sport. In section three the participant currently using PESS was asked reasons for using, frequency of use and which substances he is or used to be using. The last section was concerned with the participants' attitude toward doping in sport. Here the participant ranked the degree to which he agreed or disagreed with sport related statements such as "There is a problem of banned substance use in my sport", "There are too many athletes using

substances in my sport to enhance their athletic performance" and "The use of performance enhancing substances and supplements has risen in the last five years".

Data Analysis

The collected data was group analyzed through inferential and differential statistical methods.
Data was captured into a computer based excel spreadsheet for analysis. Data was analysed by the statistical program GenStat®. [50]

Means, standard deviations, frequencies and percentages were computed. A significance level of $p = 0.05$ was used to indicate significant differences between groups.

Since survey data are mainly categorical the data was therefore summarized by 2-way or multi-way tables of counts per category, which was analyzed using the Chi-square test for proportions. For example, how many boys of each grade have indicated that they do use supplements? [50] [51]
When a sample of individuals may be classified according to two attributes the result is a two-way frequency table known as a row x column contingency table. [51] The χ^2-test is suitable for analysis of categorical data. [50] Significance was set at the 5% level ($p<0.05$).

Row by column χ^2-tests was applied to test for differences in proportions between grade 9 and 10, and grades 11 and 12 learners (two grades grouped together for more reliable testing). Spearman's rank correlation coefficient was used to determine if responses to different questions are related. [50] [51] The Mann-Whitney (or Wilcoxon) U-test was used to test for differences in means between any two responses of interest. [50] [51]

CHAPTER 4 – RESULTS

This chapter will present all the results found in this study in the form of tables and figures. The results will be presented under headings such as demographic data; sports participation; general perception and knowledge of prohibited substances; reported sources of information regarding PESS; substance use; questions raised by athletes; supplement use and lastly attitudes toward doping in sport.

Demographic data

Four schools from the central metropolitan area in Cape Town participated in this study, a total of 122 (N) competitive male high school athletes participated. The respondent athletes ranged from 14 to 18 years of age.

TABLE 4.1 RESPONDENTS PER GRADE

Grade	Total respondents per grade	Percentage respondents per grade (N=122)
9	14	12%
10	42	34%
11	31	25%
12	35	29%
Total	**122**	**100%**

Table 4.1 shows the total respondents per grade. The majority of respondents were in senior grades with 34% in grade 10, 29% in grade 12 and 25% in grade 11. The minority respondents were represented by juniors in grade 9 at 12%.

Sports participation

Table 4.2: SPORTS PARTICIPATION PER GRADE														
Sport	**Rugby**		**Swimming**		**Athletics**		**Hockey**		**Soccer**		**Other**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gr. 9	0	0	0	0	3	21	7	50	0	0	4	29	14	100
Gr. 10	14	33	5	12	2	5	6	14	0	0	15	36	42	100
Gr. 11	13	42	4	13	0	0	6	19	2	7	6	19	31	100
Gr. 12	9	26	3	9	2	6	16	46	0	0	5	14	35	100
Total	**36**	**30**	**12**	**10**	**7**	**6**	**35**	**29**	**2**	**2**	**30**	**25**	**122**	**100**

Table 4.2 shows the chosen five major sports that athletes from each grade participated in. The majority of respondents participated in rugby (30%) followed by field hockey (29%) and then other sports (25% - see table 4.3).

Table 4.3: PARTICIPATION IN OTHER SPORTS														
Sport	**Not indicated**		**Water-polo**		**Touch rugby**		**Cycling**		**Squash**		**Basketball**		**Total participants**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gr. 9	11	79	1	7	1	7	0	0	1	7	0	0	14	100
Gr. 10	41	98	0	0	0	0	1	2	0	0	0	0	42	100
Gr. 11	28	90	1	3	0	0	0	0	0	0	2	7	31	100
Gr. 12	32	91	3	9	0	0	0	0	0	0	0	0	35	100
Total	**112**	**92**	**5**	**4**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**122**	**100**

Table 4.3 above shows the participation in other sports. Unfortunately most of the respondents (92%) that indicated that they participated in another sport, did not indicate which sport they

participated in, regardless of them being asked to do so. The other indicated sports included water polo (4%), basketball (2%), touch rugby (1%), cycling (1%) and squash (1%).

General perception and knowledge of prohibited substances

Section two of the questionnaire asked questions regarding the athlete's general perception and knowledge of prohibited substances.

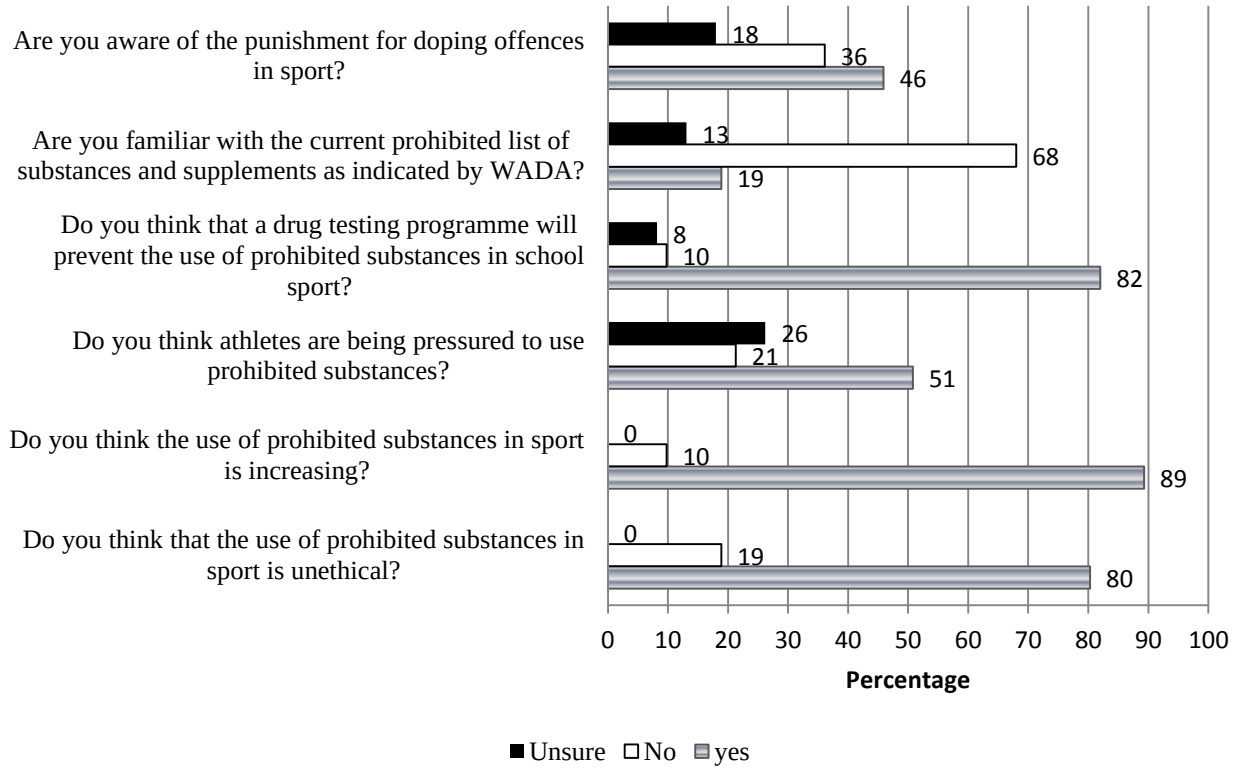


Figure 4.1: General Perception and knowledge of prohibited substances

Figure 4.1 summarizes the questions that were asked regarding general perception and knowledge of prohibited substances. It can be seen that few of the participants were aware of the punishments for doping offences in sport, as only 46% of the participants responded yes. The majority (68%) were not familiar with the prohibited list of substances available from WADA. Most (82%) thought that a drug testing programme would prevent the use of prohibited substances in school sport. Half (51%) of the participants thought athletes are pressured to use PESS, while 21% did not think so

and 26% were unsure. The majority (89%) thought the use of PESS is increasing and also thought that its use unethical (80%). Non-responses were not included in this graph.

Chi-Square tests for proportions were performed on the different questions regarding athlete's perception and knowledge of prohibited substances. Chi-square testing produced a non-significant result ($\chi^2 = 0.11$; p=0.739; d.f = 1) for the question "do you think the use of prohibited substances in sport is increasing?". In a later statement: "the use of performance enhancing substances and supplements has risen in the last five years" the Chi-square test for proportions still produced a non-significant result (χ^2=1.56; p=0.459; d.f = 2). However, when comparing these two statements with each other using a one-way chi-square testing for equal proportions on the response for all learners it showed significance ($\chi^2 = 19.03$; $p < 0.001$*; d.f = 2).

Chi-square testing also showed significance for the question: "Do you think athletes are being pressured to use prohibited substances?" ($\chi^2 = 4.30$; $p = 0.038$ *; d.f = 1).

Table 4.4: "Do you have any knowledge of how the substances that you are using function?"

	No answer		**Yes**		**No**		**Unsure**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gr. 9	11	79	2	14	1	7	0	0	14	100
Gr. 10	33	79	5	12	1	2	3	7	42	100
Gr. 11	19	61	11	6	1	3	0	0	31	100
Gr. 12	27	77	6	17	1	3	1	3	35	100
Total	**90**	**74**	**24**	**20**	**4**	**3**	**4**	**3**	**122**	**100**

Table 4.4 summarizes the participants' knowledge of how the substances, they indicated to be using, function. Most participants did not provide an answer (n=90, 74%). Of those that did respond to the question, the majority indicated that they did know how the substances worked (n=24, 20%). One-way chi-square testing was performed for this question and it showed a highly significant result (χ^2= 25.0; $p < 0.001$*; d.f = 2).

Reported sources of information regarding PESS

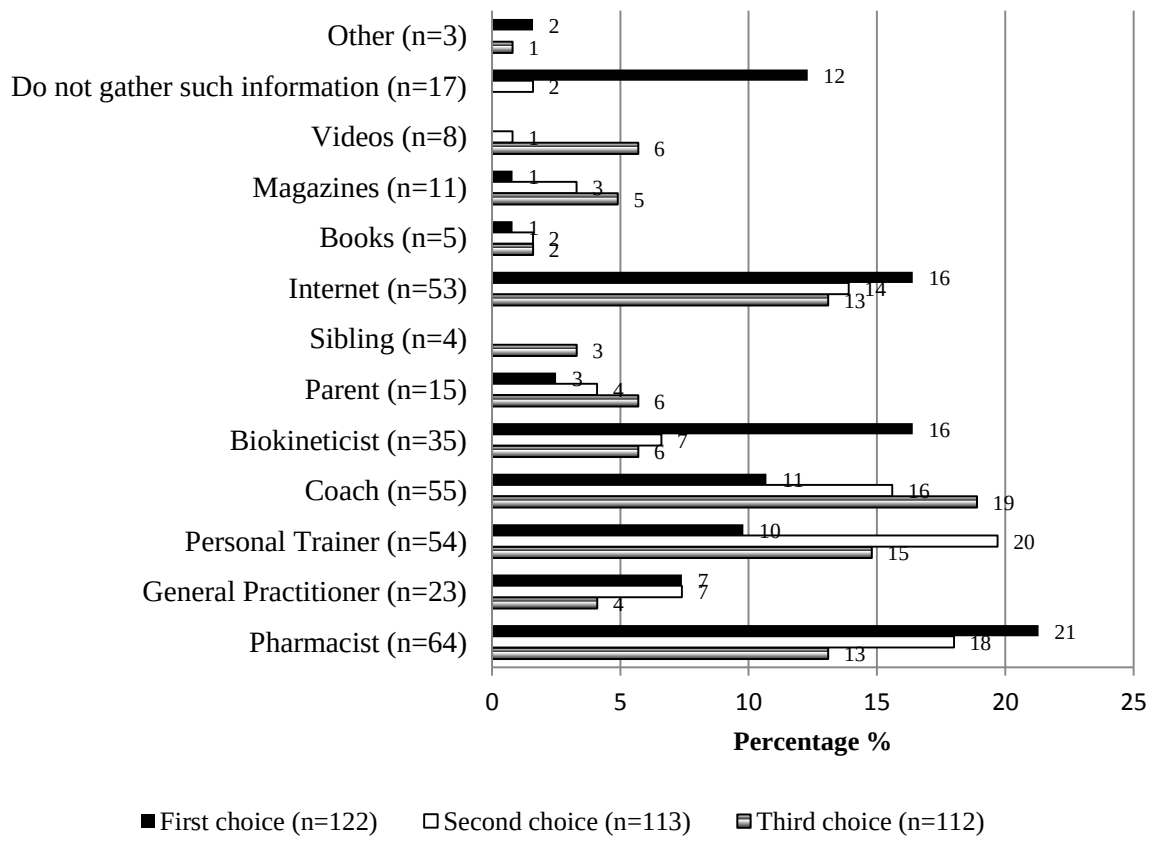


Figure 4.2: The three main sources of information

Participants were asked to list the three main sources they would utilize to gather information about doping in sport. Figure 4.2 shows these sources. The number of participants is shown next to each of the selected sources. For instance, a total of 64 participants indicated a pharmacist as either their first, second or third choice source of information. Of the 64 participants, 21% indicated the pharmacist as their first choice, for 18% it was their second choice and for 13% of the participants, the pharmacist was their third choice. Non-responses (n=19) were not included in the above figure.

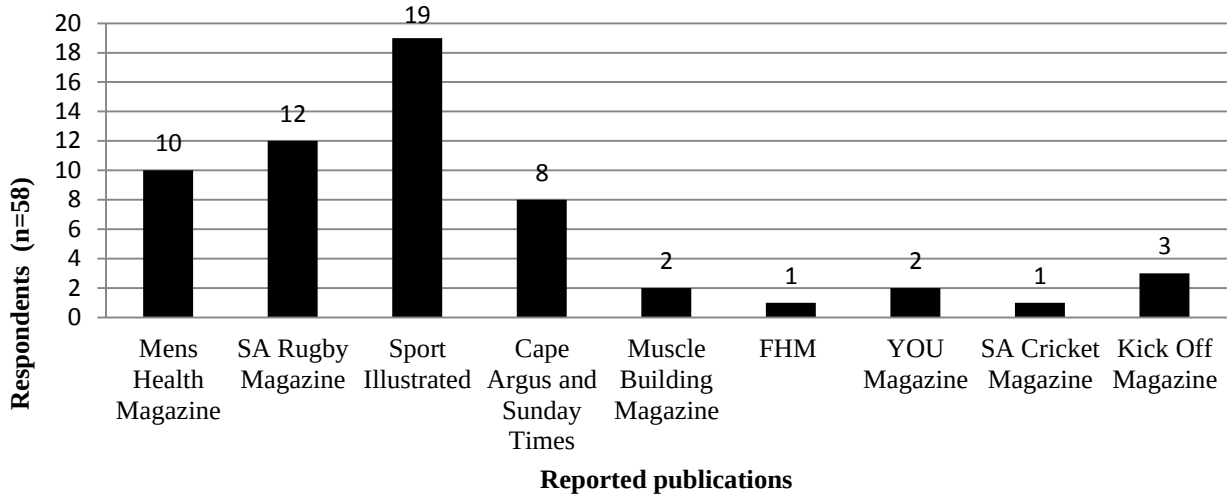


Figure 4.3: Reported publications containing information regarding PESS

Figure 4.3 indicates the magazine and newspaper publications listed by athletes, where PESS are advertised, and where further information regarding the use of PESS can be acquired. Non-responses were not included.

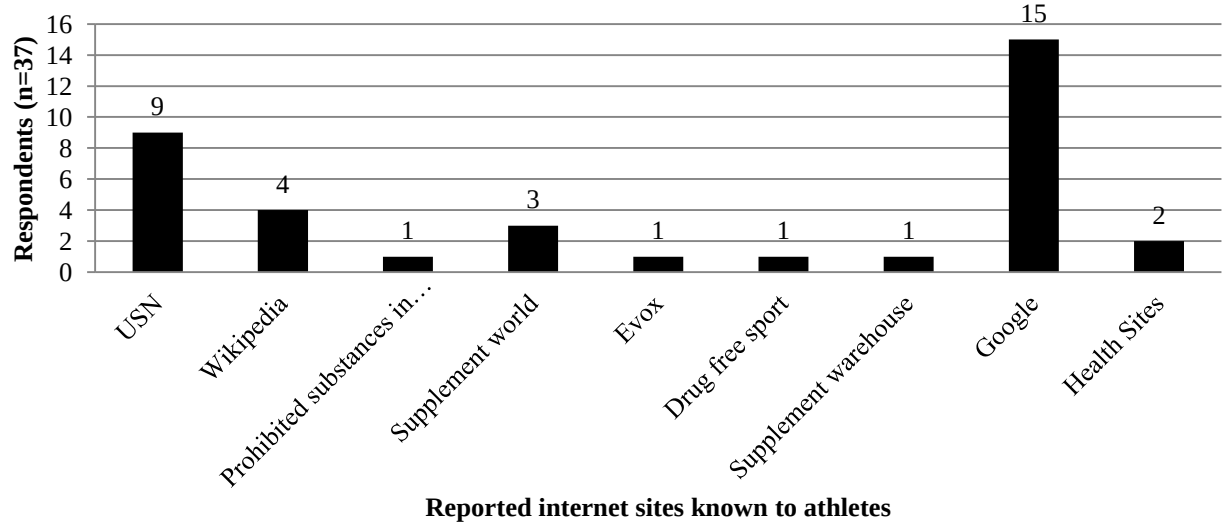


Figure 4.4: Listed internet sites where information about PESS can be found

Figure 4.4 shows the different internet sites listed by the athletes where information can be found regarding PESS use. Only 37 athletes responded to this question. Non-responses were not included in the figure.

Substance use

No illegal performance enhancing substances were reported to be used by any of the respondents and the use of other substances was very low.

Table 4.5: Indicated substance use

	Asthma pump	Caffeine	Alcohol
Grade 10		1	1
Grade 11	1	1	3
Grade 12	1	1	2
Total	**2**	**3**	**6**

Table 4.5 shows the substances used by athletes. Of the six athletes using alcohol; only two provided a dosage indicating that their consumption was low.

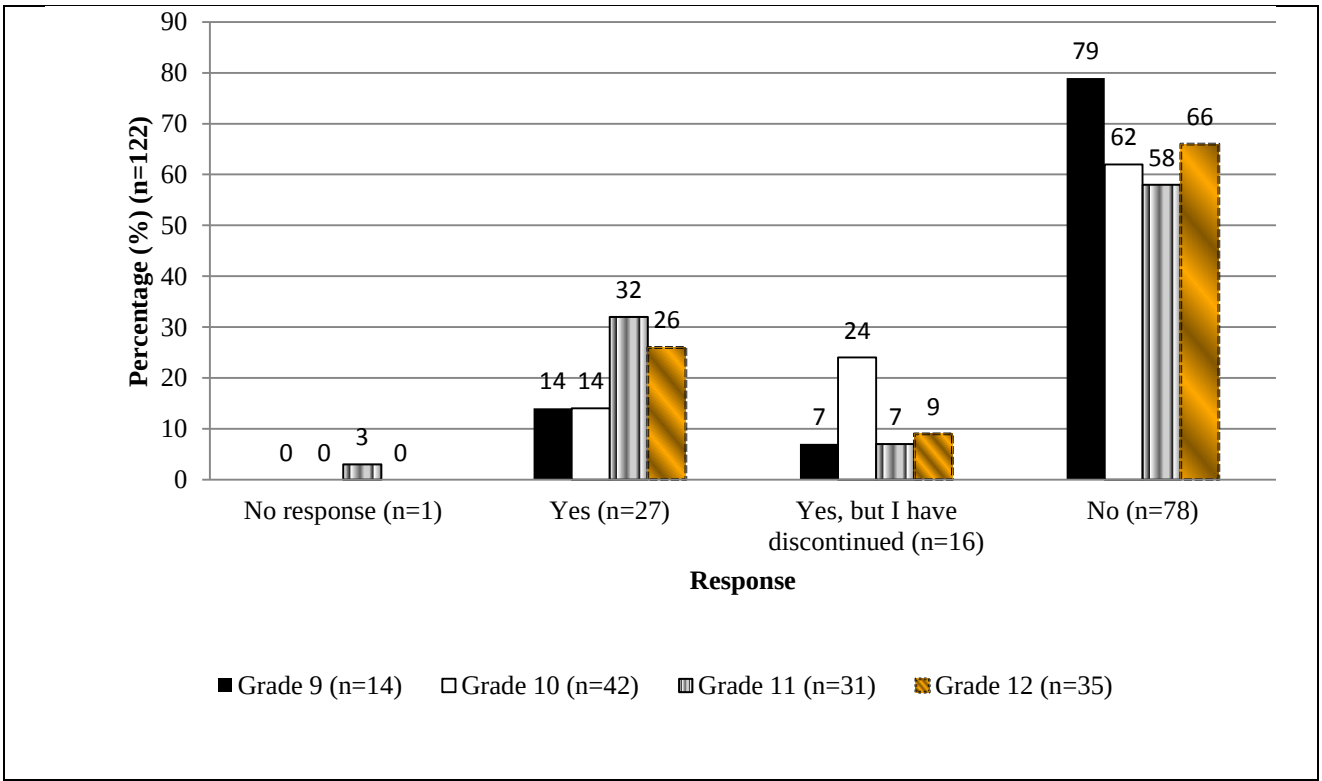


Figure 4.5: Athletes using PESS in the past year, categorized by grade

Figure 4.5 shows the percentage of athletes per grade using, or who have previously used PESS but discontinued in the past year, as well as those who do not use PESS, in percentage values. The

majority of participants indicated that they have never used PESS (n=78), of which the highest percentage were in grade 9 (79%), followed by 66% in grade 12, 62% in grade 10 and 58% in grade 11. Twenty-seven indicated that they have used PESS in the past year, of which most were in grade 11 (32%). Sixteen participants indicated that they did use PESS, but have discontinued - most of these participants were in grade 10 (24%). Only one participant did not respond.

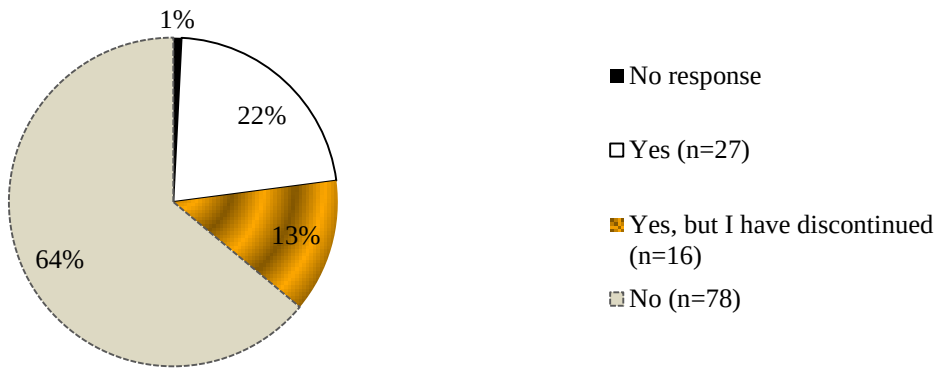


Figure 4.6: Total percentage of athletes using PESS in the past year

Figure 4.6 shows the total percentage of athletes using PESS in the past year. The majority indicated they do not use PESS (64%), 22% indicated they do use PESS, while 13% indicated that they did use PESS in the past year but have since discontinued. Only 1% did not respond to this question.

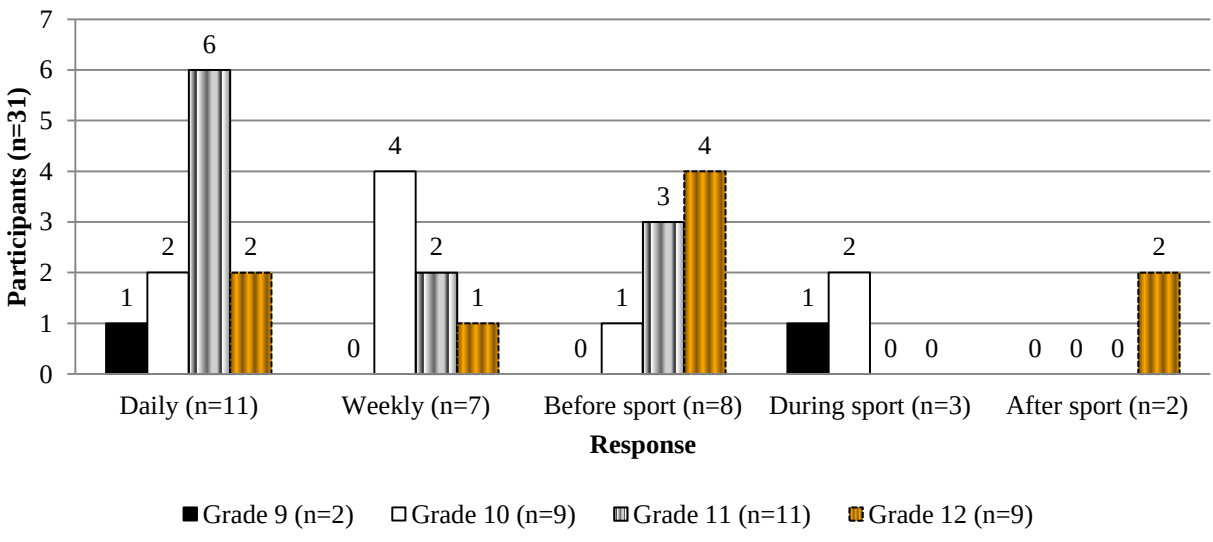


Figure 4.7: How often athletes report to use PESS, categorized by grade

Figure 4.7 shows how often athletes report to be using PESS, grouped according to grade. Only 31 participants responded to this question. Most participants indicated that they used PESS daily (n=11) of which most were in grade 11 (n=6). Seven participants indicated that they use PESS on a weekly basis and eight use it before sport. Three participants answered that they use it during sport while two said they use PESS after sport. Non-response values were not included.

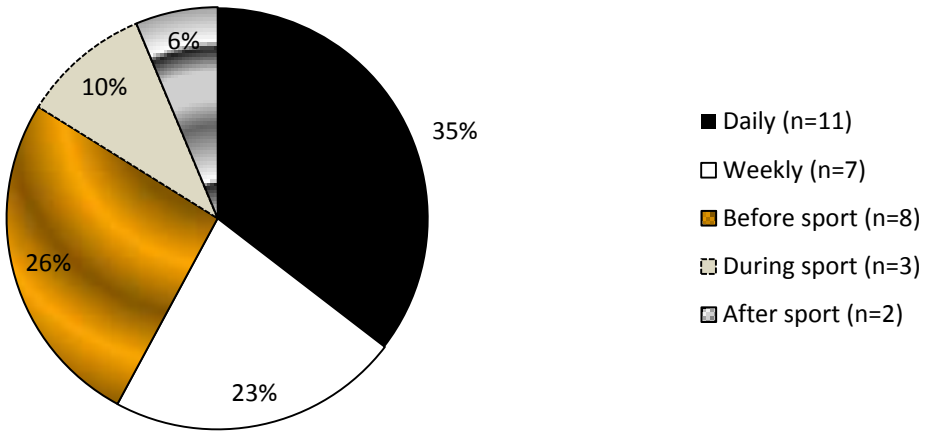


Figure 4.8: Total percentage representation of how often athletes use PESS

Figure 4.8 shows the total percentage representation of how often athletes use PESS, excluding non-response values.

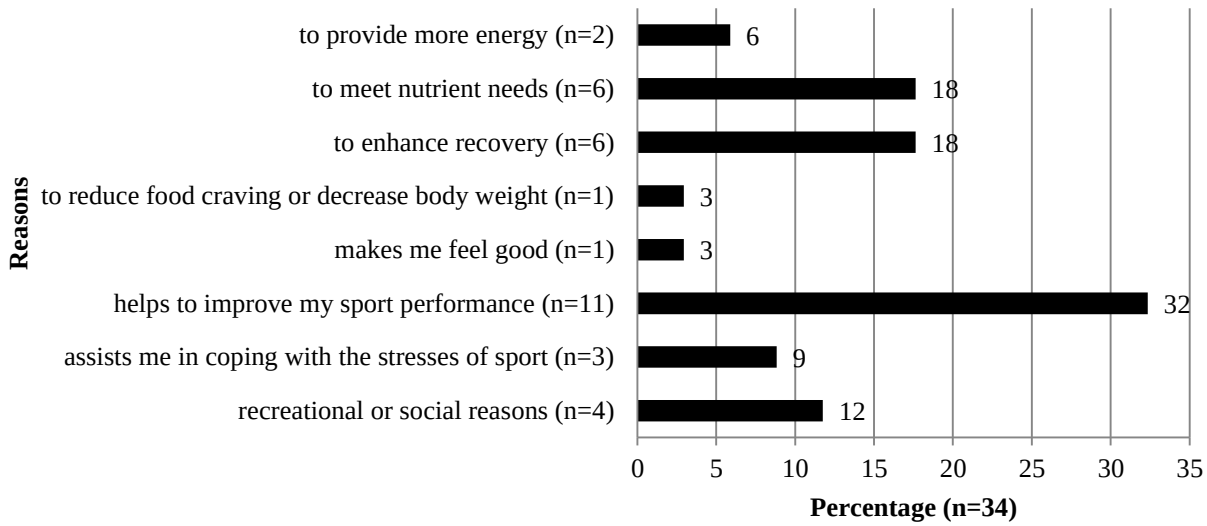


Figure 4.9: Primary reason for using PESS

Figure 4.9 ranks the primary reasons why athletes chose to use PESS. Thirty-four participants responded to this question. The majority of participants indicated that they use PESS to improve their sport performance (32%), followed by 18% indicating that they use it to meet their nutrient needs and another 18% indicating PESS use for enhanced recovery. Non-responses values were not included in this graph.

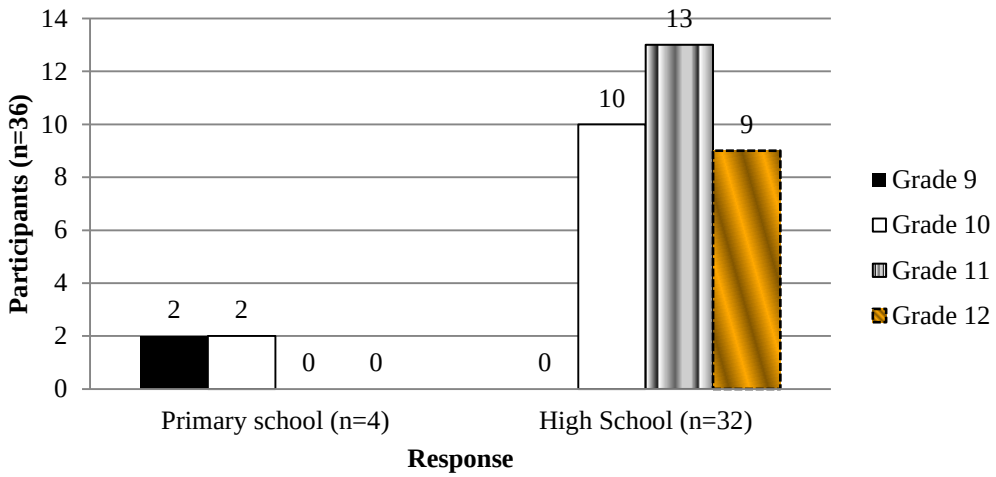


Figure 4.10: When athletes started using PESS

Figure 4.10 indicates when participants of the different grades started to use PESS. Thirty-six participants responded to this question. The majority indicated they started using PESS in high school (n=32) of which most were in grade 11 (n=13). Four participants indicated that they started using PESS in primary school of which two were in grade 9 and two were in grade 10.

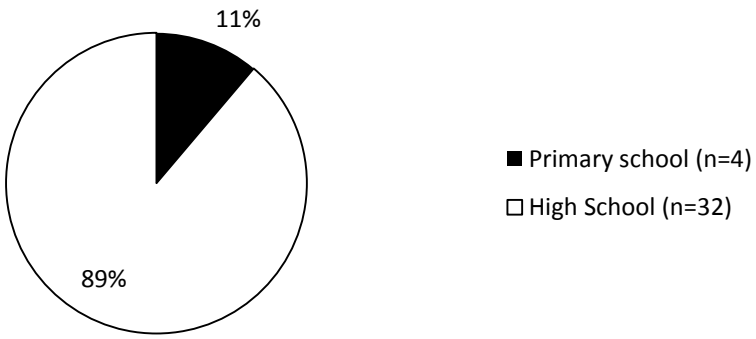


Figure 4.11: Percentage representation of when athletes started using PESS

Figure 4.11 illustrates the percentage representation of when athletes started to use PESS. The majority started using PESS in high school (89%) while 11% began PESS use in primary school.

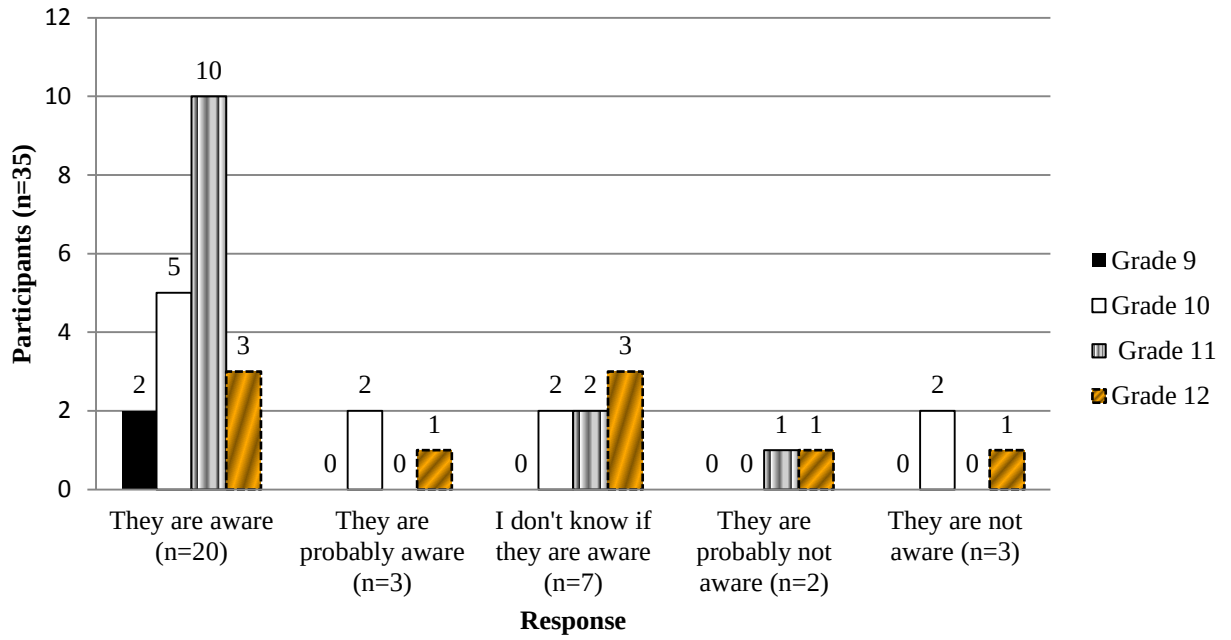


Figure 4.12: Coach's awareness of athlete PESS use

Figure 4.12 shows the coach's awareness of the athlete's PESS use, non-response values were not included in the graph. Thirty-five participants responded to this question. The majority (n=20) of these participants indicated that their coaches were aware of their PESS use, of which most of the participants (n=10) were in grade 11. The minority (n=3) indicated that their coaches were not aware of their use of PESS.

Questions raised by athletes regarding PESS

Respondents were given the opportunity to ask any question relating to the supplement or substance that they were currently using. The following five questions were asked by five individual respondents:

"What are the long term effects on the body?"

"Are there any side effects?"

"What age should you start?"

"What do the complicated substances mean?"

"Is it healthy to use supplements at a teen-age when you are still growing?"

In addition to this question, respondents were also given the opportunity to ask questions any other supplements or substances. The following five questions were asked:

"What is the best substance to use?"
"What is the most common "illegal" ingredients in products?"
"Does creatine work?"
"Which supplement is more required for a pre-season workout?"
"I want to know more about creatine and muscle building drugs, because I'm anti-them and somewhat naive about them"

Supplement use

The following two figures below summarize supplement usage as indicated by athletes, categorized by their grade (Figure 4.13) and as a collective representation of the whole sample (Figure 4.14).

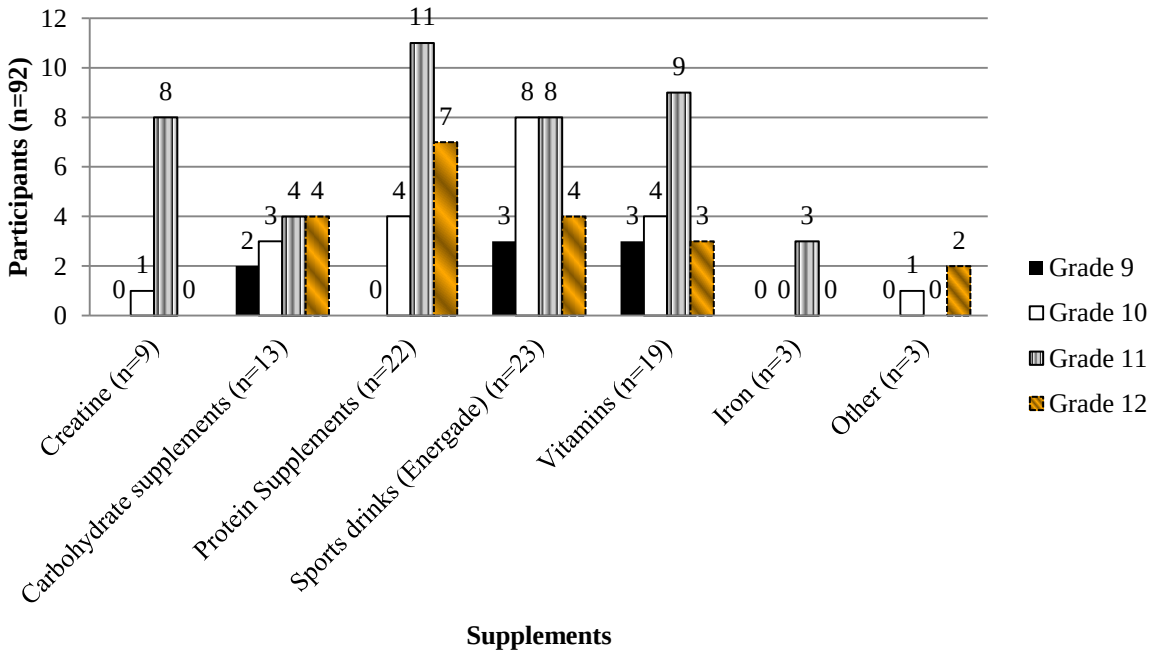


Figure 4.13: Supplement usage indicated by athletes, categorized by grade

Figure 4.13 shows the seven different supplements that participants indicated to be using, categorized by their grades. Of the 92 participants who responded to this question, the highest number of participants indicated the use of sports drinks (most indicated they used Energade)

(n=23), followed closely by 22, who indicated protein supplement use. Of those using protein supplements (n=22) the majority were in grade 11 (n=11), followed by seven in grade 12 and four in grade 10.

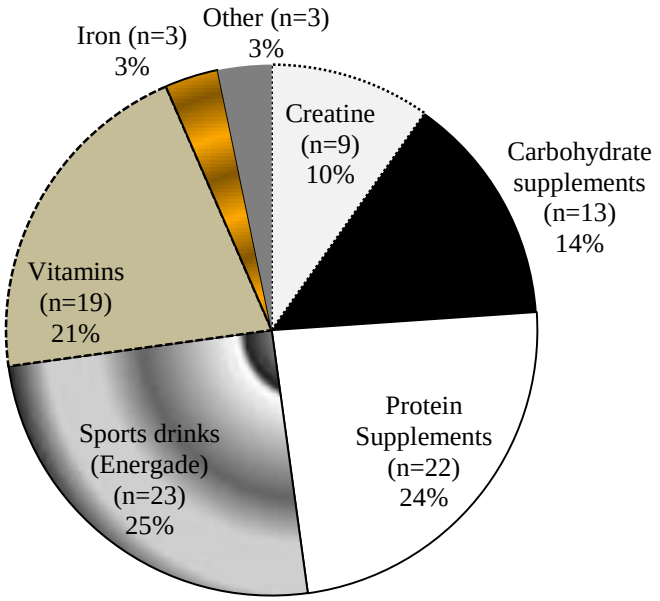


Figure 4.14: Percentage representation of total supplement use

Figure 4.14 shows the seven indicated supplements, which were used by the participants, in percentage values. Of the 92 participants who responded to this question, the majority (25%) indicated using sports drinks (such as Energade), followed by 24% and 21% using protein supplements and vitamins, respectively. Non-response values were not included.

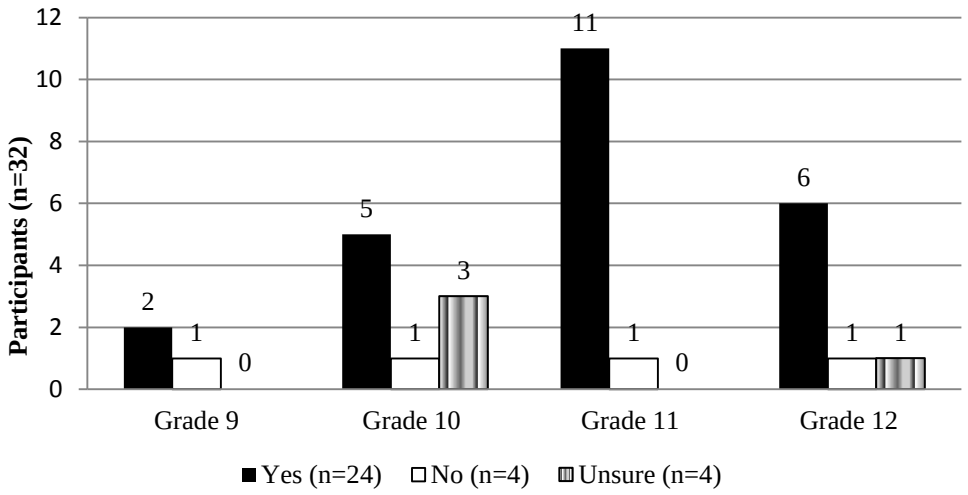


Figure 4.15: Participant response to whether they know how the PESS they use work

Figure 4.15 shows the participant responses (n=32) to whether they know how the PESS they use work, categorized by grade. Thirty-two participants responded to this question. Of those that did respond, the majority indicated that they knew how the supplements they used work (n=24), of which most were in grade 11 (n=11). Four indicated that they did not know (one per grade), while four were unsure of how the supplements they used work, of which three were in grade 10 and one in grade 12. Non-responses were not included in this graph.

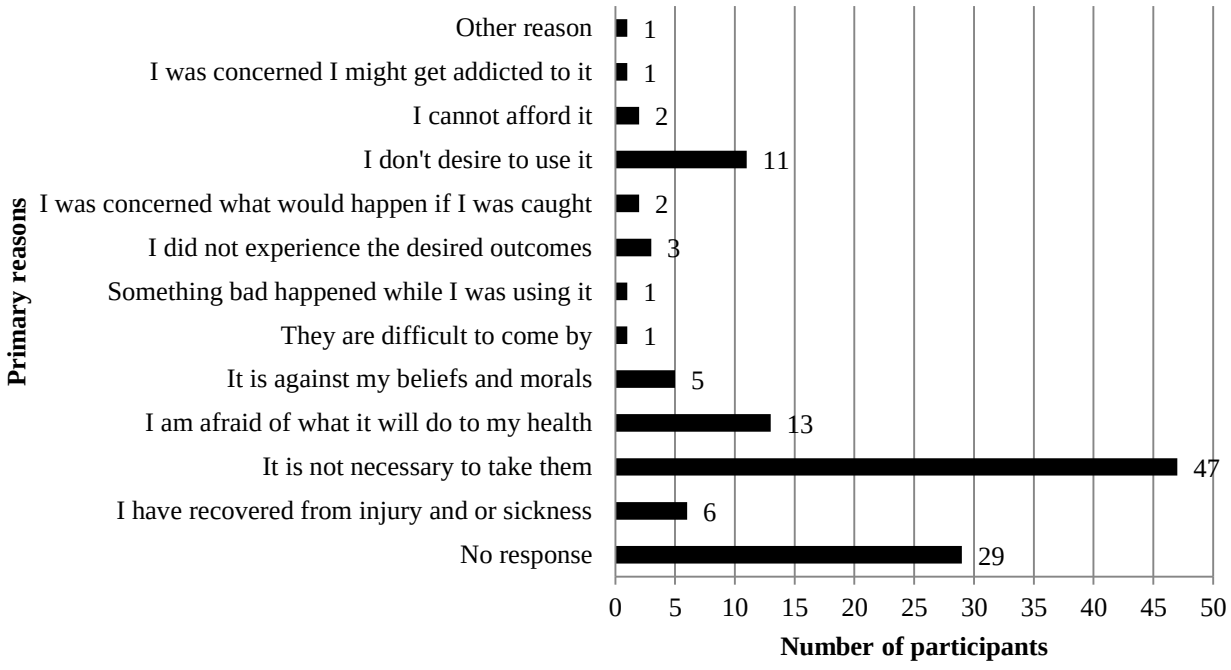


Figure 4.16: Primary reason for not using or discontinuing use of PESS

Athletes were asked to indicate the primary reason why they chose not to use PESS or why they discontinued the use of PESS. Figure 4.16 summarizes their responses. The majority indicated that it was not necessary to take them (n=47). Thirteen said they did not use PESS because they were afraid of what it would do to their health, while 11 said they did not desire to use PESS. Twenty-nine did not respond to this question.

Attitudes toward doping in sport

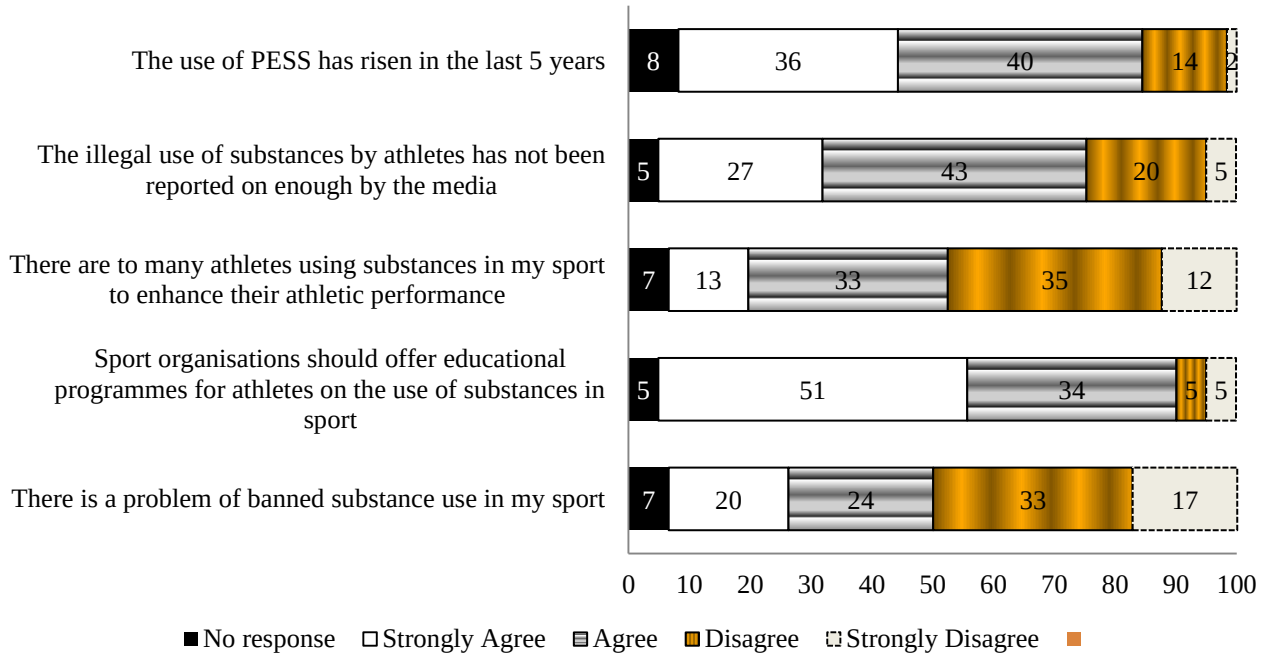


Figure 4.17: Attitudes toward doping in sport

Five questions were asked regarding the participants' attitude toward doping in sport and figure 4.17 summarizes their responses.

Chi-square tests were performed to test for association between grades for each of these different statements. Chi-square testing showed only significant responses for two of the questions, the first one being: "the use of performance enhancing substances and supplements has risen in the last five years" (χ^2=1.56; p=0.459*; d.f = 2). The second statement that produced a significant chi-square was: "sport organizations should offer educational programmes for athletes on the use of substances in sport" (χ^2 = 6.70; p = 0.035*; d.f. = 2).

CHAPTER 5 – DISCUSSION

Four major research objectives emanated from this study. Firstly; to evaluate the prevalence and use of sport PESS in the five major sport codes chosen. Secondly; to determine the most frequently used sport PESS. Thirdly; to determine where athletes obtain their information (information sources), regarding the use of PESS. Lastly, to evaluate the perceptions and attitudes of male high school athletes, with respect to the use of PESS. The implications of the results of this research will now be discussed in light of these objectives.

Demographic data

A total of 122 (N) competitive male athletes from four schools in the Central Metropolitan Area of Cape Town participated in this study. Due to the small number of schools participating in the research, grade nine learners were also allowed to participate. The majority of participating athletes were in grade 10 (34%) and grade 12 (29%) as seen in Table 4.1. The fact that so few schools were willing to participate in this research study is of concern. A random selection of 47 schools was contacted through email and telephonic follow up, but only four schools agreed to participate. Some of the schools provided an excuse for not participating by saying they did not offer school sport while other schools said they already had an anti-doping strategy in place, however most of the contacted schools refused without reason.

Scwellnus *et al.* [3] managed to survey the matriculates of 13 schools in the Western Cape in 1991 and 1361 participants completed their questionnaire. [3] In comparison to their study, the total participants surveyed in this study are a considerable limiting factor. However, the unwillingness or fear of schools to participate in such research could provide another avenue for future research.

Sports participation

The researchers chose to look at five popular school sports. The sporting codes of interest for this study included; rugby, swimming, athletics, hockey and soccer.

Table 4.2 shows the major sports that athletes from each grade participate in. The majority of athletes participated in rugby (30%) and field hockey (29%) Participants could also indicate if they participated in another sport and 25% of the athletes indicated that they participated in other sports such as water-polo, touch rugby, cycling, squash and basketball (Table 4.3).

This is in line with what Gradidge *et al*. [7] found when they looked at the prevalence of PES use by Johannesburg male adolescents involved in competitive sports. The majority of their participants also participated in rugby; followed by hockey, water polo, football and swimming. Other sports included cricket, golf, athletics, rowing, basketball, rock climbing etc. [1] [7]

General perception and knowledge of prohibited substances

Section two of the questionnaire asked questions regarding the athlete's general perception and knowledge of prohibited substances. It was hypothesized that male high school athletes in the central metropolitan area of Cape Town would have poor knowledge regarding PESS. Figure 4.1 summarizes the six questions that were asked regarding general perception and knowledge of prohibited substances. The six questions were: "Are you aware of the punishment for doping offences in sport?"; "Are you familiar with the current prohibited list of substances and supplements as indicated by WADA?"; "Do you think that a drug testing program will prevent the use of prohibited substances in school sport?"; Do you think athletes are being pressured to use prohibited substances?"; "Do you think the use of prohibited substances in sport is increasing?"; "Do you think that the use of prohibited substances in sport is unethical?".

Participants of a Johannesburg based study felt that the use of PES in sport is rising, 91% of their participants felt this way. [1] Similar to their finding, it was found that from the total sample, 89% of athletes thought that the use of prohibited substances in sport was on the increase (Figure 4.1). Chi-square testing showed no significant difference between the proportion of junior (89.1%) to senior (90.9%) participants ($\chi^2 = 0.11$; $p = 0.739$; d.f. = 1). Therefore indicating the proportion of seniors and juniors agreed that the use of prohibited substances in sport is indeed increasing.
When comparing this finding to a later statement "The use of performance enhancing substances and supplements has risen in the last five years" (Figure 4.17) most of the participants still agreed (40%) with this statement and also showing no discrepancy as measured by a chi-square test (χ^2 =

1.56; p = 0.459; d.f. = 2). However, when comparing these two statements by a one-way chi-square test, a highly significant discrepancy was found and thus proving the participants' answers to be untrustworthy (χ^2 = 19.03; p < 0.001*; d.f = 2).

Many of the participants (51%) believed that athletes are being pressured to use prohibited substances, while 26% were unsure about this statement and 21.3% did not think that athletes are being pressured to use prohibited substances. With this question the chi-square test did show a significant difference between the junior and senior participants (χ^2 = 4.30; p = 0.038*; d.f. = 1). In the junior group only 58% of the participants agreed that athletes are being pressured to use prohibited substances while, 79% of the seniors thought that athletes are being pressured to use prohibited substances (Figure 4.1). One could argue that the significantly higher senior percentage is due to the possibility that they experience greater pressure to perform well in order to get selected for the first team or to get drafted into a professional team when they graduate from school.
In the study done by Schwellnus [3] they found that responders who did indicate using AAS felt under more pressure to perform well in sports, while those who did not indicate the use of AAS did not report the same feeling of being under pressure to perform well. [3] A higher percentage of participants (84%) in the Johannesburg study by Gradidge *et al.* [1] reported perceived pressure to perform and to use prohibited PES. [1]
It would be interesting to know why adolescent athletes feel pressured to use prohibited PES. Is the pressure self inflicted through a desire for a sculpted physique, improved sporting performance or to improve self-image? [19] [29] [39] [41] [40] If they are not placing this pressure on themselves, who is? Is it their peers, coaches or parents? [6] [21] [40] It was not the aim of the current study to evaluate the reasons why adolescent athletes feel pressurised to use PES, but it is recommended that future researchers consider this in their research.

Furthermore, in terms of knowledge and general perception toward the use of PESS, Figure 4.1 showed that a significant amount of participants (82%) believed that a drug testing programme will prevent the use of prohibited PES in schools. In contrast, only 55% of participants in the Johannesburg-based study thought that doping tests will prevent PES use in sport. [1] This question was also asked by Sports Illustrated [48] when they personally interviewed 18 first team rugby players, playing for the top schools in South Africa. All 18 of these players said that there was a problem with PES use in schoolboy rugby, and that they felt that testing for doping should occur more frequently and not only at Craven Week. [48]

Respondents showed poor knowledge as to which substances and supplements are prohibited by WADA (68%), while 13.1% said they were unsure and 18.9% indicated that they were familiar with the prohibited list. In contrast to this, 46% of the participants indicated that they were aware of the punishment for doping offences in sport, while 36% did not know and 18% indicated they were unsure of the punishments for doping offences (Figure 4.1). Once again a different result was documented by Gradidge *et al.* [1] 72% of their participants indicated that they were familiar with the WADA prohibited list. [1]

Table 4.4 summarizes participants' knowledge of how the substance they indicated to be using functions. Most participants did not provide an answer (n=90, 74%). The majority indicated that they did know how the substance worked (n=24, 20%), whilst 3% (n=4) indicated that they were unsure and further 3% indicated that they did not know how the PESS they use functions. One-way chi-square testing was performed for this question and it showed a highly significant result (χ^2= 25.0; $p < 0.001$*; d.f = 2). This suggests that their answers are untrustworthy and that their knowledge regarding PESS is poor, regardless of the majority indicating that they do know how PESS work.

Overall, the general perception and knowledge toward PESS use in this study was found to be poor. It would appear that education in the use of PESS is lacking and strategies should be put in place to help athletes make educated decisions. Schwellnus *et al.* [3] said that it is important to know the level of knowledge adolescent athletes have regarding PES, as it is important to be able to use such data to develop intervention strategies. They suggested providing learners with notes and lectures about AAS. The researchers of the current study agree with this comment, but would like to suggest including other PESS. In so doing it is hoped to encourage athletes to substitute the use of PESS or AAS with reliable information on nutrition and exercise. [3] It is proposed that the apparent discrepancies between Cape Town-based adolescents and their Johannesburg-based peers be investigated further.

Overall the findings of our study correspond to the Cape Town based result of Schwellnus *et al.* [3] as well as the Johannesburg based results by Gradidge *et al.* [1] in that the general knowledge toward the use of PES (and the use of AAS) [3] of adolescent male athletes is poor. [1] [3]

Reported sources of information regarding PESS

Figure 4.2 shows the three main sources athletes approach or utilize to gather information about doping in sport. The athletes were asked to choose three sources of information, and rank them. The majority of participants (21%) said their first choice source of information was a pharmacist, followed by biokineticist (16%) and the internet (16%). It is encouraging to see that the respondents preferred experts in the medical community (pharmacists and biokineticists) as their sources of information to PESS.

This differs to what was found by Gradidge *et al.* [1] who showed that the majority of adolescent athletes indicated that they would use the internet (74%) as their main source of information followed by magazines (72%) and friends (66%) as their second and third choices of sources of information respectively. [1] [7] Although the internet could be seen as a valuable tool for education on PESS, it would depend on the site the individual visited, as well as their interpretation of the information presented on that site.

In a Canadian study, health professionals and the internet were found to be the preferred source of information in their research. [8] In a study by Morrison *et al.* [49] gymnasium members were asked where they gathered their information regarding the use of supplements. The majority of participants indicated that they used magazines (65.8%), family or friends (63%). Other options for sources of information included; staff at a health food store (55.7%), books (54.5%), the media (45.5%), and personal trainers (38.7%). Interestingly the smallest percentage of participants chose to go to their physician (33.8%), dietician (28.4%) or pharmacist (17.1%) for advice on the supplements they use. [49]

This is also reflected in the current study, but with even fewer participants (7%) indicating that they would go to their general practitioner as a first choice, for getting information regarding PESS (figure 4.2). It is disconcerting to see that so few participants would seek guidance from a general practitioner, someone who as a health care professional, could provide important information regarding the use of PESS. In this study a personal trainer (20%) was the majority of participants' second choice, followed by a pharmacist (18%) and then the internet (13%). The third choice for source of information was the participant's coach (19%), followed by a personal trainer (15%), and again a pharmacist (13%) and the internet (13%).

Athletes were asked to list publications, i.e. magazines or newspapers, that they were familiar with containing information regarding PESS (Figure 4.3). Only 58 athletes responded to this question (48%), a reason for this could be that most young athletes would rather use the internet as a source of information. However, even less (30%) responded to the question of which internet sites one could gather information about PESS. Alternatively, it could be argued that due to the fact that none of the participants indicated serious PES use in this study, they don't need to gather such information and are not interested in PESS. The most popular magazines and newspapers indicated, to contain information regarding PESS, were shown to be the Sports Illustrated (n=19), SA Rugby magazine (n=12) and Men's Health magazine (n=10). Gradidge *et al.* [1] did not make mention of which specific publications were most used but 72% of their participants said that they used magazines as a source of information, and only 29% used newspapers. [1]

The internet is another possible source of information. Figure 4.4 shows the different internet sites known to athletes where information regarding the use of PESS could be found. Only 37 (30%) athletes responded to this question. Most misinterpreted the question and indicated "google" to be a source of information (n=15), but it was included in the data as it serves as a search engine for information. The most popular internet site for the gathering of information on PESS was indicated as "USN" – Ultimate sports nutrition - which is a known sports supplementation company (n=9). Wikipedia (n=4) and Supplement world (n=3) were the other indicated internet sites.

None of the participants mentioned SAIDS as one of the possible internet sites to gather information regarding the use of PESS. This South African organization provides education and important information via their easily accessible website. There are also cellular phone applications for those who may not have access to the internet via computer, but can do so via a smart phone. Their main aim is to realise drug-free sport in South Africa. They provide information regarding sport supplements, prohibited substances and drug testing programmes, among other things. It is therefore recommended that athletes and schools be informed about the existence of SAIDS. [28]

WADA is an international organization with a good interactive website where athletes can learn more about anti-doping through means of interactive games and quizzes. [17] Similarly, the majority of participants in the research by Gradidge *et al.* [7] preferred gathering information about PES from media, paper and electronic sources. A very small percentage of their respondents would gather information from professional sources such as physicians, pharmacists or biokineticists. [7]

Schwellnus *et al.* [3] found that most of their respondents who used AAS preferred to obtain AAS from their peers rather than from someone in the medical community, such as a medical doctor or

pharmacist. It is alarming to note that AAS are so easily available to adolescents, since the use of AAS is illegal. The researchers suggested that the intervention strategies that were in place at the time needed to be evaluated and addressed to control the supply of AAS. They proposed amplified penalties for possession and distribution of such substances. [3]

Performance-enhancing substance and supplement use

Although it is encouraging to see that none of the participants in the current study admitted to using any serious illegal substances (Table 4.5), this data should be interpreted with caution, as all survey data should. Even though the respondents were assured of anonymity, they may have still lied with the result of under-reported illegal PES use.

Only two respondents indicated asthma pump usage (Table 4.5). It is assumed that the use was for medical reasons to relieve bronchospasm. Most ß$_2$-agonists are on the WADA prohibited list, but athletes with legitimate medical requirements can apply for Therapeutic Use Exemption (TUE). Salbutamol, Salmeterol and Formoterol are the only ß$_2$-agonists not prohibited, provided they are utilised within the recommended WADA guidelines.

Three of the respondents admitted to the use of high dosage caffeine, in the form of energy drinks such as Redbull or Monster. Regular alcohol consumption was indicated by six respondents. This finding is similar to what Peltzer & Cherian [45] found in their study. They found alcohol to be the predominant substance of use by urban and rural (N=209) high school pupils in the Northern Province. Secondary to alcohol use was tobacco and cannabis. In addition, they compared the substance of choice of the urban sample to that of the rural sample. The substance of choice of the urban sample included tobacco, cannabis, amphetamines and stimulants. The rural sample preferred alcohol, inhalable substances and cocaine. With the exception of cocaine which is considered a "sophisticated" and expensive drug, it would seem that the rural sample tended to use substances readily available to them. [45] This relates to socio-economic standing, which the researchers feel should be investigated in more detail in future research.

Contrary to the findings of the current study, Gradidge *et al.* [1] found 30% of their respondents admitted to the use of illegal PES which included the use of AAS (4%, n=100), growth hormone (5%, n=100), adrenaline / ephedrine (4%, n=100) and insulin (2%, n=100). [1] Interestingly, in their

study based in the Western Cape, Schwellnus *et al.* [3] found that the prevalence of AAS use was significantly higher among Afrikaans speaking learners. They postulated that their result might be due to under-reporting by English learners due to dishonesty and fear of being caught. In an effort to try and ascertain the extent of under-reporting they included a question asking non-using participants how many learners he or she knew who were using AAS. [3] In the schools where participants identified themselves as users, the non-users reported knowing of many users. Similarly at the schools without reported users, non-users disclosed the knowledge of users in their school. Unfortunately, the rate of under-reporting could not be determined in the study. [3]

Schools participating in the current study were all English schools due to the geographical location of the study. It would be interesting to compare the current pattern of PESS use between Afrikaans and English athletes and this should be considered for further research. Future researchers could also investigate the difference of PESS use between athletes of different socio-economic backgrounds.

During the 2011 Craven Week where 47% of the total players were tested, only four tested positive for doping. However, according to a survey done by Sports Illustrated, PES use by schoolboy rugby players appears to be a more of a problem than indicated by the Craven Week results. They surveyed 110 rugby players from 19 of the top schools in South Africa and revealed that 67% of the players reported to know of other players who were doping and 17% admitted to have used PESS themselves. These statistics are higher than what was seen at the 2011 Craven Week. Many of the respondents requested increased doping tests, throughout the year, and not just at Craven Week as per the current custom. [48]

Figure 4.5 shows the percentage of athletes per grade who are currently using (n=27), or have used PESS but discontinued in the past year (n=16), as well as those who do not use PESS (n=78). No response was provided by 3 athletes in grade 11. As seen in Figure 4.6 a total of 64% of the participants in this study indicated that they have never used PESS, 22% are currently using PESS and 13% used PESS before but have discontinued. Only 1% (n=122) of the total sample did not respond to this question. It is apparent that the athletes did not fully understand the questionnaire as they were supposed to proceed to question 3.10 if they had stopped using or never used PESS. Only 27 athletes indicated that were currently using PESS, yet 92 indicated some form of supplement use (Figure 4.13) which formed part of question 3.8 (which they should in theory not have completed). The results of figure 4.13 were kept as they provide helpful insight into supplementation use but must be considered with caution due to this observed lack of comprehension.

Figure 4.7 shows how often athletes reported using PESS. Only 31 athletes responded to this question. Most participants indicated that they used PESS daily (n=11) of which the majority were in grade 11 (n=6). Seven participants indicated that they used PESS on a weekly basis and eight used it before sport. Three participants answered that they used it during sport, while only two said that they used PESS after sport. Figure 4.8 shows the percentage representation of how often athletes use PESS, excluding non-response values. Most indicated to using PESS on a daily basis (n=11, 35%), eight athletes indicated PESS use before sport (26%) and seven athletes indicated PESS use on a weekly basis (23%). Even though only 11 respondents admitted to PES use (Table 4.5), we will assume that these results rather represent the use of supplements almost exclusively.

Athletes were asked what their primary reason for using PESS was (figure 4.9). They were given a list of reasons, of which they were to select three and then rank them accordingly. Although 92 athletes indicated some form of supplement use (figure 4.13 and Figure 4.14), only 34 athletes responded to this question. We are left wondering what the other 58 athletes' reasons were.
Of the 34 that did answer the question, the majority (32%) indicated that they used PESS in order to help with improvement of sport performance. Thereafter, recovery enhancement (18%) and nutrient needs (18%) were indicated by the respondent sample as the primary reason for using PESS. A further 12% said that they used PESS for recreational or social reasons. Only 3% indicated that they used PESS because it made them feel good. Thus, the majority of athletes appear to use PESS for the enhancement of sports performance rather than recreational purposes. Other studies proposed the drive for muscularity or thinness, extreme concern with body image, extrinsically motivated athletes wanting "to win at all costs", poor academic performance or participation in sports requiring strength and power as the motivations behind using PESS or AAS. [5] [21] [29] [38] [41]

The majority of athletes started using PESS in high school (89% - Figure 4.11) and of the respondent sample, the grade 11 group is the largest (n=13 – figure 4.10). Only 11% (n=4), collectively in grades 9 and 10, of the respondent sample indicated they started using PESS in primary school. It is interesting and reassuring to note that none of the senior grades (grades 11 and 12) indicated that they started using PESS in primary school. This excludes those who did not respond to this question (n=86, 71%).

Figure 4.12 shows the coach's awareness of the athlete's PESS use. The majority of athletes reported that their coaches were aware (n=20, 57%), or probably aware (n=3, 8%) that they were

using PESS. The minority reported that their coaches were probably not aware (n=2, 6%). Three respondents indicated that their coaches were not aware (n=3, 8%) that they were using PESS.
With regards to the coach's awareness concerning PESS use, this can be seen in both a positive and negative light. The coach's awareness of the athlete's PESS use can be seen as positive, if the coach is fully aware of what the athlete is taking and the dosage thereof. The coach could provide guidance in terms of PESS use and would have greater knowledge when dealing with possible over doses or contraindications to use. From a negative viewpoint, the coach may be the reason the athlete started using PESS in the first place, by placing undue pressure on the athlete to excel in his sport. This was not one of the study objectives, but would be a potentially interesting topic for future research.

Questions raised by athletes regarding PESS

Respondents were given the opportunity to ask any questions relating to the supplement or substance that they were currently using.
Five questions were asked by the participants and most give the impression that the athletes did not have a good knowledge base regarding the use of PESS. One respondent wanted to know what the long term effects off PESS use on the body were. This is a good question. The answer would depend on the type of PESS he was using. For most of the PESS available we know the acute effects, and we can form ideas around what possible long term effects could be, however, for the adolescent population our data is limited. [2] [6] [15] Laos *et al.* [2] indicated in their research that creatine use by adolescents (younger than 18) is of concern because no studies have examined the effects of creatine use in adolescents in the short- or long-term. In addition to this, they said that many creatine users tend to use dosages far above what is recommended as they believe creatine is a natural compound in the body, and thus should be safe to use at higher dosages. This overload is done in order to accelerate muscle mass gains, but they do not realise the potential harm to their kidneys. Laos *et al.* [2] documented two cases of renal failure in adults in their research. [2] Creatine is not a banned substance but is still potentially harmful in incorrect dosages.
Two participants were concerned with the use of PESS and age. One participant wanted to know at what age one should start using PESS. Similarly, the other participant wanted to know how healthy it is to use supplements at a young age. Most professionals (who are fair-minded and have the athlete's best interest at heart) would answer that it would never be a good age to start using PESS. The best way to start answering would be to first gather more information regarding the athlete's

medical history and sporting background and to then establish his specific training and dietary needs. Only when this is in place will one be able to give expert and evidence based advice. The focus should still be on guiding the young athlete and providing a balanced nutritional eating plan as well as a periodized training programme specific to their sport. Proper education is vital to ensure they understand the possible harm PESS can potentially do to their bodies.

Lastly, one participant wanted to know what the "complicated substances mean". It is not sure what the participant was specifically asking and which substances he was referring to. It could be those read on the label of a supplement product. Labels of supplement products can be confusing and some of the names are scientific and long. He could have also been referring to some of substances listed in the questionnaire. The best way to answer his question would probably be to divide the list of substances into their various classes (AAS, Hormones and –related substances, Stimulants, Narcotics, Cannibinoids and other) and give a broad description of each.

The athletes could also raise questions about any other supplement or substance (that they were not using). Most of the questions raised, were about the use of creatine, whether or not it works, and more information, in general, regarding the substance. Others asked which substances were the best to use, which supplement should be used in pre-season workouts and what the most common "illegal" ingredients in products were.
The last question can be answered through the work done by Geyer et al. [10] [11] who showed that from a sample of 634 nutritional supplements, 94 (15%) samples tested positive for AAS that were not declared on the label. They tested for various substances but mainly for the presence of AAS such as testosterone and the pro-hormones of testosterone. The products they tested were sampled internationally (USA, Germany, UK, Italy, Portugal etc). Inadvertent doping, when using nutritional supplements, is a serious risk and an impartant reason why athletes should take extra care in their final decision. [11] [10] Apart from the risk of inadvertent doping, the researchers also found potentially risky impurities in many of the nutritional supplements they tested, such as lead, broken glass or animal faeces. These impurities find their way into nutritional supplements due to the lack of control over the supplement industry in general, as well as poor manufacturing procedures. [5] [10] [11] [22]

Even though only a small portion of respondents asked questions, the fact that some asked questions shows that there is a need for further education amongst high school athletes with regards to the use of PESS.

Supplement use

Figure 4.13 shows that Grade 11 athletes reported the highest percentage supplement usage from the total sample, with protein supplements (n=11), vitamins (n=9), sport drinks (with Energade most indicated sports drink) (n=8) and creatine (n=8) being the most popular supplements. Grade 12 athletes were the next highest, with protein supplements (n=7), carbohydrate supplements (n=4) and sports drinks (n=4). Metzl *et al.* [15] investigated creatine use among 1103 young athletes attending school in New York City, in grades 6 to 12. They found creatine use to be the highest by grade 12 (44%, n=12/27) and grade 11 (12%, n=19/158) athletes. However only 27 grade 12 athletes participated in their study, which is a very small sample size in comparison to the other grades that had 200 participants on average. Therefore they pooled the data from grade 11 and grade 12 athletes. Their findings still correspond to those of the current study since creatine use was exclusively reported by these grade 11 athletes.

Figure 4.14 shows the supplement use by the athletes (75.4%, n=92) participating in this study. These supplements include: sports drinks (e.g. energade) (25%, n=23), protein supplements (24%, n=22), vitamins (21%, n=19), carbohydrate supplements (14%, n=13), creatine (10%, n=9), iron (3%, n=3) and other supplements (3%, n=3). This is similar to the findings of Gradidge *et al.* [1] except that they found 57% (n=28) used caffeine supplements. [1] As a self-administered questionnaire was used (in both studies) one cannot assume complete honesty.

When asked if they had any knowledge of how the PESS they were using functioned, only 32 participants responded (53%) and most indicated that they did know (20%, n=24), 3% said they didn't know and another 3% were unsure (Table 4.4 – discussed further under General perception and knowledge of prohibited substances). Of the grade 11 athletes (n=12), 11 indicated yes they did know how the PESS they were using functioned, whilst only one indicated no. Six of the grade 12 athletes (n=8) indicated yes, one answered no and another was unsure (figure 4.15).

Athletes were asked to indicate the primary reason why they don't use or have discontinued the use of PESS. Figure 4.16 shows the athletes' primary reason for not using or discontinuing the use of PESS. It is encouraging to note that the majority of athletes felt that it was not necessary to take PESS (n=47, 39%). It could be that the athletes do not feel the need to "win at any cost", which most other studies have proposed as the main reason why athletes would turn to PESS. [2] [14] [5] [34]

Another reason could be that they are unsure that there is any significant benefit in using PESS. Thirteen athletes (11%) were afraid of what it would do to their health, which goes hand in hand with the first statement. These athletes were more concerned with their health than making the team, or winning. A further 11 athletes said they did not desire to use PESS (9%). One could argue that they did not desire to use PESS because they have other needs that take higher priority, such as the basic need to three meals a day or school education. Unfortunately, no questions related to the athletes' socio-economic status were asked, so these assumptions cannot be made. It is therefore suggested to be included in future research. One athlete indicated "other" as his reason, elaborating that his parents told him not to use PESS. A total of 29 athletes (24%) did not respond to this question.

In a French study by Peretti-Watel *et al*. [52] participant responses, from 458 French elite student-athletes between the ages of 16 and 24, were categorised into three clusters. The first cluster included those who thought doping to be dangerous and useless. The second cluster comprised those who thought doping was an accessory to sport and the last cluster included those who thought sporting success could not be achieved without doping. The majority (50%) of participants in their study fell into the first cluster, believing doping to be dangerous and useless. This did not completely agree with the authors' initial hypothesis; that athletes would value honesty and therefore find doping dishonest and secondly that they would rate performance and hence doping, as necessary due to them being athletes. [52] The French study's first cluster is comparable to the 47 (39%) athletes (PESS unnecessary) and 13 (11%) athletes (PESS health concerns) of the current study. Only a small portion (30%) of the French athletes preferred the second cluster, where they hought doping was an accessory to sport, followed by the third cluster (20%) where it is thought that sporting success cannot be achieved without doping.

Gradidge *et al.* [1] found additional reasons for not using, or the discontinuation of the use of PES in their study. They found that 42% (n=94) of participants said they would never consider using PES and 61% (n=94) indicated they did not think it was fair to use PES, while 39% thought it was always wrong to use PES. [1] This sample seems to be more concerned about the ethics surrounding the use of PES, while the sample in the current study appear to find PESS unnecessary and undesirable.

Attitudes toward doping in sport

Five statements were made regarding athletes' attitude toward doping in sport, to which the athletes had to respond to what extent they agreed with the statement. Their options were to: "strongly agree", "agree", "disagree" or "strongly disagree". These statements are summarised in Figure 4.17. The statements were: "The use of PESS has risen in the last 5 years", "The illegal use of substances by athletes has not been reported on enough by the media", "There are too many athletes using substances in my sport to enhance their athletic performance", "Sport organizations should offer educational programmes for athletes on the use of substances in sport.," and "There is a problem of banned substance use in my sport."

When asked if athletes thought there was a problem of banned substance use in their sport, 44% agreed, while 50% disagreed and 7% did not respond (Figure 4.17). It is disconcerting to see that the majority of participants disagreed with the statement that there is a problem with the use of banned substances in their sport. The athletes' attitudes are perceived as apathetic with regards to the use of prohibited PESS in sport, and specifically adolescent sport, where drug testing is limited to national events such as the Craven Week. [48] In the study by Gradidge *et al.* [1] most participants agreed that doping is cheating, but at the same time felt they were under significant pressure to perform and succeed, which they felt was reason enough to use PES. [1] In the case of high school athletes based in the central metropolitan area of Cape Town, one could argue that they showed ignorance regarding the use of PESS and therefore have a poor attitude.

The majority (85%) agreed that sport organizations should offer educational programmes for athletes on the use of substances in sport (Figure 4.17). Only 10% disagreed with this statement and 5% did not respond. There was a significant difference in viewpoint between the juniors and seniors in this regard ($\chi^2 = 6.70$; $p = 0.035^*$; d.f. = 2). Thus the proportion of athletes who answered "Strongly agree" for grades 9 and 10 (42.6%) was significantly different to the proportion of grades 11 and 12 athletes (62.9%). One could argue that the seniors place more value on educational programmes, as they are experiencing pressure to perform in sport and are therefore using, or are contemplating using PESS, and thus need more information regarding PESS use. When comparing this result with that of Gradidge *et al.* [1] based in Johannesburg, it is interesting to note that the majority of their participants (81%) did not think they needed to be provided with more education on PESS and doping (figure 2). However, 46% of their participants strongly agreed with the

statement that "sport organizations should offer educational programmes for athletes on the use of substances in sport", while only 12% of the participants disagreed with this statement (figure 3). [1] They also found participants acknowledging the use of PESS. It may be argued that participants in Johannesburg have more exposure to PESS and that there are already certain educational programmes in place, thus the discrepancy between our Northern and Southern findings. One can also not ignore socio-economic differences between the two samples, since Johannesburg is seen as the heart of South Africa's economy, however this was not one of the current study's objectives. These differences in socio-economic status and its effect on attitudes toward PESS use should be evaluated in future research.

Athlete responses were equal regarding the statement that too many athletes are using substances in their sport to enhance athletic performance. Forty-six percent agreed with the statement while 47% disagreed and 7% did not respond (Figure 4.17). Interestingly, Gradidge *et al.* [1] found a similar response in their study, where the same percentage of their respondents both agreed (30%) and disagreed (30%) with the statement that there are too many athletes using substances to increase performance. From their sample 27% strongly agreed with this statement while 13% strongly disagreed. This again supports the current study's hypothesis that the sample has a poor attitude toward PESS as the majority appear to dismiss the issue of PESS use by adolescent athletes.

The majority of respondents (70%) agreed that the illegal use of substances by athletes has not been reported on enough by the media, while 25% disagreed and 5% did not respond (Figure 4.17). This is interesting as there have been many incidents reported in the media, especially since 2010. This also shows that they are not familiar with SAIDS, as SAIDS publish reports of recent athlete doping cases on their website. They communicate the PESS involved, as well as the outcome of the case, whether it is suspension from sport participation or a TUE grant. [28] A very small amount of athletes indicated that they used magazines (n=11) as a source of information, however 19 athletes mentioned Sports Illustrated magazine as a publication from which they could gather information about PESS. Earlier in the text, reference was made to a Sports Illustrated article on the topic of PESS where adolescent rugby players state that there is a problem with the use of PESS in rugby. [48] This not only indicates a poor attitude toward PESS, but also poor knowledge about PESS.

Lastly, 76% of the athletes agreed that the use of PESS has risen in the past five years while 16% did not agree and 8% did not respond (Figure 4.17). Junior and senior point of view did not differ

significantly when tested using chi-square for equal proportions ($\chi^2 = 1.56$; $p = 0.459$; d.f. = 2). This was discussed in detail under the heading: *General perception and knowledge of prohibited substances.*

Limitations of the study

The main limitation of this study was the small sample size of the population. As a result there was relatively low power to detect differences between groups.

The use of a survey to establish true use of PESS is also a limitation on its own. Questionnaires are often employed in epidemiological research, as is the case in this study. [53] When administering questionnaires there is the risk that the participant will not fill in the questionnaire correctly (as seen in the current study) or not provide truthful answers due to fear of recognition (even in the case of guaranteed anonymity). Athlete's definitions of doping also differ as was seen in the research done by Lentillon-Kaestner. [53] They found that the definition of doping and the type of question (open-ended versus closed-ended) used resulted in a significant difference in the reporting of PESS use. When using closed-ended questions, with a list of doping substances to select from, athletes stand a smaller chance of "forgetting" the substances they use, compared to open-ended questions. However, using a list of banned substances might also lead to under-reporting if all substances are not included on this list. Therefore, when compiling a questionnaire for research, all of these factors should be considered in detail. [53]

CHAPTER 6 – CONCLUSION AND RECOMMENDATIONS

This study documents the general perception and knowledge of PESS by male high school elite athletes, with the focus on five major sporting codes. Contrary to our hypothesis that adolescent athletes would prefer to gather information about PESS from non-medical industries and would rather ask their peers or consult the internet, we found that the majority would prefer to ask a pharmacist (21%) followed by a biokineticist (16%) and then the internet (16%). As hypothesized, athletes' general perception and knowledge was found to be poor. This is highlighted by their lack of knowledge of SAIDS and WADA, and the valuable information that can be acquired from both of these organizations' websites regarding PESS. In spite of this, many claimed to be aware of the punishment for doping offences in sport – this appears contradictory. Most of the athletes felt that the use of prohibited substances in sport was unethical (80%), most thought the use of PESS was increasing (89%) and that athletes were being pressured to use PESS (51%). However, the majority indicated that they werenot familiar with the prohibited list of substances and supplements available from WADA (68%).

Only a small number of schools agreed to participate in the current study, which is a major limitation to our research. It is recommended that future researchers seek alternative means of increasing participation in such research. A suggestion would be to contact SAIDS to aid in educating school principals and convincing schools to participate in this important research.

It is encouraging to observe that the majority of participants chose a pharmacist as their first choice source of information regarding PESS use. This is an important finding as emphasis can now be placed on ensuring pharmacists and biokineticists are well educated regarding adolescent PESS use. In addition to this, they can provide them with knowledge and information pertaining to anti-doping campaigns. Pharmacists should have sufficient knowledge regarding the pharmacological actions of various supplements and should provide guidance to athletes when choosing supplements. Even though pharmacists may not necessarily know which supplements and substances are banned by WADA, they could still aid the young athlete in making educated decisions about PESS, instead of the athlete consulting the internet as an information source.

Only 16% of the current study's sample indicated the internet as their first choice source of information on PESS and this is in significant contrast to the 74% of athletes in Johannesburg who prefer gathering information from internet sites as shown by Gradidge and partners. [(1)] Although the

internet can provide one with a vast amount of information, it is preferred that adolescents gather information from registered medical professionals instead. The researchers believe that organizations such as SAIDS and WADA can help adolescents in this regard as both of these organizations have informative websites which adolescent athletes can use to gain information about PESS. [26] [28]

There were several differences noted in the participants' general perception and knowledge toward PESS between the current Cape Town-based study and that of the study based in Johannesburg. [1] [7] The Johannesburg based participants seemed to experience a higher amount of pressure to perform and thus use PESS, in comparison to the current study. This may also be the reason why the researchers found no serious PESS use in the current study. Gradidge *et al.* [7] found that their Johannesburg-based participants acknowledged the use of illegal PES including anabolic steroids, growth hormone and adrenaline. [7] Another difference noted between the two provinces was that a higher proportion of participants in the current study, believed that a drug testing programme would prevent the use of PESS in schools, compared to the Johannesburg participants. The major difference noted, and one which should be addressed urgently is the fact that few participants in the current study carried any knowledge of the substances prohibited by WADA, while the Johannesburg-based participants indicated that they were fairly familiar with this list. It seems that the Johannesburg-based participants were better educated regarding PESS, whilst the Cape Town-based participants were perceived as being apathetic regarding PESS use and the possible consequences thereof. It could also be argued that Cape Town athletes did not indicate any prohibited PES use, and are therefore unfamiliar with the prohibited list of substances. However, this only emphasizes the need for further research to determine this. It is possible that socio-economic status could be reason for most of the differences mentioned between the Cape Town and Johannesburg based samples.

The following is recommended:

- Further research, including significantly more schools, to look at the prevalence of PESS use by high school learners (both athletes and non-athletes), as well as their knowledge, perception and attitude toward the use of PESS, nationally.
- Future researchers should contact their provincial Department of Education in order to assist in obtaining schools to participate in their investigation in this regard. SAIDS could be asked to help with the education of school principals regarding their intended research and thus increasing potential participation.

- Similar studies should be done in other provinces of South Africa to investigate PESS use by high school athletes. This research could then be compared at a national level.
- Socio-economic status should be included in such investigations and compared regarding the use of PESS. Knowledge, perceptions and attitudes toward PESS could also be investigated here.
- Persons in the medical community such as pharmacists, biokineticsts and others should be informed of WADA and SAIDS (if they are not already aware) to help in informing and educating athletes (adolescents or adults).
- Information provided by various internet sites (perhaps starting with the ones mentioned in this study) should be evaluated for their safety and efficacy in disseminating information about PESS to adolescents.

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CHAPTER 9 – ADDENDUMS

ADDENDUM A:
QUESTIONNAIRE

University of the Witwatersrand

Centre for Exercise Science and Sports Medicine

Performance Enhancing Substance and Supplement Use in Cape Town

The following survey is to investigate the use of performance enhancing substances and supplements by High School sport participants in Cape Town. It is an anonymous and voluntary survey and you may withdraw at any time. Please ensure that your name does not appear on the questionnaire to guarantee confidentiality.

Please read the following questions carefully. Mark the correct blocks or when asked, please write your answer. Please do not communicate with fellow participants when filling in the questionnaire. Should you have any questions please do not hesitate to ask the person in charge.

Your participation in this important study is greatly appreciated!

SECTION ONE: PERSONAL BACKGROUND INFORMATION

This section is to gather background information about you, personal details such as you name should be omitted to guarantee confidentiality.

Date of Birth | | | | | | |

Age | | |

What grade are you in?

- ☐ 10th Grade
- ☐ 11th Grade
- ☐ 12th Grade

1.4 Indicate the ONE main sport you participate in

- ☐ Rugby
- ☐ Cricket
- ☐ Swimming
- ☐ Athletics
- ☐ Hockey
- ☐ Soccer
- ☐ Other

1.5 What is your Ethnicity?

- ☐ Black/African
- ☐ Coloured
- ☐ Indian
- ☐ White/Caucasian

SECTION TWO: GENERAL PERCEPTION AND KNOWLEDGE OF PROHIBITED SUBSTANCES

This section will ask questions about your knowledge of prohibited substances

2.1 Do you think that the use of prohibited substances in sport is unethical?
- ☐ Yes
- ☐ No

2.2 Do you think the use of prohibited substances in sport is increasing?
- ☐ Yes
- ☐ No

2.3 Do you think athletes are being pressured to use prohibited substances? (By coaches, media, their parents etc.)
- ☐ Yes
- ☐ No
- ☐ Unsure

2.4 Do you think that a drug testing programme will prevent the use of prohibited substances in school sport?
- ☐ Yes
- ☐ No
- ☐ Unsure

2.5 Are you familiar with the current prohibited list of substances and supplements as indicated by the World Anti-Doping Agency?
- ☐ Yes
- ☐ No
- ☐ Unsure

2.6 Are you aware of the punishment for doping offences in sport?
- ☐ Yes
- ☐ No
- ☐ Unsure

2.7 From whom would you gather information about doping in sport, should you want to gather such information?
Choose THREE below and number: 1 = applies best, 2 = applies second best, 3 = applies less

- ☐ Pharmacist
- ☐ General Practitioner
- ☐ Personal Trainer
- ☐ Coach
- ☐ Biokineticist
- ☐ Parent
- ☐ Sibling
- ☐ Internet
- ☐ Books
- ☐ Magazines
- ☐ Videos
- ☐ I do not gather such information
- ☐ Other (please specify)

_____

2.8 List the publications (i.e. Magazines or Newspapers) that contain advertisements and information about doping in sports that you are familiar with.

_____

2.9 Which internet sources do you use to get information about substance and supplement use? (Please list the names of the sites or addresses)

_____

SECTION THREE: SUBSTANCE USE

3.1 Are you currently using, or have you used performance enhancing substances and supplements in the past year?

- ☐ Yes
- ☐ Yes, but I have discontinued (proceed to question 3.10)
- ☐ No (proceed to question 3.10)

3.2 How often do you use performance enhancing substances and supplements?

- ☐ Daily
- ☐ Weekly
- ☐ Before sport
- ☐ During sport
- ☐ After sport

3.3 What is your PRIMARY purpose for using performance enhancing substances and supplements? Choose THREE below and number: 1 = applies best, 2 = applies second best, 3 = applies less

- ☐ Recreational or social reasons
- ☐ Assists me in coping with the stresses of sport
- ☐ Assists me in coping with life's stresses
- ☐ Helps to improve my sport performance
- ☐ Makes me feel good
- ☐ To reduce food craving or decrease body weight
- ☐ To enhance recovery
- ☐ To counteract tiredness
- ☐ To meet nutrient needs
- ☐ To provide more energy
- ☐ Don't know
- ☐ Other (please specify)

_____

3.4 When did you start using performance enhancing substances or supplements?

- ☐ Primary School grade _____
- ☐ High School grade _____

3.5 Are your coaches aware that you are using performance enhancing substances and supplements?

- ☐ They are aware
- ☐ They are probably aware
- ☐ I do not know if they are aware or not
- ☐ They are probably not aware
- ☐ They are not aware

3.6 Do you have any questions relating to the supplement or substance that you are currently using?
Please state briefly

_____

3.7 Do you have any questions relating to any other supplement or substance? Please state briefly

_____

3.8 Which of the following substances or supplements do you use?
Please mark ALL that apply to you, and give an indication of the dosage (e.g. 10mg per day)

SUBSTANCES	Mark	Dosage
Anabolic Agents		
Anabolic-androgenic steroids		
Hormones and related substances		
Erythropoietin (EPO)		
Growth hormone (hGH)		
Insulin-like Growth factors (IGF-1)		
Gonadotropins		
Insulins		
Corticotropins		
Asthma medication-pump or other related tablets		
Hormone antagonists and modulators (Aromatose inhibitors)		
Diuretics and other masking agents (Bumetanide)		
Stimulants		
Adrenaline		
Ephedrine		
Pseudoefphedrine (Sudafed)		
Cathine		
High doses of Caffeine (Redbull or lage quantities of coffee)		
Amphetamines		
Narcotics		
Cocaine		
Heroin (diamorphine)		
Morphine		
Cannibinoids		
Marijuana (dagga)		
Glucocorticosteroids		
Alcohol		
Beta-blockers		
Other Substances (please specify)		

☐ I do not use any substances

SUPPLEMENTS	Mark	Dosage
Creatine		
Carbohydrate supplements (in gel-, bar-, or powder form)		
Protein supplements		
Oxygen therapy		
Energade / Powerade / other sportsdrinks		
Vitamins		
Iron		
Non-vitamin mineral supplements		
Other supplements (please specify)		

☐ I do not use any supplements

3.9 Do you have any knowledge of how the substances that you are using function?

☐ Yes
☐ No
☐ Unsure

3.10 If you DO NOT use, or have DISCONTINUED using performance enhancing substances and supplements, what is the ONE PRIMARY motivating factor why?
Choose THREE below and number: 1 = applies best, 2 = applies second best, 3 = applies less

☐ I have recovered from injury / sickness
☐ It is not necessary to take them
☐ I am afraid of what it may do to my health
☐ It is against my beliefs or morals
☐ People might pass judgment
☐ They are difficult to come by
☐ Something bad happened while I was using it
☐ I did not experience the desired outcomes
☐ I was concerned about what would happen if I was caught
☐ I do not desire to use it
☐ The coaches have made a rule not to use it
☐ I cannot afford it
☐ My sport performance suffered
☐ I was concerned about getting addicted to it
☐ I was afraid of becoming ineligible
☐ Other (please specify)

_____

SECTION FOUR: ATITUDES TOWARDS DOPING IN SPORT

Kindly rate the degree to which you agree or disagree with the following sports related statements

1 = Strongly agree **2 = Agree** **3 = Disagree** **4 = Strongly disagree**

Mark number with an X

4.1	There is a problem of banned substance use in my sport	1	2	3	4
4.2	Sport organisations should offer educational programmes for athletes on the use of substances in sport	1	2	3	4
4.3	There are too many athletes using substances in my sport to enhance their athletic performance	1	2	3	4
4.4	The illegal use of substances by athletes has not been reported on enough by the media	1	2	3	4
4.5	The use of performance enhancing substances and supplements has risen in the last five years	1	2	3	4

Thank you kindly for participating in this study!

Please ensure that your name is NOT anywhere on this questionnaire

If you are fully satisfied with your answers please fold the paper in half and put it in the box

Kind regards,

The researchers

ADDENDUM B:
INFORMATION SHEET TO SCHOOL PRINCIPALS AND CONCENT FORM

University of the Witwatersrand

Centre for Exercise Science and Sports Medicine

PO Box 1044
Stellenbosch
7599
Date

Address of school
Cape Town
Western Cape, South-Africa

Dear Mr/Mrs *Principal's Name*

I am currently conducting a study in conjunction with the University of Witwatersrand, Johannesburg, South Africa, to identify whether performance enhancing substances and or supplements is being used by first team high-school athletes in the metropolitan of Cape Town.

Athletes from the first rugby, -cricket, -hockey, and -soccer teams as well as track and field athletes and swimmers will be asked to complete a questionnaire to ascertain their attitudes toward and knowledge of performance enhancing substances and supplements. Confidentiality of each participant as well as each school participating is guaranteed since the data will be analyzed in group format.

Each athlete's parents or guardians will have to grant permission for their child to participate in this study. The athletes themselves will not be forced to participate and will sign a child assent form that they agree to participate in the study.

The participation of your school's athletes will be greatly appreciated. Be assured that every effort will be made to ensure that the participant's normal school curriculum will not be disrupted.

Ethical clearance has been obtained from the Department of Education in the Western Cape to perform this study. You may contact Dr. Audrey Wyngaard from the Department to confirm this.

We hope to publish the results of this study in a scientific medical journal.

Please feel free to contact any of the researchers should you have any questions or concerns regarding this study.

Mrs. Mariaan van Aswegen
079 407 1006

Prof. Yoga Coopoo
083 415 7466

Principal Consent Form

I have read and comprehended the information on the research that is being done on the use of performance enhancing substances and supplements in high-schools of Cape Town.

I give the researchers permission to conduct this study at ***School's Name***

Signature of Principal Date

Or

I do not give the researchers permission to conduct this study at ***School's Name***

Signature of Principal Date

ADDENDUM C:
PARENT OR GUARDIAN INFORMATION SHEET AND CONSENT FORM

University of the Witwatersrand

Centre for Exercise Science and Sports Medicine

Dear Parent / Guardian,

I hereby request your permission to allow your son to participate in a survey investigating the use of performance enhancing substances and supplements in high schools in Cape Town.

The questionnaire will take 10-15minutes of your son's time and will not interrupt his normal school curriculum. Your son will not reveal his identity on the questionnaire in order to maintain confidentiality. Confidentiality will further be established by keeping all data in a locked environment and the data will be analysed as a group.

The participation of your son will be greatly appreciated. Should they still prefer not to participate, their wish shall be respected. Before your son will be allowed to participate, he will have to agree in writing on the child assent form.

Permission to do this study has been granted by the Department of Education and by the Principal of your son's school. The results may be published in a scientific medical journal.

Kindly respond and sign this consent form in the provided spaces below and return this form by requesting your son to give the completed form to their coach or individual responsible for school sport.

Kind regards

The researchers

Mariaan van Aswegen

079 407 1006

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Prof. Yoga Coopoo

083 415 7466

Parent / Guardian Consent form

I have read and comprehended the information on the research that is being done on the use of performance enhancing substances and supplements in high-schools in Cape Town.

I give permission that my son may participate in this study.

Name of Minor	Minor's signature
Signature of Parent/Guardian	Date

Or

I **do not** give permission that my son may participate in this study.

Name of Minor	Minor's signature
Signature of Parent/Guardian	Date

ADDENDUM D:
ATHLETE INFORMATION SHEET AND ASSENT FROM

University of the Witwatersrand

Centre for Exercise Science and Sports Medicine

Dear athlete,

Researchers at the University of Witwatersrand, Johannesburg, South-Africa, are trying to learn more about the use of performance enhancing substances and supplements amongst elite high-school athletes in Cape Town.

We aim to conduct a survey in which you complete an anonymous questionnaire. This questionnaire will ask which, if any, performance enhancing substances and supplements are being used by yourself. It will also aim to identify the knowledge base and attitudes of those involved regarding the use of these aids in sport.

Participation in this study is entirely voluntary and you may withdraw at any stage. We do encourage you to discuss your participation in this study with your parents before deciding whether or not to participate, as they too will have to grant their permission for you to participate.

You are encouraged to ask as many questions as necessary to make sure that you comprehend the nature of the study before signing this form.

Kind regards

The researchers

Mariaan van Aswegen
079 407 1006

Prof. Yoga Coopoo
083 415 7466

Athlete's Assent form

I have read and comprehended the information on the research that is being done on the use of performance enhancing substances and supplements in high schools in Cape Town.

I consent to volunteering to participate in this study.

Student's signature _____ Date _____

Or

I **do not** consent to volunteering to participate in this study.

Student's signature _____ Date _____

ADDENDUM E:
WESTERN CAPE EDUCATION DEPARTMENT RESEARCH APPROVAL LETTER

Navrae
Enquiries Dr A.T Wyngaard
IMibuzo
Telefoon
Telephone 021 467 9272
IFoni
Faks
Fax (021) 425-7445
IFeksi
Verwysing
Reference
ISalathiso 20100727-0010

Wes-Kaap Onderwysdepartement

Western Cape Education Department

ISebe leMfundo leNtshona Koloni

Mrs Mariaan Van Aswegen
18 Flamingo Street
Onderpapegaaiberg
Stellenbosch
7600

Dear Mrs Mariaan Van Aswegen

Research Proposal: the knowledge, attitudes and use of performance enhancing substances and supplements among male high school first team athletes in the metropolitan area of cape town south africa

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from 01 August 2010 till 30 September 2010.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

    The Director: Research Services
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000

We wish you success in your research.

Kind regards.
Signed: Audrey T Wyngaard
for: HEAD: EDUCATION
DATE: 27 July 2010