

**THE DEVELOPMENT OF A MEASURING INSTRUMENT
TO DETERMINE THE KNOWLEDGE
AND ATTITUDES OF
ELITE ADOLESCENT ATHLETES
ABOUT ERGOGENIC AIDS AND BANNED SUBSTANCES**

by

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DECLARATION

I, Amanda Welthagen, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or has to be submitted for another degree at this or any other university.

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This dissertation is submitted for the degree of Masters of Human Movement Science in the School of Allied Health Professions in the Faculty of Health Sciences of the University of the Free State, Bloemfontein.

A handwritten signature in black ink, appearing to read 'Welthagen', with a small circular mark below it.

Ms A. Welthagen

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ABSTRACT

The use of sports supplements and banned substances amongst adolescent athletes is high. The literature review reveals that supplement and banned substance use is a complex health and social issue. Athletes use supplements in the belief that it improves performance in various ways, although there is a lack of scientific evidence of the efficacy and safety of nutritional supplements. Health risks exist with regard to using supplements due to lack of quality control and contamination with banned or dangerous substances. Contamination can cause inadvertent doping offences. A continuum from supplement use to banned substance and recreational drug use was identified. The use of banned substances have pronounced health, psychological and socio-ethical risks. The risk of getting ostracised for a doping offence is probably limited to elite sports.

Banned substance use is driven by the belief that others are using it and not following suit reduces the chances of athletic success. Especially adolescents are vulnerable to controlling influences from significant others. Athletes with an external locus of control are more prone to use supplements and banned substances. Moral disengagement has been associated with the use of banned substances.

The zero tolerance (ZT) approach to doping by the World Anti-Doping Agency (WADA) has not reduced the prevalence of doping. The harm reduction (HR) approach accepts the reality of widespread doping in sports and approaches the problem with the social drivers of doping in mind.

Many athletes are willing to use substances to achieve their goals even at the expense of their health and wellbeing. It is therefore important to not only evaluate the prevalence of use in the adolescent athlete population, but to develop effective preventative interventions. Understanding adolescents' knowledge, their preferred sources of information, attitudes and beliefs about sports supplements and banned substances are required in this regard. Therefore, the aim of this study was to develop a reliable measuring instrument (questionnaire) to be used in South Africa to assess the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances.

The study was done in two phases. A mixed method research model was used to gather both quantitative and qualitative data. In the first phase of the study a questionnaire was

developed and the relevancy and validity of the questionnaire ensured by means of qualitative research methods. In the second phase, the questionnaire was tested with a cohort of elite adolescent athletes of the University of the Free State Athletics Club, where both quantitative data (closed-ended questions) and qualitative data (open-ended questions) about the habits and knowledge of the cohort were gathered and analysed. The questionnaire was assessed as functional and user friendly.

The majority of the athletes in the test population (90%) reported the use of sports supplements in the previous six months; however, all the participants (100%) claimed that they would refuse the use of banned substances even if its use was encouraged by a coach or trainer. The main reasons for using sports supplements were reported as "to increase energy" (65%), "aiding recovery" (45%), "to improve endurance" (35%), "to improve strength" (20%) and "to improve sporting performance" (15%). Thirty-five percent (35%) of the participants indicated that they were not aware of any dangers of sports supplements. Supplement information was obtained from the internet (35%), coaches (30%) and friends (30%).

This complex social and health issue requires in-depth analysis and intervention, including holistic educational programmes. If these factors are addressed and their effects monitored, a positive contribution could be made to the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances in South Africa.

Key words: Ergogenic aids, banned substances, knowledge and attitudes, adolescent athletes

LIST OF ABBREVIATIONS

AAS	Anabolic Androgenic Steroids
ALS	Amyotrophic Lateral Sclerosis
EPO	Erythropoietin
FCE	False Consensus Effect
FIMS	International Federation of Sports Medicine
HMB	β-hydroxy-β-methylbutyrate
HR	Harm reduction
IAAF	International Association of Athletics Federation
Ifs	International Federations of sports
IOC	International Olympic Commission
PES	Performance Enhancing Substances
PESS	Performance Enhancing Substances and Supplements
SAIDS	South African Institute for Drug-free Sports
SARU	South African Rugby Union
USA	United States of America
WADA	World Anti-Doping Agency
ZT	Zero Tolerance

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CHAPTER 1

INTRODUCTION

1.1 SCOPE OF RESEARCH

The use of sports supplements has become increasingly popular among elite athletes and adults, as well as among athletic and non-athletic adolescents (El-Hammadi & Hunien, 2013). On the surface the use of dietary supplements to optimise sports performance seems to be a reasonable practice, but in-depth consideration reveals a significant public health and social issue. The use of sports supplements is associated with certain risks, including health and safety risks, contamination with banned substances, legal risks and psychosocial risks. The risk of testing positive for a banned substance from the use of contaminated sports supplements is a reality athletes have to face (Maughan, King & Lea, 2004). This is of great concern, because of the increasing number of young South African athletes who test positive for the use of banned substances (Gradidge, Coopoo & Constantinou, 2010). It is therefore appropriate to investigate and discuss sports supplements and banned performance enhancing substances in the same context.

The main aims of prohibiting performance enhancing methods in sports are not only to prevent athletes from gaining unfair competitive advantage over their competitors, but to preserve the principle of "sports and fair play". Smith and Stewart (2008) also mention the importance to protect athletes' health against potential hazards of doping. The International Olympic Committee (IOC) mandate requires that doping education be made an integral part of every country's sports development programme. The widespread use of sports supplements, despite the absence of proven efficacy and the risk such practices carry, underscores the need for ongoing, appropriate, and focused educational initiatives in this area (Huang, Johnson & Pipe, 2006).

Greater knowledge of sports supplements can be linked to the decreased use thereof (Massad, Shier & Koceja, 1995). Research on the effective counselling of adolescents with respect to doping identified the importance of belief systems and social influences that affect behavioural outcomes, and personal control factors affecting behavioural choices (Lucidi, Zelli, Mallia, Grano, Russo & Violani, 2008). The life cycle model of performance enhancement suggests that for educational purposes, instead of focusing on the actual

engagement in prohibited performance enhancing practices, deterrence strategies are likely to be more effective. This should be done by targeting the main factors influencing athletes at the appropriate life stage (Petróczi & Aidman, 2008). Intervention measures against doping in sports should be aimed at enhancing athletes' specific knowledge to increase their anti-doping attitude (Wanjek, Rosendahl, Strauss & Gabriel, 2007). Dunn, Eddy, Wang, Nagy, Perko and Bartee (2001) suggest that intervention programmes should focus on the attitudes, intentions and reasons that athletes use sports supplements as the basis for the development of intervention programmes. Such programmes should simultaneously educate athletes about the risks of using sports supplements. This educational process should start at a young age and be sustained throughout their entire sporting career (Dvorak, Bauma, Botre, Broseaus, Budgett, O'Frey, Geyer, Harcourt, Ho, Howman, Isola, Lundby, Marclay, Peytavin, Pipe, Pitsiladis, Reichel, Robinson, Rodchenkoc, Saugy, Sayegh, Segura, thevis, Vernec, Viret, Vouillamoz & Zorzoli, 2014). It is important that athletes are well informed to enable educated decisions about ergogenic aids and supplements (Van Aswegen, 2013). Educational programmes need to be implemented with young athletes to timeously establish the correct attitudes and behaviours toward doping and should involve all those who play a role (e.g. doctor, coaches and family) in athletes' decision-making (Morente-Sánchez & Zabal, 2013). Therefore, effective education on supplement use and doping requires one to understand each athlete's level of knowledge and attitudes about the topic.

Dvorak *et al.* (2014) highlighted the need for applied research on doping; effective analysis; improved efficiency and evidence-based educational programmes to solve the problem of unsafe supplement use and doping. Very little research has been done in South Africa regarding the use, knowledge and perceptions toward performance enhancing substances and supplements (PESS) in any population.

1.2 THE AIM OF THE STUDY

The aim of this study was to develop a reliable measuring instrument to be used in South Africa to assess the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances. For the secondary aim of the study, a pilot study was conducted with a cohort of adolescent athletes from the Free State University Athletics Club, to test the functionality of the questionnaire and to obtain data on various aspects of sports supplements and banned substances.

1.3 THE GOAL OF THE STUDY

The end goal is to provide insight into the adolescent athlete's knowledge of and attitudes regarding the use of ergogenic aids and banned substances in order to design and implement an effective education programme on these topics.

1.4 LAYOUT OF THE DISSERTATION

The dissertation consists of five chapters. Chapter one presents the introduction and aims of the study. Chapter two provides an overview of existing literature related to the topic. In chapter three the development and piloting of the measuring instrument is discussed. Chapter four presents the conclusions and recommendations for future research. Chapter five reflects on the research and the lessons learned.

CHAPTER 2

ARTICLE 1: CONSIDERATIONS FOR EFFECTIVE EDUCATION ABOUT DIETARY SUPPLEMENT USE AND DOPING IN ADOLESCENT ATHLETES

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Abstract

The use of sports supplements and banned substances amongst adolescent athletes is high. A literature review reveals that supplement and banned substance use is a complex health and social issue. Athletes use supplements in the belief that it improves performance in various ways. There is a lack of scientific evidence of the efficacy and safety of nutritional supplements. Risks of using supplements include health risks due to lack of quality control and contamination with banned or dangerous substances. Contamination can cause inadvertent doping offences. A continuum from supplement use to banned substance and recreational drug use was identified. The use of banned substances has pronounced health, psychological and socio-ethical risks. The risk of getting sanctioned for a doping offence is limited to elite sports. Banned substance use is driven by the belief that others are using it and that not following suit reduces the chances of athletic success. Adolescents are vulnerable to controlling influences from significant others. Athletes with an external locus of control are more prone to the use of supplements and banned substances. Moral disengagement has been associated with the use of banned substances. The zero tolerance (ZT) approach to doping by the World Anti-Doping Agency (WADA) has not reduced the prevalence of doping. The harm reduction (HR) approach accepts the reality of widespread doping in sports and approaches the problem with the social drivers of doping in mind. This complex social and health issue requires in-depth analysis and intervention, including holistic educational programmes.

2.1 INTRODUCTION

Performance enhancing substances have been used by man for thousands of years (Mottram, 2002). More recently, the popularity and increased specialisation of sports in adolescent athletes have contributed in creating a culture where athletes experience the desire to win at all costs (Metzl, Small, Levine & Gershel, 2001). The desire to play sports at a higher level and the ever-increasing pressure on school level athletes to perform at top level in their chosen sports discipline have led to a considerable increase in the use of dietary supplements among adolescent athletes (Metzl, Small, Levine & Gershel, 2001; Godo, Graves, O’Kroy & Hecht, 2006). On the surface the use of dietary supplements to optimise sports performance seems to be a reasonable practice, but in-depth consideration reveals a significant public health and social issue.

A literature review focusing on adolescent athletes was conducted on topics relevant to sports supplement and banned substance use. EbscoHost, Medline, Google Scholar and University of the Free State Library databases were used as search engines. The key issues associated with supplement use in adolescents are identified; reasons for its widespread use are explored; and the benefits and risks of supplement use are considered.

The association between supplement use and banned substances are discussed and strategies to reduce doping and promote rational and safe supplement use are presented. The article concludes with recommendations regarding effective approaches and educational strategies on the issue. This review is part of a larger research project approved by the Ethics Committee of the Faculty of Health Sciences, University of the Free State (ECUFS 138/2014).

2.2 DEFINITIONS

Sports supplements are defined as sources of nutrients and/or other substances, marketed and sold as such in the field of amateur and/or professional sports, with a nutritional or physiological effect of supplementing the normal diet directly or indirectly by altering or enhancing body composition, sporting performance, and/or assisting with recovery following sporting activity (Claassen, 2011). Specialised sports supplements include products like sports drinks, carbohydrate gels, meal replacements and sports bars that act as a convenient source of energy (Baume, Hellemans & Saugy, 2007). Ergogenic sports supplements aim at

enhancing sports performance and include products like caffeine, creatine, β -hydroxy- β -methylbutyrate (HMB), glutamine, carnitine, ginseng and amino acids (Baume *et al.*, 2007). The World Anti-Doping Agency (WADA) has banned the use of certain methods and drugs that may enhance performance, harm the athlete or violate the spirit of sports (Hughes, 2015). The most commonly used banned substances are the anabolic androgenic steroids (AAS) but other substances such as peptide hormones, including human growth hormone, erythropoietin (EPO), insulin and others are also used (Laure & Binsinger, 2005; Hughes, 2015).

2.3 ADOLESCENTS' USE OF DIETARY SUPPLEMENTS AND BANNED SUBSTANCES – HOW BIG IS THE PROBLEM?

Internationally, dietary supplement use has been reported to occur in between 59% and 100 % of young athletes (Nieper, 2005; Petróczi & Naughton, 2008; Pumpa, Madigan, Wood-Martin, Flanagan & Roche, 2012). Limited African data are available about adolescents' use of dietary supplements and banned substances. Only four studies on nutritional supplement use amongst adolescents in South Africa could be found in existing literature. A prevalence of 27%-90% use of nutritional supplements was reported (Gradidge, Coopoo & Constantinou, 2010; Van Aswegen, 2013; Nolte, Steyn, Kruger & Fletcher, 2014; Welthagen, 2016).

Concerning banned substance use, a similar prevalence of 4% was reported internationally (Eaton, Kahn, Kinchen, Ross, Hawkins, Harris, Lowry, Mcmanus, Chyen, Shanklin, Lim, Grunbaum & Wechsler, 2005; Laure & Binsinger, 2005). Two studies reported 3,9% and 5% prevalence amongst adolescent athletes in South Africa, including androgenic anabolic steroids (AAS), growth hormone, stimulants and insulin (Gradidge, Coopoo & Constantinou, 2010; Nolte, Steyn, Kruger & Fletcher, 2014).

Supplement use, and particularly use of banned substances, are often underreported (Pitsch & Emrich, 2012; Dimeo & Taylor, 2013; Mallia, Lucidi, Zelli & Violani, 2013; De Hon, Kuipers & Van Bottenburg, 2014), emphasising its significant but undetermined use.

2.3.1 The risks involved with dietary supplement and banned substance use

Beneficial effects have been proven on a number of nutritional sports supplements, such

as protein and amino-acids, creatine, caffeine, alkalinising agents, and central nervous system acting compounds (Maughan, Despiesse & Geyer, 2007). However, certain health and safety, as well as psychosocial and legal risks have been documented. The risks involved in using banned substances are similar, but more pronounced.

2.3.1.1 Health and safety risks

On the whole there is a lack of scientific information on nutritional supplements and possible adverse effects of performance-enhancing substances (PES) (Morente-Sánchez & Zabal, 2013). In addition to the risk of ingesting contaminated preparations, the long-term side effects of most ergogenic substances are relatively unknown and the lack of reported side effects in short-term studies do not prove that such supplements are safe for use (Baume *et al.*, 2007). However, it is a known fact that dangerous substances can be found in over-the-counter sports supplements. (Baume *et al.*, 2007). Even simple protein supplements have been identified as posing possible health risks such as dehydration and increased stress on the liver and kidneys (Claassen, 2011; Maughan, 2013). Cardiovascular, neurological, metabolic and haematological problems have been postulated (Nieper, 2005; Caraci, Pistara, Corsaro, Tomasello, Sortino, Nicoletti & Copani, 2011). Furthermore, contamination of nutritional supplements due to lack of quality control in the industry may increase the risk of toxicity and allergic reactions (Nieper, 2005; Cohen, Travis & Venhuis, 2015).

2.3.1.2 Contamination

The sports supplement industry is largely unregulated. Even though dietary supplements are sold legally without a prescription, the safety of the products cannot be guaranteed. The vast majority of ingredients found in sports supplements have not been scientifically tested for efficacy or safety (Cohen, *et al.*, 2015). Furthermore, contamination of nutritional supplements by banned substances is a reality (Van der Merwe & Grobbelaar, 2004; Van der Merwe & Grobbelaar, 2005; Maughan, Despiesse & Geyer, 2007; Geyer, Parr, Koehler, Mareck-Engelke, Schanzer & Thevis, 2008). The obvious health risks include ingestion of unknown substances with potential harmful effects (Cohen, Travis & Venhuis, 2015). The legal risk of inadvertent doping because of contamination with a banned substance has been established (Geyer, Mareck-Engelke, Reinhart, Thevis & Schanzer, 2004; Van der Merwe & Grobbelaar, 2004; Van der Merwe & Grobbelaar, 2005; Atkinson, 2007; Maughan *et al.*, 2007). Two South African studies indicated that approximately 7% of supplements legally available on the market were

contaminated with banned substances (Van der Merwe & Grobbelaar, 2004; Van der Merwe & Grobbelaar, 2005). The International Olympic Committee (IOC) found that 14.8% of samples collected internationally contained prohormones not stated on the label (Geyer *et al.*, 2004). Prohibited contaminants include stimulants, anabolic androgenic steroids (AAS) and prohormones (Atkinson, 2007).

2.3.1.3 *Legal risks*

The legal risk of nutritional supplement or banned substance use is a potential WADA Anti-Doping Code violation. One has to distinguish between inadvertent doping by contamination or false labelling, and purposeful use of banned substances. According to the World Anti-Doping Code (WADA, 2015), an athlete is presumed guilty of doping if a prohibited substance is found in his/her urine or blood, irrespective of how it got there. Therefore, even when doping occurred inadvertently, the athlete remains liable for the ingestion of the banned substance, and if tested positive for a prohibited substance, may be ostracised (Claassen, 2011; WADA, 2015). Possession or sale of scheduled drugs such as AAS, for illegitimate or non-medical reasons, constitute legal offences. The WADA anti-doping testing programme is focused on elite and professional sports, and is highly unlikely to reach the majority of amateur athletes in the world.

2.3.1.4 *Psychosocial risks*

The World Anti-Doping Association (WADA, 2015) aims to protect and promote the “spirit of sports”, which reflect values such as ethics, fair play, honesty, respect for rules and laws, respect for self and other participants, character and education. Doping is in direct violation of this statement of intent. Adverse psychological effects of banned substance use in general include a greater risk of depression, lower self-esteem, dissatisfaction with personal appearance, and persistent feelings of guilt and shame (Lovstakken, Peterson & Homer, 1999; Bloodworth & McNamee, 2010). Testing positive for a banned substance can ruin an athlete’s reputation and sporting career (Claassen, 2011). Nevertheless, it has been shown that banned substance use is regarded as acceptable behaviour by many athletes (Lentillon-Kaestner & Carstairs, 2010).

Of great psychosocial concern is the gateway hypothesis, which suggests that the use of certain drugs serve as a gateway for the use of other drugs, started by using substances

of lower risk that introduce substances of higher risk (Kandel, 2002). It is for this reason that the use of dietary supplements and the use of banned substances by adolescent athletes need to be viewed along a continuum (Metzl *et al.*, 2001). A definite relationship between the use of banned substances for performance enhancement and nutritional supplementation has been established (Calfee & Fadale, 2006; Dodge & Jacard, 2006, Papadopolous, Skalkidis, Parkkari & Petridou, 2006; Lucidi *et al.*, 2008; Backhouse, Whitaker & Petroczi, 2013; Mallia *et al.*, 2013). Of even greater concern is the proven risk of this continuum to progress to general high risk behaviour, including the use of tobacco, alcohol and illicit recreational drugs (Yussman, Wilson & Klein, 2006).

The risks involved in supplement and banned substance use are compounded by the fact that athletes obtain their information on the topic from unreliable sources, such as the internet, friends, coaches, supplement labels or shop assistants (Welthagen, 2016).

2.3.2 Considerations in planning of educational programmes on nutritional supplements and banned substances

In order to reduce the risks involved in nutritional supplement and banned substance use the reasons for its use and current and/or alternative educational and anti-doping strategies should be considered.

2.3.2.1 *Why do adolescents use dietary supplements and banned substances?*

There are physical and psychosocial drivers for the use of nutritional supplements and banned substances. Dietary supplements are widely marketed, easily available and are presented as a safe way of improving sporting performance (Metzl *et al.*, 2001).

Even though the efficacy of very few nutritional supplements has been scientifically proven (Maughan *et al.*, 2007), there are a multitude of beliefs about improving performance in sports which encourage sports supplement use. These include that supplements assist with fatigue management (Laure & Binsinger, 2005); improve recovery after exercise (Laure & Binsinger, 2005; Erdman, Fung, Doyle-Baker, Verhoef & Reimer, 2007); increase energy (Erdman *et al.*, 2007); and improve and sustain strength and enhance endurance (Petroczi, Naughton, Mazanov, 2007) in order to improve performance. It is also believed that sports supplements

can prevent nutritional deficiencies and maintain health (Erdman *et al.*, 2007).

The current trend in many western populations to emphasise performance in sports has been well documented (Metzl *et al.*, 2001; Godo *et al.*, 2006, Laos & Metzl, 2006). The use of perceived beneficial nutritional supplements to assist in this quest to improve performance is a seemingly sound and very common practice (Maughan, 2007).

Adolescents are vulnerable to controlling influences to influence their decision-making (McNamee, 2009). The intent to use supplements include external social influences exerted by trainers, coaches and parents, all of whom have significant effects on adolescents' attitudes towards supplement use and on the development of supplement use as a subjective norm (Dunn *et al.*; 2001McNamee, 2009). Social-cognitive mechanisms which have been shown to direct adolescents' intention to use banned substances increase alongside stronger positive attitudes about doping; stronger beliefs that significant others would approve of their use; stronger convictions that doping can be justified; and a lower capacity to resist situational pressure or personal desires. Moral disengagement and stronger intentions were associated with adolescents who already used banned substances (Lucidi *et al.*, 2008). Aggressive marketing has also been shown to play a key role in attitudes towards dietary supplements and health behaviour – sometimes resulting in a negative (boomerang) effect on health protective behaviour (Bolton, Reed, Volpp & Armstrong, 2008).

People's perceptions and understanding of how the world functions have a significance influence on their decision-making styles and choices (Barkoukis, Lazarus & Tsorbatzoudis, 2014). For instance, people who attribute failure in competition to external reasons, such as a bad coach, are unlikely to exert efforts to improve their own performance (= external locus of control) (Weiner, 2010). On the other hand, if internal causes are seen as potential causes (= internal locus of control), people are more motivated to pursue their goals and achieve positive outcomes (Barkoukis *et al.*, 2014). Using performance enhancing substances to improve athletic performance is closely associated with an athlete's expectations about success in sports (Petróczi & Naughton, 2007; Petróczi & Aidman, 2008). It can therefore be argued that athletes who attribute success to external factors such as sports supplements or doping will be more prone to those practices than athletes with an internal drive to achieve success (Barkoukis *et al.*, 2014).

In the competitive and pressured environment of professional sports, young athletes may resort to utilising banned substances to gain the competitive edge and achieve success in

sports (Calfee & Fadale, 2006). Many users of banned substances believe that success in sports cannot be achieved without the use of banned substances (Laure & Binsinger, 2005; Bloodworth, Petróczi, Bailey, Pearce & McNamee, 2012). The demands of competing at a higher level and the associated possible economic gains may convince young athletes that doping is necessary to achieve success in sports and in life (Lippi, Franchini & Guidi, 2008). This belief system is driven to a large extent by the belief that champions and competitors are using legal or illegal performance enhancing substances. It has been proposed that athletes who believe that others are doping may be more likely to engage in such practices, called defensive doping, which can potentially create a damaging self-fulfilling prophecy (Kirkwood, 2012; Moston, Engelberg & Skinner, 2015; Petróczi, 2015).

Doping is not only prevalent among competitive athletes. Whilst performance enhancement to create a competitive edge is a major factor for doping use in young athletes, the increase of muscle mass to enhance physical appearance is a dominant factor for the adolescent non-athlete (Bloodworth *et al.*, 2012; Mallia *et al.*, 2013).

2.3.3 Approaches to doping and anti-doping

There has been no decline in the relative number of positive doping findings, despite the increased anti-doping effort (Petróczi, 2007). Current educational programmes have, therefore, been largely unsuccessful both globally and in South Africa.

Möller's (2010) working hypothesis is that the fight against doping – promoted as an initiative to cleanse sports of cheats – is at heart an attempt to redeem sports from itself. At the heart of this runs a fault line between the will to purity and the will to win. The current strategy against doping is one of zero tolerance (ZT model), decreed by WADA. This mission and policy are founded on three key objectives:

- The athlete's fundamental right to participate in a doping-free environment;
- to promote health, fairness and equality for all athletes; and
- to ensure harmonised and effective anti-doping programmes (WADA, 2015).

It is clear that this policy has neither been successful in eliminating doping, nor effective in protecting the health of athletes (Smith & Stewart, 2015). Furthermore, testing and sanctioning only reach an elite few athletes, and fail to address doping issues in other

populations, such as adolescent athletes.

Performance enhancing strategies, including the use of performance enhancing drugs, has been used throughout history (Mottram, 2002). The term “doping” only refers to the prohibited and detested end scale of otherwise acceptable performance enhancing strategies. Many athletes use performance enhancing drugs which do not appear on the WADA List of Banned Substances. It has been indicated that the significance of health and morality is greatly underestimated by athletes. Smith and Stewart (2015) explain that punitively driven deterrence is not successful because the underlying reason for using banned or legal performance enhancing drugs is the pursuit of improved performance, and not the desire to comply with rules. Even athletes who have rejected the use of banned substances participating at club level sports agree that a transition to the next level requires some additional substance use, including banned substances, as noted in cycling for example (Lentillon-Kaestner & Carstairs, 2010).

Blurred lines exist between many aspects of doping, including: legality/illegality, acceptable/unacceptable, equity/equality, and more importantly, between goals and behaviour (Petróczi, 2015). Lippi *et al.* (2008) believe that pain, sacrifice and psychological trauma are normal constituents in an athlete’s routine; and that risk and health problems are part of the game. The threat of sanction, however severe, pales against a cost-benefit algorithm where failure is as unpalatable as victory is compelling. Current anti-doping efforts fail to address these key motivators of doping in meaningful and practical ways, which explain why they are ineffective. Instead, effective anti-doping strategies must build on an evidence-based understanding of how athletes perceive doping (Petróczi, 2015).

For these reasons Smith and Stewart (2015) propose an alternative approach which they call the harm reduction (HR) approach. In the context of sports, the HR approach consists of three principles: First, drug use is neither merely a sporting, criminal nor legal matter, but constitutes a serious social issue. Second, HR precludes the need for any form of moral certitude. Instead, it accepts that drug use occurs in sports and will never be completely eliminated. Third, although HR does not condone the use of drugs in sports, policy makers have an obligation to develop public health measures that reduce drug related harm to all athletes. In addressing the broader public health issues related to doping, HR advocates propose that in the long term the best interest of athletes will be served.

The life cycle model of performance enhancement is based on the importance of belief systems concerning behavioural outcomes, social influences on behaviour, and personal control factors affecting behavioural choices (Lucidi *et al.*, 2008). The model suggests that, for educational purposes, instead of focusing on the actual engagement in prohibited performance enhancing practices, deterrence strategies are likely to be more effective. This should be done by targeting the main factors exerting influence on athletes at their respective life stages. Groups of athletes should be identified in their respective career stages together with concurrent, pertinent risks of engagement in doping practices. Targeting specific risk factors and expectancies (Petróczi & Aidman, 2008) would enable a more effective intervention approach.

2.3.4 An approach to educational programmes

Whichever approach is followed, a key element in the quest for rational and safe nutritional supplement use and the concomitant fight against doping is the appropriate education of applicable target populations. In planning such programmes, the risks and benefits as described in this review need to be considered.

It has been argued for decades that the potential vulnerability of young people to the harmful effects of doping with associated risks far outweighs any possible benefits of temporary superior athletic ability (Brown, 1984; McNamee, 2009). Despite this clear argument, McNamee (2009) points out that there is a lack of unequivocal pronouncements on adolescent or paediatric doping *per se* by official global bodies such as the International Olympic Committee (IOC), the International Federation of Sports Medicine (FIMS) and WADA.

Although athletes are becoming increasingly familiar with anti-doping rules, there is still a lack of knowledge on sports nutrition, nutritional supplements and banned substances that should be addressed (Massad, Shier & Koceja, 1995; Nieper, 2005; Erdman *et al.*, 2007; Wanjek *et al.*, 2007; Gradidge *et al.*, 2010; Morente-Sánchez & Zabal, 2013; Nolte *et al.*, 2014). Educational programmes therefore require informational content on these topics. It is imperative that those persons teaching the facts are knowledgeable, objective and ethical (Claassen, 2011).

Educational programmes need to start with young athletes to establish the correct

attitudes and behaviours toward supplement use and doping and should involve all those who play a role – teachers, coaches, medical professionals and family – in these athletes' decision-making (Claassen, 2011; Morente-Sánchez & Zabal, 2013). In selecting specific target populations for specific educational focus areas, the life cycle model of performance enhancement can be used as a planning tool (Petróczi & Aidman, 2008). A multi-professional approach involving experts in nutrition, coaching, conditioning and health should be involved in educational strategies (Claassen, 2011). Open communication amongst all the individuals responsible for the health and safety of the adolescent athlete should be encouraged (Metzl *et al.*, 2001).

2.4 CONCLUSION

The use of supplements and banned substances is common and often underreported. The health, psychosocial and legal risks of these habits and their drivers have been identified. Despite educational and deterrent measures by anti-doping authorities, there has been no decrease in doping offences. A common lack of knowledge on sports nutrition, nutritional supplements and banned substances is widely acknowledged by scientists and anti-doping authorities. The lack of quality control in the supplement industry is a further key issue which presents health and legal problems.

We suggest from the literature that the entire nutritional supplement and banned substance problem be recognised as a public health and social issue, and addressed as such on global, local and individual levels. A cornerstone of such a process should be the planning of holistic educational programmes which not only address the lack of knowledge in key role players, but also take into account the socio-cultural aspects of sports, high risk groups or individuals, and the athlete's motivation for adopting these habits.

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CHAPTER 3

ARTICLE 2: THE DEVELOPMENT OF A MEASURING INSTRUMENT TO DETERMINE THE KNOWLEDGE AND ATTITUDES OF ELITE ADOLESCENT ATHLETES ABOUT SPORTS SUPPLEMENTS AND BANNED SUBSTANCES

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Abstract

Many athletes are willing to use substances to achieve their goals even at the expense of their health and wellbeing. It is therefore important to not only evaluate the prevalence of use in this adolescent population, but to develop effective preventative interventions. Understanding adolescents' knowledge, the sources of information they use, attitudes and beliefs about sports supplements and banned substances are required in this regard. Therefore, the aim of this study was to develop a reliable measuring instrument (questionnaire) to be used in South Africa, to assess the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances. The study was done in two phases. A mixed method research model was used. Both quantitative and qualitative data were gathered. In the first phase of the study a questionnaire was developed and the relevancy and validity of the questionnaire ensured by means of qualitative research methods. In phase two, the questionnaire was tested in a cohort of elite adolescent athletes of the University of the Free State Athletics Club, where both quantitative data (closed-ended questions) and qualitative data (open-ended questions) about the behaviours and knowledge of the cohort was gathered and analysed. The questionnaire was found to be functional and user friendly. The majority of the athletes (90%) reported the use of sports supplements in the previous six months. However, all the participants (100%) claimed that they would refuse the use of banned substances even if its use was encouraged by a coach

or trainer. The main reasons for using sports supplements were reported as "to increase energy" (65%), "aid recovery" (45%), "to improve endurance" (35%), "to improve strength" (20%) and "to improve sporting performance" (15%). Thirty-five percent (35%) of the participants indicated that they were not aware of any dangers of sports supplements. Supplement information was mostly obtained from the internet (35%), coaches (30%) and friends (30%). If these factors are addressed and their effects monitored, a positive contribution could be made to the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances in South Africa.

3.1 INTRODUCTION

The use of sports supplements has become increasingly popular among elite athletes and adults, as well as among athletic and non-athletic adolescents (El-Hammadi & Hunien, 2013). The use of performance-enhancing methods, including the use of sports supplements is no longer restricted to elite athletes. Laos and Metzl (2006) state that where sports participation had previously seen as recreational activity, it was now a highly intense environment for the adolescent athlete, placing high demands on athletes to perform in order to get drafted into professional sports teams before they graduate from high school or university. The use of sports supplements is associated with certain risks, not least of which is the risk of contamination with banned substances in sports and the general availability of banned drugs in sports in retail stores. However, of even greater concern, is the increasing number of young South African athletes who test positive for the use of banned substances (Gradidge *et al.*, 2010). The risk of testing positive for a banned substance from the use of contaminated sports supplements is a reality athletes have to face (Maughan, King & Lea, 2004). It is therefore appropriate to investigate and discuss sports supplements and banned performance enhancing substances in the same context.

As early as 1999, the International Olympic Commission (IOC) issued the Olympic Movement Anti-Doping Code in which doping was defined as "the use of an expedient substance or method which is potentially harmful to athletes' health and/or capable of enhancing their performance, or the presence in the athlete's body of a prohibited substance or evidence of the use thereof or evidence of the use of a prohibited method" (El-Hammadi & Hunien, 2013; World Anti-Doping Association, 2013). Various sporting bodies, including the South African Institute for Drug-Free Sports (SAIDS), International Olympic Committee (IOC), the World Anti-doping Agency (WADA) and other international federations of sports (IFs) strive to protect the integrity of sports. The main aims of prohibiting performance enhancing methods in sports are not only to prevent athletes from

gaining an unfair competitive advantage over their competitors, but to preserve the principle of “sports and fair play”. Smith and Stewart (2008) also mentioned the importance to protect athletes’ health against potential hazards of doping. The International Olympic Committee (IOC) mandate requires that doping education be made an integral part of every country’s sports development programme. However, very little research has been done in South-Africa regarding the use of, knowledge and perceptions regarding performance-enhancing substances and supplements (PESS) with respect to any population. It was also suggested that adolescents fall prey to mass media and aggressive marketing by supplement companies (Gradidge *et al.* 2010). Dvorak *et al.* (2014) highlighted the need for applied research on doping; effective analysis; improved efficiency and evidence-based educational programmes to solve the problem of unsafe supplement use and doping. However, despite the increased anti-doping effort, the relative number of positive findings for doping is constantly increasing (Petróczi *et al.*, 2007).

The widespread use of sports supplements despite the absence of proven efficacy and the risk such practices carry underscores the need for ongoing, appropriate, and focused educational initiatives in this area (Huang *et al.*, 2006). Greater knowledge of sports supplements can be linked to its decreased use (Massad *et al.*, 1995). Research into effective counselling of adolescents with regard to doping identified the importance of belief systems and social influences that impact on behavioural outcomes and personal control factors that affect behavioural choices (Lucidi *et al.*, 2008). The life cycle model of performance enhancement suggests that for educational purposes, instead of focusing on the actual engagement in prohibited performance enhancing practices, deterrence strategies are likely to be more effective. This should be done by targeting the main factors that influence athletes at the respective life stage (Petróczi & Aidman, 2008). Intervention measures against doping in sports should be aimed at enhancing athletes’ specific knowledge to increase their anti-doping attitude (Wanjek *et al.*, 2007). Dunn *et al.* (2001) suggest that intervention programmes should focus on the attitudes, intentions and reasons why athletes use sports supplements, as well as educating the athletes about the risks of using sports supplements.

This educational approach should start at a young age and be sustained throughout their entire sporting career (Dvorak *et al.*, 2014). It is important that athletes should be well informed to make educated decisions about ergogenic aids and supplements (Van Aswegen, 2013). Educational programmes need to be implemented amongst young athletes to

establish the desired attitudes and behaviours toward doping and should involve all role players (e.g. doctor, coach and family) in the athletes' decision-making (Morente-Sánchez & Zabal, 2013). However, according to Gradidge *et al.* (2010), mixed messages from the medical community, opposing the use of these performance enhancers, versus society's appetite for better, more spectacular competitions and performances confuse adolescents. A definite need exists for educational information on these ergogenic aids to assist adolescents in making informed decisions. Therefore, it is important to understand the athletes' level of knowledge and attitudes about the topic in order to implement an effective educational approach regarding supplement use and doping.

In order to gain an understanding of adolescent athletes' knowledge and attitudes towards supplement use and doping, a suitable measuring instrument is needed. The aim of this study was thus to develop a reliable measuring instrument to be used in South Africa, to assess the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances. In the second phase of the study, a pilot study was conducted on a cohort of adolescent athletes from the Free State University Athletics Club to test the functionality of the questionnaire and to obtain data on aspects of sports supplement and banned substances.

3.2 METHODOLOGY

3.2.1 Development of a measuring instrument

This part of the study (phase 1) consisted of methodological research with a qualitative research design.

3.2.1.2 Background

The need was identified to conduct comprehensive research to determine the status on various aspects of sports supplement and banned substance use, to formulate applicable educational and deterrent strategies. Various measuring instruments on the topic, such as questionnaires and interview, were scrutinised, but none fitted the requirements of the five domains identified to be researched. It was therefore necessary to design a survey questionnaire specifically for this study and population. The questionnaire was developed in phases. The phased approach to the study is illustrated in Figure 1.

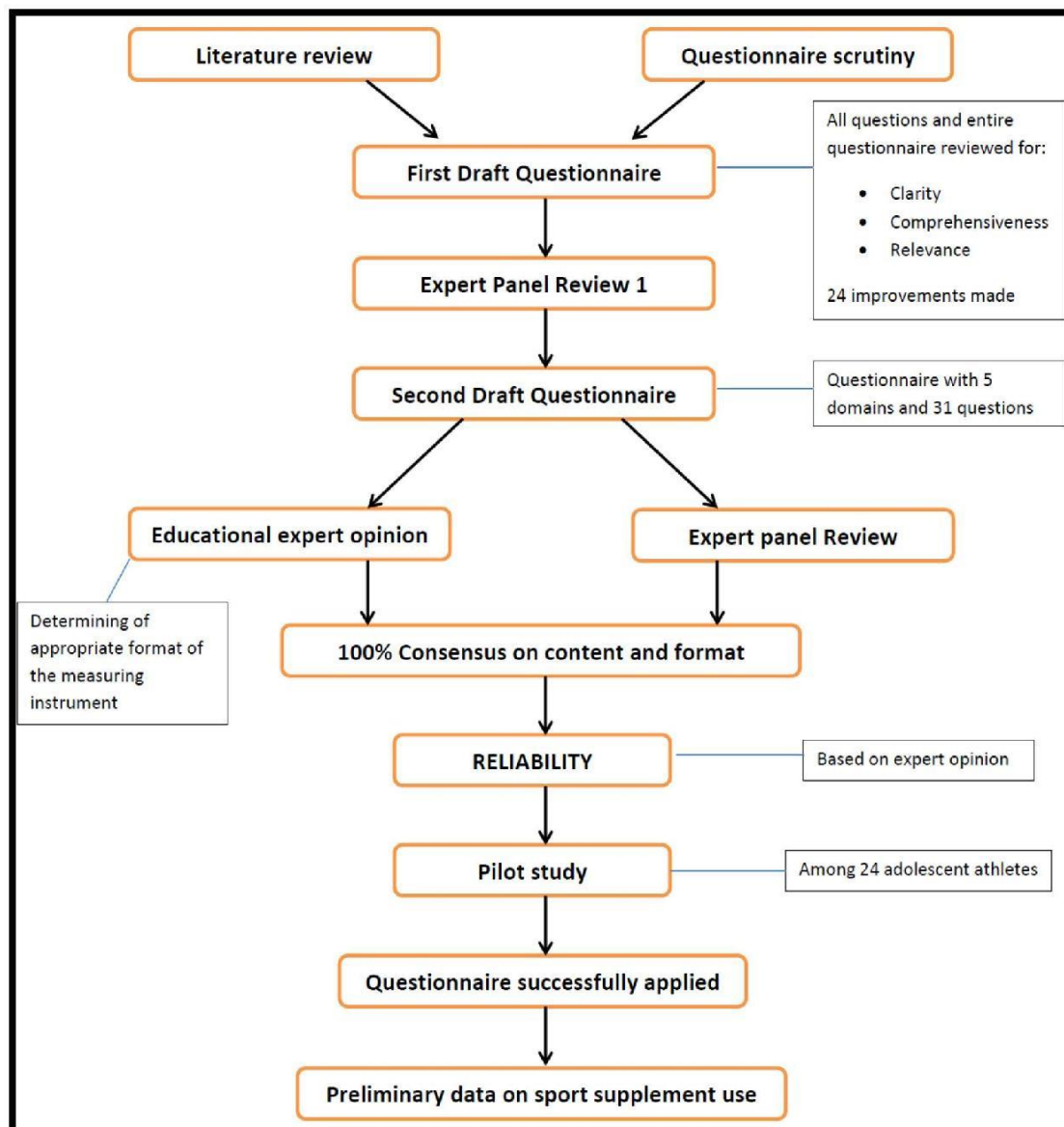


FIGURE 3.1: FLOW CHART OF THE RESEARCH PROCESS

3.2.1.3 Literature review

A literature review was conducted on the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances and their use of sports supplements and banned substances utilising EbscoHost, Medline and Google Scholar and University of the Free State Library databases as search engines (Schwellnus *et al.*, 1992; Massad *et al.*, 1995; Ray *et al.*, 2001; Dunn *et al.*, 2001; Nieper, 2005; Petróczi & Aidman, 2008; Gradidge *et al.*, 2010; El-Hammadi & Hunien, 2013, Morente-Sánchez & Zabal, 2013, Van Aswegen, 2013). From the existing literature possible questions were identified and drafted into a questionnaire. A combination of open-ended and closed questions was utilised in the

questionnaire (Goddard & Melville, 2001; Bowling, 2002). Furthermore, various existing questionnaires on assessment of the knowledge and attitudes of athletes about ergogenic aids and banned substances were scrutinised and relevant questions identified (Massad *et al.*, 1995; Nieper, 2005; Petróczi & Aidman, 2008; Gradidge *et al.*, 2010; El-Hammadi & Hunien, 2013; Morente-Sánchez & Zabal, 2013; Van Aswegen, 2013). A draft set of questions was then developed.

3.2.1.4 Content validity

Content validity determines the extent to which the questions of the measuring tool are related to the objectives studied (Cook & Beckman, 2006). To assess the content validity of this questionnaire, a panel of experts was assembled according to a rigorous grading system.

The expert panel consisted of five individuals who are experts on the fields of supplements, nutrition, banned substances, sports conditioning and sports medicine respectively. The experts were selected from a panel nominated by the study supervisors according to the following categories:

- 1) qualifications and experience in their specific fields,
- 2) experience with elite athletes,
- 3) knowledge of nutritional supplements, and
- 4) knowledge of banned substances.

The nominees were awarded marks for each category and the five candidates with the highest scores were recruited to individually review each question in the draft questionnaire. The expert panel individually assessed aspects of each question, including relevancy (the power and ability of statements to reflect content characteristics), clarity (clarity in correct spelling and concepts explained by statements) and comprehensiveness (the ability of this tool to cover all relevant areas to be studied) (Samani *et al.*, 2015). All suggestions and comments received from the expert panel in this review were tabulated and incorporated into a second draft questionnaire. This was distributed for a second expert review. To ensure good inter-rater agreement (IRA), proposed changes were incorporated after 100% consensus by the expert panel.

3.2.1.5 Face validity

Face validity refers to the validity of the measuring instrument for subjects, administrative factors and untrained observers (Grone *et al.*, 2010). The key face validity issue in this study was to ascertain the most appropriate method of delivery of the questionnaire to obtain reliable data, considering the sensitive nature of certain questions and the possible vulnerability of adolescent participants. The panel of experts considered various methods of delivery of the measuring instrument (questions), including self-administered questionnaires, discussion groups, and personal interviews. To select the most appropriate method to gather data on supplement use and doping from an adolescent athletic population, the draft questionnaire was presented to two educational experts working intimately with adolescent athletes. These educational experts were selected from a pool of first team sports coaches of an elite sports school in Bloemfontein by the headmaster of the school. They reached consensus and made recommendations by means of an unstructured interview (Kajorboon, 2005).

After a final review, the questionnaire was constructed and coded.

3.2.2 Pilot study

In the second phase of the study, a pilot study was conducted using a cohort of adolescent athletes from the Free State University Athletics Club to test the functionality of the questionnaire and to obtain data on aspects of sports supplement and banned substance use. The questionnaires were completed during a weekly scheduled training session, immediately sealed in an envelope by the respondent and dropped into a sealed box to ensure anonymity.

3.2.3 Reliability

Reliability in this study was determined by qualitative measures. The reliability in this study was established by means of well-constructed questions for the interviews, carefully piloted and reviewed by experts in this area of research. In addition, the reliability of the study was enhanced by the meticulous selection of participating experts. Qualitative feedback was also received from the cohort of athletes in the pilot study. However, no measurement of

repeatability of the measuring instrument by intra-class correlation and internal consistency reliability as assessed by Cronbach's alpha was performed.

3.3 STATISTICAL ANALYSIS AND INTERPRETATION OF DATA

In the development of the questionnaire, qualitative content analysis of data was done. All data were electronically captured using Microsoft Excel 2007. In the pilot study, the SAS version 9.1.3 statistical software was used for further analysis of the data. Means and standard deviations or medians and percentiles were calculated for numeric data. Frequencies and percentages were calculated for categorical data.

3.4 ETHICAL ISSUES

The study was approved by the Ethics Committee of the Faculty of Health Sciences, University of the Free State (ECUFS 138/2014). For phase 1, informed consent was obtained from the panel of experts and educational experts. Similarly, all participants in the pilot study (phase 2) and their parents or legal guardians gave informed consent. Permission to conduct the study on adolescent athletes of the University of the Free State Athletics Club was obtained from the Director of Sports of the University of the Free State. Participation was voluntary. The anonymity of all participants was ensured.

3.5 RESULTS AND DISCUSSION

3.5.1 Development of a measuring instrument

3.5.1.1 *Draft questionnaire*

A draft set of questions was compiled after scrutiny of relevant existing literature. These questions were grouped under demographics, followed by questions on current habits, knowledge and attitudes towards supplement and banned substance use. In the final instance questions on education were posed (Table 1).

TABLE 3.1: DRAFT QUESTIONNAIRE BASED ON EXISTING LITERATURE (Table continues on next page)

A: DEMOGRAPHICS	
1.	What gender are you?
2.	What is your age?

3. In what school grade are you?
4. In what sports do you participate?
5. What is the highest level at which you participate in your main sports code?
6. How many hours per week do you spend practising or participating in sports?
B: CURRENT PRACTICES REGARDING SUPPLEMENT USE
7. Have you taken any sports supplements in the last 6 months?
8. If yes, what is your reason for using sports supplements?
9. If yes, how did you obtain the sports supplements?
10. Where do you find information about the sports supplements?
C: KNOWLEDGE OF SUPPLEMENTS AND BANNED SUBSTANCES
11. Are you aware of any of the dangers or possible side effects of using sports supplements?
12. If yes, can you name all the side effects of which you are aware?
13. Do you think that you can achieve the same results through exercise and diet that you can by using sports supplements?
14. Have you ever received any education about the use of sports supplements?
15. Have you ever received any education about the use of banned substances?
17. If yes, in what format was the educational programme?
18. Do you know what percentage (%) of sports supplements are contaminated with illegal substances?
19. Do you know what the consequences are for testing positive for a banned substance? If yes, can you name the consequences?
D: ATTITUDES TOWARDS SUPPLEMENTS AND BANNED SUBSTANCES
20. Do you consider the use of banned substances to be dangerous for your health?
21. Do you think banned substances are commonly used in your sports?
22. Do you personally know another athlete who is using banned substances?
23. Why do you think athletes use banned substances?
24. If you are encouraged by your coach/trainer to use banned substances, will you take it?
25. If yes, what is your motivation for using banned substances?
26. If no, what are your reasons for refusing?
E: EDUCATION ON SUPPLEMENTS AND BANNED SUBSTANCES
27. Do you feel that you receive enough information about supplements to make an informed decision?
28. Do you feel that you receive enough information about banned substances to make an informed decision?
29. What would you suggest is the best way to educate young athletes about supplements?
30. What would you suggest is the best way to educate young athletes about banned substances?

3.5.1.2 *Validity*

The first draft of the measuring instrument was determined by a literature review of relevant existing questionnaires and literature on the use of sports supplements and banned substances amongst adolescent athletes. In the first review of the draft, 24 potential areas of improvement of content validity were identified by the expert panel. Of these, 11 (46%) related to relevancy, seven (29%) related to clarity and six (25%) related to comprehensiveness (Table 2).

TABLE 3.2: FEEDBACK ON AREAS OF IMPROVEMENT (Table continues on next page)

DETAILS	NUMBER OF IMPROVEMENTS	DOMAIN
More demographical detail of participants	1	Comprehensiveness
Reasons for supplement use	1	Comprehensiveness
Sources of information	1	Comprehensiveness
Patterns of supplement use	1	Comprehensiveness
Additional question on knowledge of banned substances	1	Comprehensiveness
Awareness of current educational programmes	1	Comprehensiveness
Determination of age group of target population	4	Relevance
Scope of sports codes	1	Relevance
Level of participation	2	Relevance
Definition of sports supplements	4	Relevance

Regarding face validity, seven potential areas of improvement in grammar and phrasing of questions were identified. Furthermore, the educational experts concluded that the most valid data from adolescent athletes will be obtained by an anonymous questionnaire presented to groups of 8-10 athletes at a time. The reasoning was that this method would afford the athlete an opportunity to tell the truth without the fear of rejection, judgement or punishment. The questionnaire must be administered by an independent person, as opposed to those directly involved with the athlete (e.g. the coach or teacher). A questionnaire was therefore selected as the most appropriate measuring tool for this type of research.

All potential areas of improvement of validity were addressed, and a final questionnaire was prepared after 100% consensus on all components had been reached by the panel of experts.

3.5.2 Pilot study

No problems were encountered by any of the participants in completing the questionnaire. Qualitative feedback from the participants indicated that the questionnaire was understandable and easy to use, adding to the reliability of the questionnaire. The results of the pilot study are briefly presented below.

3.5.2.1 Demographics

A total of 20 out of a possible 24 adolescent athletes (83%), training at the University of the Free State Athletics Club, participated in the study. The majority of the participants

were between the ages of 15 and 17 years. Eleven out of the 20 participants (55%) competed at provincial level, whilst 3 athletes (15%) competed at national level.

3.5.2.2 Supplement use

The majority of the athletes (90%) reported the use of sports supplements in the previous six months. The main reasons for using sports supplements were reported as "to increase energy" (65%), "aiding recovery" (45%), "to improve endurance" (35%), "to improve strength" (20%) and "to improve sporting performance" (15%). Thirty-five percent (35%) of the participants indicated that they were not aware of any dangers of sports supplements. Supplement information was mostly obtained from the internet (35%), coaches (30%) and friends (30%) (Table 3).

TABLE 3.3: SOURCES OF INFORMATION ON SUPPLEMENTS
(Table continues on next page)

SOURCE	FREQUENCY	%
Internet	7	35
Coach	6	30
Friends	6	30
General Practitioner	4	20
Dietician	3	15
Shop assistant	3	15
Label of supplement containers	3	15
Team members	2	10
Role model	1	5
Personal Trainer	1	5

3.5.2.3 Banned substances

All the participants (100%) participating in this study reported that they would refuse the use of banned substances even if its use was encouraged by a coach or trainer and that if faced with a choice they would not use any banned substances to improve their sporting performance. Reasons given for not using banned substances include: health reasons (80%), it was viewed as being against the spirit of sports (60%), it was regarded as cheating (55%) and it was against their moral values (50%). Twenty percent (20%) of the participants feared facing possible sanctions or being banned from sports. Ninety percent (90%) of the participants reported that they believe banned substances were being used in their sports and 40% reported that they personally knew another athlete who was using banned substances. Participant perceptions of the reasons for the use of banned substances by other athletes are given in Figure 2.

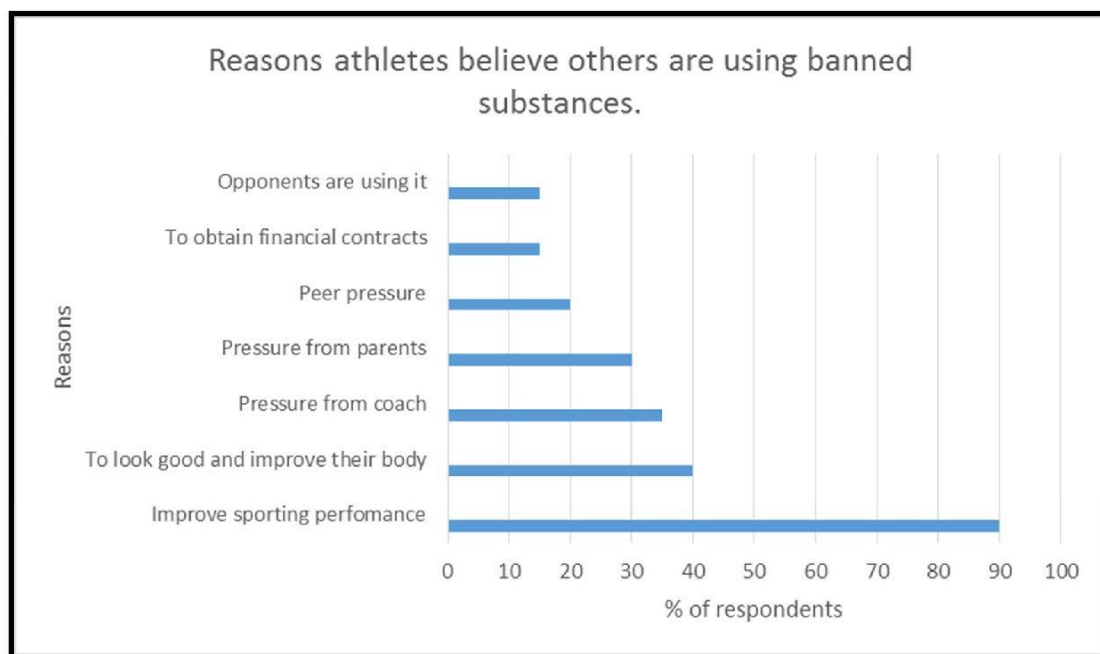


FIGURE 3.2: REASONS FOR USE OF BANNED SUBSTANCES

3.5.2.4 Education

The majority of participants indicated that they had received education about the use of sports supplements (80%) and banned substances (85%). Education was generally in the form of informal presentations (60%) and took place in the classroom or at the sports club. Other forms of education included formal lectures (30%), informational pamphlets (20%) and the internet (15%). Thirty-five percent (35%) of the participants felt that they did not receive enough information about supplements to make an informed choice. Similarly, 45% of the participants felt that they did not have enough information about banned substances.

3.6 DISCUSSION

Different methods such as interviews and group discussions were considered to collect the required data. However, the panel of educational experts opted for a questionnaire as the most trustworthy measuring instrument to obtain true information. Since doping remains a sensitive topic in sports and the athletes may fear sanctions of judgement, the anonymity of a questionnaire was the only way to ensure that reliable data were collected. This format had also been used with success in other studies on sports supplements in various populations (Massad *et al.*, 1995; Nieper, 2005; Petróczi & Aidman, 2008; Gradidge *et al.*, 2010; El-Hammadi & Hunien, 2013; Morente-Sánchez & Zabal, 2013; Van Aswegen, 2013).

During this study, a mixed method research model was used: both quantitative and qualitative data were gathered. Open-ended information such as that gathered in interviews produces qualitative data and closed-ended information such as that gathered on knowledge, behaviour and attitudes produces quantitative data. The mix of data types provides a better understanding of the problem being addressed (Creswell & Plano-Clark, 2007).

Boynton & Greenhalgh (2004) state that it is imperative that the questionnaire is deemed as reliable (understood and interpreted consistently over time), valid (measured what it was supposed to measure) and standardised (the same question in the same format was asked to all the participants). This study addressed the reliability and validity of the measuring instrument by means of qualitative methods. A major contributing factor in ensuring validity and reliability by qualitative means is the careful selection of the panel of experts (Holtzhausen *et al.*, 2014). Great care was taken with this process. However, quantitative validation and repeatability testing of the questionnaire remain to be performed.

A preliminary pilot study was executed as first step in the validation process. Ninety percent (90%) of the participants in this study reported using sports supplements in the previous six months. Reasons given for not using banned substances include: health reasons, it was against the athletes' moral values, it was viewed as cheating and was seen as being contrary to the spirit of sports. These positive values and attitudes of athletes toward their health and the spirit of sports may prove valuable in the fight against doping. Educational programmes should not only be constructed around the negative effects of sports supplements and banned substances, but also acknowledge the positive qualities of fair competition and true sportsmanship.

Although the participants in this study indicated that they had received education about the use of sports supplements and banned substances in one form or another, a considerable group of athletes, 35% and 45% respectively, felt that they did not possess enough information about supplements and banned substances to make an informed choice. These results seem conservative compared to those reported in a UK study, where 75% of the athletes felt that they needed more advice and information about supplements (Nieper, 2005) and a Johannesburg study where 88% of male athletes surveyed indicated that there was a need for further education on prohibited and non-prohibited performance enhancing substance use (Gradidge *et al.*, 2010). These varying results could be an indication of the

differences in population. It could also be that the small group of elite athletes in the current study have had greater exposure to education because of their participation in their sports disciplines. Overall, a clear need had been identified for continuous education about nutrition, supplement use and doping. Similarly, a Cape Town study found that there was a general lack of knowledge about performance enhancing substances and supplements (Van Aswegen, 2013). Other researchers (Massad *et al.*, 1995; Nieper, 2005; Petróczi & Aidman, 2008) have likewise found that athletes at high school and college level have a limited knowledge and understanding of sports nutrition and nutritional supplements.

The data that do not directly relate to athletes' involvement with doping, seem to be in accordance with the findings in existing literature. However, there were a few anomalies in the results related to doping behaviour. Of the respondents in this study, 100% indicated that they would decline to use banned substances. Conversely, 90% of these respondents also reported to believe that others in their sports are using banned substances and 40% personally knew another athlete who used banned substances.

This discrepancy could be explained by the athletes not being truthful about their use in order to maintain a socially acceptable image. Athlete and coach surveys have showed high rates of banned substance use, although it was also indicated that respondents tend to identify doping in their peers rather than to admit their own personal use (Uvacsek *et al.*, 2011; Moston *et al.*, 2015). Answers manipulated in this way could lead to unreliable results and incorrect conclusions about doping athletes versus non-doping athletes (Petróczi *et al.*, 2011).

The high number of respondents who believed others to be engaging in illicit behaviour may also be an indication that there was a degree of the false consensus effect (FCE) causing the respondents to overestimate the actual use of banned substances. The false consensus effect causes individuals who engage in certain questionable behavioural choices, like doping, to overestimate the prevalence of that particular behaviour in their peers (Ross *et al.*, 1977). In this case, the results of these particular statements call into question the reliability of the questionnaire when it comes to behavioural aspects. This issue will be scrutinised in the further validation of the questionnaire.

Although there is some indication that a single method of measuring behavioural aspects cannot provide accurate data, valuable information about athletes' knowledge of supplement use and doping was collected from the pilot questionnaire.

3.7 LIMITATIONS

To avoid researcher bias and to ensure reliability and validity, the questionnaire was peer reviewed by a panel of five scientific experts, as well as two educational experts working with adolescents. Since the sample size for the pilot study was small and participation in the study was voluntary, non-responder bias may have led to information being inaccurate. The self-reported format of the measuring tool may cause an increased likelihood of the possible false consensus effect or social desirability. To minimise these biases the participants received information to explain the importance of the research and to motivate athletes to respond truthfully.

Banned substances may be a sensitive topic and the fear of “getting caught” or experiencing punishment may lead to some of the athletes opting either not to take part in the research or to not be completely truthful when answering the questions. Anonymity of the respondents were emphasised to address this fear.

3.8 CONCLUSION AND RECOMMENDATIONS

This study developed a measuring instrument, deemed reliable by an expert panel, to be used in South Africa to assess the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances, even though the reliability of data on banned substances may be questionable, as evident in the literature. Although many athletes have previously received education about ergogenic aids and banned substances, the pilot study identified a need for more intensive education. The majority of the athletes (90%) reported the use of sports supplements in the previous six months. The main reasons for using sports supplements were reported as “to increase energy” (65%), “aid recovery” (45%) and “to improve endurance” (35%). Thirty-five percent (35%) of the participants indicated that they were not aware of any dangers of sports supplements. Alarming, supplement information was mostly obtained from the internet (35%), coaches (30%) and friends (30%). Previous research had indicated a pharmacist as their preferred source of information regarding ergogenic aids. Pharmacists should have sufficient knowledge regarding the pharmacological actions of various supplements and should provide guidance to athletes in their selection. 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 ergogenic aids instead of the athlete consulting the internet as an unauthorised information source.

It is encouraging to observe that all the adolescent athletes (100%) participating in this study claimed that they would refuse the use of banned substances even if its use was encouraged by a coach or trainer and that if faced with the option they would not use any banned substances to improve their sporting performance. Reasons given for not using banned substances include health reasons (80%), being against the spirit of sports (60%), that it constituted cheating (55%) and that it was against their moral values (50%).

Although some results from this study can prove valuable in the fight against doping and the education of young athletes, the level of knowledge and attitudes of athletes are just a few of many factors to consider when developing an effective anti-doping intervention and education programme. Further research is needed to identify the most effective way to educate adolescents about ergogenic aids and banned substances.

The following are recommended:

- Quantitative validation of the questionnaire, to ensure true validity, reliability and trustworthiness.
- Further research, including significantly more athletes, to assess the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances in South Africa.
- Various internet sites should be evaluated for their content, safety and efficacy in disseminating information to adolescents about ergogenic aids and banned substances.
- Socio-economic status should be included in these investigations and compared regarding the use, knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances in South Africa.

If these factors are addressed and their effects monitored, a positive contribution could be made to the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances in South Africa.

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CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSION

There has been no decrease in doping offences, despite educational and deterrent measures by anti-doping authorities. The use of dietary supplements and banned substances is common and often underreported. The drivers and health, psychosocial and legal risks of these habits have been identified. There is a common lack of knowledge on sports nutrition, dietary supplements and banned substances that is well known amongst scientists and anti-doping authorities. Another key issue is the lack of quality control in the supplements industry, which presents health and legal problems for the unsuspecting athlete.

From the existing literature we conclude that the entire nutritional supplement and banned substance problem should be recognised as a public health and social issue, and addressed as such on global, local and individual levels. A cornerstone for the planning of such a process should be holistic educational programmes which not only address the lack of knowledge in key role players, but also take the socio-cultural aspects of sports, high risk groups or individuals, and athletes' motivation for these habits into account.

This study developed a reliable measuring instrument to be used in South Africa to assess the knowledge and attitudes of adolescent athletes about dietary supplements and banned substances, even though the reliability of data on banned substances may be questionable, as seen in the literature. Although many athletes have previously received education about ergogenic aids and banned substances, the pilot study identified a continued need for more intensive education. The majority of adolescent athletes (90%) in the population group reported the use of sports supplements in the previous six months. The main reasons for using sports supplements were reported as "to increase energy" (65%), "aid recovery" (45%) and "to improve endurance" (35%). Thirty-five percent (35%) of the participants indicated that they were not aware of any dangers of sports supplements. Alarming, supplement information was mostly obtained from the internet (35%), coaches (30%) and friends (30%).

It is encouraging to observe that all the adolescent athletes (100%) participating in this study claim that they would refuse the use of banned substances even if its use was encouraged by a coach or trainer and that if faced by the option they would not use any banned substances to improve their sporting performance. Reasons given for not using banned substances include: health reasons (80%), it was regarded as being against the spirit of sports (60%), it was regarded as cheating (55%) and it was against their moral values (50%).

Although some results from this study can prove valuable in the fight against doping and the education of young athletes, the level of knowledge and attitudes of athletes are just a few of many factors to consider when developing an effective anti-doping intervention and education programme. Further research is needed to identify the most effective way to educate adolescents about ergogenic aids and banned substances.

4.2 RECOMMENDATION

The following are recommended:

- Quantitative validation of the questionnaire, to ensure true validity, reliability and trustworthiness.
- Further research, including significantly more athletes, to assess the knowledge level and attitudes of adolescent athletes about ergogenic aids and banned substances in South Africa.
- Information on ergogenic aids and banned substances provided by various internet sites should be evaluated for their content, safety and efficacy in disseminating information about ergogenic aids and banned substances to adolescents.
- The socio-economic status of respondents should be included in investigations and compared with regard to the use, knowledge and attitudes of adolescent athletes concerning ergogenic aids and banned substances in South Africa.
- Educational programmes on nutritional supplement use and doping should form part of a broader public health and sociological approach to the problem.
- Educational programmes should be holistic; initiated at a young age, take athletes' life stage into account, and include education of the significant others of athletes, including coaches, parents and teachers.

- The efficiency of educational programmes should be monitored continuously and revised as required.

If these factors are addressed and their effects monitored, a positive contribution could be made to the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances in South Africa.

CHAPTER 5

REFLECTIONS ON THE RESEARCH PROCESS

5.1 REFLECTIONS

I remember the first time I spoke to my research supervisor about the use of banned substances in youthful athletes. I had no idea how wide the scope of this topic was and I am sure that without his guidance, and that of various other experts, I would still be floundering between all the possible research questions in this field. Choosing an interesting topic was easy. Turning that into valuable research was a bit more challenging.

Doing research was not the solitary journey I initially thought it would be. Many individuals provided input and opinions and without them the research would lack depth and value. During the literature review I was not able to find a single questionnaire or interview guide that answered all the questions I needed to have answered, so the only resolution to this was to create my own. During the development of the questionnaire, the opinions of the experts proved to be invaluable. Everyone in their own way provided insight, contributing to a better understanding of how to deal with a sensitive topic like this.

In the two years it took to complete this dissertation, I sometimes found it challenging to keep the flame burning, but with every news report of another athlete involved in doping and the effect it had on the world of sports, I was intrigued to learn more. Sports can awaken a sense of unity and pride among people, but it can also pose heavy challenges to the athletes to perform according to expectation -- opening just one of the many gateways for doping in sports. For this reason I believe education is key in the fight against doping. Education needs to start with the athletes and those directly involved with them, but should not be limited to them only. Everyone participating, coaching, organising and supporting sports should be made aware of the dangers of doping and the importance of fair play.

In the end, the research process was much more than just an educational experience. It has taught me some new skills, such as disciplined focus, and has improved some others, such as time management. Most important, it has reminded me of the value of people who believe in you and support you. I am forever grateful for this opportunity.

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APPENDICES

APPENDIX A

**Appendix A1: LETTER TO THE DIRECTOR, KOVSIE SPORTS:
REQUEST TO CONDUCT RESEARCH**

**Appendix A2: BRIEF AAN DIE DIREKTEUR, KOVSIE SPORT:
VERSOEK OM NAVORSING TE DOEN**

LETTER TO THE DIRECTOR, KOVSIE SPORTS: REQUEST TO CONDUCT RESEARCH

Amanda Welthagen
PO Box 29250
Danhof, 9310
amanda.wel@hotmail.com
Phone: 072 651 8859

The Director
KovsieSports
University of the Free State
22 September 2014

Dear Mr DB Prinsloo

Research study about adolescent athletes' knowledge and attitudes of ergogenic aids and banned substances

I am currently doing research for the completion of my Master's studies in Biokinetics. We, Amanda Welthagen (researcher), Dr Louis Holtzhausen (study leader) and Dr Pieter van der Merwe (co-study-leader), are doing research on the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances. In this study we want to learn what knowledge young athletes have about supplements and banned substances, as well as their attitudes toward its use. I would like to request your permission to conduct this research at the University of the Free State Athletics Club.

The aim of this research is to determine what the athletes know about these aids, as well as their attitudes towards its use, so as to better understand what is needed to improve the effectiveness of an intervention programme. All information will be gathered through an anonymous questionnaire. All athletes between the ages of 13 and 18 years will be requested to complete the questionnaire; however, participation is voluntary. There are no costs involved for the institute or its athletes.

The information gathered will be of great value in the fight against doping in sports. If you are willing to support this effort, please provide permission in writing and e-mail it to amanda.wel@hotmail.com.

Kind regards

Amanda Welthagen
Researcher

BRIEF AAN DIE DIREKTEUR, KOVSIE SPORT: VERSOEK OM NAVORSING TE DOEN

The Director
KovsieSports
University of the Free State
22 September 2014

Dear Mr DB Prinsloo

Research study about adolescent athletes' knowledge and attitudes of ergogenic aids and banned substances

I am currently doing research for the completion of my Master's studies in Biokinetics. We, Amanda Welthagen (researcher), Dr Louis Holtzhausen (study leader) and Dr Pieter van der Merwe (co-study-leader), are doing research on the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances. In this study we want to learn what knowledge young athletes have about supplements and banned substances, as well as their attitudes toward its use. I would like to request your permission to conduct the research at the University of the Free State Athletics Club.

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The information gathered will be of great value in the fight against doping in sports. If you are willing to support this effort, please provide permission in writing and e-mail it to amanda.wel@hotmail.com.

Kind regards

Amanda Welthagen
Researcher

Hereby I support the research 100% as stated above
Regards



DB Prinsloo

APPENDIX B

SCORING SHEET FOR PANEL OF EXPERTS

SCORING SHEET FOR PANEL OF EXPERTS

CANDIDATE	FIELD OF EXPERTISE	QUALIFICATIONS 0/1/2*	EXPERIENCE WITH ELITE ATHLETES 0/1/2**	KNOWLEDGE OF SUPPLEMENTS 0/1/2***	KNOWLEDGE OF BANNED SUBSTANCE 0/1/2***	TOTAL (OUT OF POSSIBLE 8)

* 1 = Bachelor's / honours degree or equivalent; 2 = Masters or PhD

** 0 = no experience; 1 = experience with local/provincial elite athletes; 2 = experience with national or international athletes

*** 0 = no knowledge; 1 = anecdotal knowledge; 2 = formal training and experience

APPENDIX C

REQUEST TO PARTICIPATE IN STUDY

REQUEST TO PARTICIPATE IN STUDY

Amanda Welthagen
PO Box 29250
Danhof, 9310
amanda.wel@hotmail.com
Phone: 072 651 8859

Dear Sir/Madam

Request to participate in a study

I am currently completing my Master's degree in Biokinetics at the University of the Free State. The title of my research is THE DEVELOPMENT OF A MEASURING INSTRUMENT TO DETERMINE THE KNOWLEDGE AND ATTITUDES OF ELITE ADOLESCENT ATHLETES ABOUT ERGOGENIC AIDS AND BANNED SUBSTANCES.

My supervisors are:

Promoter: Dr LJ Holtzhausen
Head: Sports and Exercise Medicine
Faculty of Health Sciences
University of the Free State
Bloemfontein, South Africa

Co-promoter: Dr P van der Merwe
SA Doping Control Laboratory
University of the Free State
Bloemfontein, South Africa

The problem to be addressed is the ever increasing popularity of sports supplements and banned substances as a means to improve sporting performance, especially amongst school aged athletes.

The aim of this study is to create a reliable measuring instrument to be used to measure the knowledge and attitudes of adolescent athletes about supplements and banned substances and then to use this measuring instrument to determine what elite adolescent athletes' knowledge and attitude about supplements and banned substances are. The purpose of this is to better understand what is needed to develop an educational programme or other preventative measures to promote safe and fair play in sports.

The value of the research will be that it will provide insight into adolescent athletes' knowledge and attitudes about the use of supplements and banned supplements. This study can lay the foundation for future research on this topic and it will provide some of the necessary information to design and implement an effective educational programme. Education about ergogenic aids could reach beyond the athlete to those involved with the athlete, including sports physicians, physiotherapists, biokineticists, sports scientists, coaches, teachers and parents.

The method that will be used in this study is a comprehensive literature study about the use of ergogenic aids and banned substances amongst elite adolescent athletes. Based on the literature findings, questions were identified that will be used to compile a draft questionnaire. This questionnaire will be evaluated by several professionals in the areas of sports medicine, sports conditioning, nutrition, doping and supplements. The final questionnaire will be used to collect data amongst the elite adolescent athletes at the University of the Free State Athletics Club.

For the purpose of this part of the study the **draft questionnaire will be evaluated** according to the following:

1. Are the questions clear and easy to understand?
2. Are the questions relevant to the topic?
3. Are the proposed answers relevant to the questions?
4. Can you identify any other relevant questions that should be added to the questionnaire?

You have been identified as having expert knowledge and experience that could aid in this research. I therefore request your assistance to evaluate the proposed questionnaire by completing the accompanying evaluation form. Should you have any questions regarding the study or questionnaire, I can be contacted at:

Telephone: 072 651 8859

Email address: amanda.wel@hotmail.com

Should you be willing to participate, please complete the accompanying evaluation form and return it to me as soon as possible.

Thank you for taking time to read this communication. I greatly appreciate your contribution to this project.

Sincerely,

Amanda Welthagen

APPENDIX D

KNOWLEDGE AND ATTITUDE QUESTIONNAIRE EVALUATION FORM

KNOWLEDGE AND ATTITUDE QUESTIONNAIRE EVALUATION FORM**Expert panelist no:**

Please use this template to evaluate each question on the accompanying questionnaire according to the criteria in the top row.

Question	Is the question clear and understandable?	Is the question relevant?	Are the proposed answers relevant?	Comments and suggestions	Office use
	Yes/No/Maybe	Yes/No/Maybe	Yes/No/Maybe		
1					1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25
26					26
27					27
28					28

Have you identified any other questions that should be added to the questionnaire?

Additional comments

Do you think that a questionnaire is the most appropriate tool to collect the information needed in this study?

Comments:

This concludes the initial evaluation of the questionnaire. Please send the completed forms to me by fax at 051-4442969 or email to elss@ufs.ac.za.

Thank you for your participation in the study.

Amanda Welthagen

APPENDIX E

LETTER TO THE DEPARTMENT SPORTS AND EXERCISE MEDICINE TO PARTICIPATE IN RESEARCH

LETTER TO THE DIVISION SPORTS AND EXERCISE MEDICINE TO PARTICIPATE IN RESEARCH

UNIVERSITEIT VAN DIE VRYSTAAT
UNIVERSITY OF THE FREE STATE
YUNIVERSITHI YA FREISTATA

☒ 339 BLOEMFONTEIN 9300

REPUBLIEK VAN SUID-AFRIKA/REPUBLIC OF SOUTH AFRICA
REPHABLIKE YA AFRIKA BORWA



**Afdeling Sport- en Oefeningsgeneeskunde / Division Sports and Exercise
Medicine Skool vir Geneeskunde / School of Medicine
Fakulteit Gesondheidswetenskappe / Faculty of Health Sciences**

18 June 2014

Dear Sir/Madam

Request to participate

I am currently completing my master's degree in Biokinetics at the University of the Free State. The title of my research is **THE DEVELOPMENT OF A MEASURING INSTRUMENT TO DETERMINE THE KNOWLEDGE AND ATTITUDES OF ELITE ADOLESCENT ATHLETES ABOUT ERGOGENIC AIDS AND BANNED SUBSTANCES.**

My supervisors are:

Promoter: Dr LJ Holtzhausen
Head: Sports and Exercise Medicine
Faculty of Health Sciences
University of the Free State
Bloemfontein, South Africa
Co-promoter: Dr P van der Merwe
SA Doping Control Laboratory
University of the Free State
Bloemfontein, South Africa

The problem that has to be addressed is the ever increasing popularity of supplements and banned substances as a means to improve sporting performance, especially under school aged athletes.

The aim of this study will be to create a reliable measuring instrument to be used to measure the knowledge and attitudes of adolescent athletes about supplements and banned substances and then to use this measuring instrument to determine what the adolescent athletes' knowledge and attitude about supplements and banned substances are. The purpose of this is to better understand what is needed to develop an educational program to promote safe and fair play in sports.

The value of the research will be that it will provide insight into the adolescent athletes' knowledge and attitudes about the use of supplements and banned supplements. This study can lay the foundation for future research on this topic and it will provide some of the necessary information to design and implement an effective educational program. Education about ergogenic aids could reach beyond the athlete to those involved with the

athlete, including sports physicians, physiotherapists, biokineticists, sports scientists, coaches, teachers and parents.

The method that will be used in this study is a comprehensive literature study about the use of ergogenic aids and banned substances amongst elite adolescent athletes. Based on the literature findings, questions were identified that will be used to compile a draft questionnaire. This questionnaire will be evaluated by several professionals in the areas of sports medicine, sports conditioning, nutrition, doping and supplements. The final draft of the questionnaire will be evaluated by educational experts before it is tested in a pilot study amongst adolescent athletes at the Free State Sports Science Institute (FS SSI).

For the purpose of this part of the study the questionnaire should be evaluated according to the following:

1. Are the questions clear and easy to understand?
2. Is the format of the measuring instrument suitable for use amongst adolescents?

You have been identified as having expert knowledge and experience that could aid in this research. I therefore request your assistance to evaluate the proposed questionnaire by providing feedback in writing. Should you have any questions regarding the study or questionnaire, I can be contacted at:

Telephone: 072 651 8859

Email address: amanda.wel@hotmail.com

Should you be willing to participate, please complete the accompanying evaluation form and return it to me as soon as possible.

Thank you for taking time to read this communication. I greatly appreciate your contribution to this project.

Sincerely,

Amanda Welthagen

APPENDIX F

INTERVIEW GUIDE FOR EDUCATIONAL EXPERTS

INTERVIEW GUIDE FOR EDUCATIONAL EXPERTS

All questions should be answered with the adolescent in mind. The aim is to develop a measuring instrument that will collect the most accurate data on athletes' knowledge and attitudes about ergogenic aids and banned substances.

1. Are the questions clear and easy to understand?

2. Is the format of the measuring instrument (questionnaire) suitable for use amongst adolescents?

3. What other methods do you think would work better to measure the athletes' knowledge and attitudes about ergogenic aids and banned substances? (One-on-one interview/discussion groups)

4. Who should present the questionnaire to the adolescents? (the researcher/ teacher/ coach)

5. How should the questionnaire be presented to the adolescents? (alone/ in groups/ formal/ informal)

6. How can we best motivate the young athletes to answer the questions truthfully to ensure reliable data are obtained? (information sessions)

7. Any other comments:

APPENDIX G

KNOWLEDGE AND ATTITUDE DRAFT QUESTIONNAIRE

KNOWLEDGE AND ATTITUDE DRAFT QUESTIONNAIRE

Mark all applicable answers with an 'X'. Where applicable, more than one answer can be selected.

***Sports supplements:** Sources of nutrients and other legal substances whose purpose it is to supplement the normal diet, to directly or indirectly alter / enhance body composition, to enhance sporting performance, and/or assist with recovery following sporting activity.

****Banned substances:** Synthetic or natural substances taken to improve sporting performance in an attempt to gain an unfair advantage during training and competition.

1. What gender are you?

M	F
---	---

2. What age are you?

13	14	15	16	17	18	19	20
----	----	----	----	----	----	----	----

3. What school grade are you in?

8	9	10	11	12
---	---	----	----	----

4. What sports do you participate in? (mark all applicable)

X	SPORTS	Office use
	Rugby	
	Cricket	
	Swimming	
	Athletics	
	Tennis	
	Squash	
	Badminton	
	Golf	
	Soccer	
	Hockey	
	Netball	
	Water polo	
	Karate	
	Judo	
	Boxing	
	Cycling	
	Other:	

5. What is the highest level at which you participate in your main sports?

X	LEVEL	Office use
	School 1 st team	
	Provincial level	
	National level	
	Other:	

6. How many hours per week do you spend practising or participating in sports?

X	TIME	Office use
	Less than 2 hours per week	
	2-3 hours per week	
	4-5 hours per week	
	6-8 hours per week	
	More than 8 hours per week	

7. Have you taken any sports supplements in the last 6 months?

Yes	No
-----	----

8. If yes, what type of sports supplements* have you taken? *(mark all applicable)*

X	SPORTS SUPPLEMENT	Office use
	Sports drinks (Energade/ Powerade)	
	Sports bars (PVM Energy Bars)	
	Sports gels (GU/ Vooma)	
	Protein supplements (Pure Protein/ Whey Protein)	
	Creatine	
	Fat Burners (Phedra cut)	
	Mass Gainers (Anabolic Mass/ Hyperbolic Mass)	
	Amino acids (BCAA/ L-Carnitine/ Beta-Alanine)	
	Pro Hormones (Testosterone Booster/ EvoTest/ Testo Methox/ Tributrone)	
	Nitric oxide (Nitrix/ Niox)	
	Glutamine	
	CLA	
	Pro Hormones (EvoTest/ Testo Methox/ Tributrone)	
	Androsterone (DHEA/ Andro)	
	Other:	

9. If yes, what is your reason for using sports supplements? *(mark all applicable)*

X	REASON	Office use
	Weight loss	
	Weight gain/muscle gain	
	An imbalanced diet	
	Aiding recovery	
	Increased energy	
	Improved strength	
	Improved endurance	
	To look good and improve your body	
	To improve sporting performance	
	Other:	

10. If yes, how did you obtain the sports supplements?

X	OBTAINED FROM	Office use
	From a friend	

	From a coach or staff member	
	From a parent	
	From a gym or personal trainer	
	From a doctor (general practitioner)	
	From a supplement shop or pharmacy	
	From the internet	
	Other:	

11. Where do you find information about the sports supplements? *(mark all applicable)*

X	INFORMATION	Office use
	Internet	
	Personal trainer	
	Coach	
	General Practitioner	
	Dietician	
	Friends	
	Team members	
	Role model	
	Shop assistants/ Supplement reps	
	Other:	

12. Are you aware of any of the dangers or possible side effect of using sports supplements?

Yes No ☐

13. If yes, can you name all the side-effects of which you are aware?

14. Do you think that you can achieve the same results through exercise and diet that you can by using sports supplements?

Yes No ☐

15. Have you ever received any education about the use of sports supplements?

Yes No ☐

16. Have you ever received any education about the use of banned substances**? Yes No

17. If yes, in what format was the educational programme?

X	EDUCATION	Office use
	Informal (e.g. in the classroom/club)	
	Formal (e.g. lecture)	
	A pamphlet or booklet	
	On the internet	
	South African Institute for Drug Free Sports (SAIDS)	
	Other:	

18. Do you know what percentage (%) of sports supplements are contaminated with illegal substances?

X	PERCENTAGES	Office use
	0%	
	1-10%	
	11-20%	
	21-40%	
	41-60%	
	61-80%	
	81-100%	

19. Do you know what the consequences are for testing positive for a banned substance?

Yes No

20. If yes, can you name the consequences?

21. Do you consider the use of banned substances to be dangerous for your health?

Yes No

22. Do you think banned substances are used in your sports discipline?

Yes No

23. Do you personally know another athlete who is using banned substances?

Yes No

24. Why do you think athletes use banned substances? *(mark all applicable)*

X	REASON	Office use
	To improve sporting performance	
	To look good and improve my body	
	Due to peer pressure	
	Due to pressure from coach	
	Due to pressure from parents	
	To obtain financial contracts	
	Opponents are using it	
	Other:	

25. If you are encouraged to use banned substances by your coach/trainer, will you take it?

Yes No

26. If yes, what is your motivation for using banned substances?

X	MOTIVATION	Office use
	To improve sporting performance	

	Because other participants in your sports code are using banned substances	
	To look good and improve my body	
	Due to peer pressure	
	Due to pressure from coach	
	Due to pressure from parents	
	For financial gains	
	Other:	

27. If no, what are your reasons for refusing?

X	REFUSAL	Office use
	Against your moral values	
	You think it is cheating	
	There is no pressure on you to perform	
	For health reasons	
	Fear for testing positive and sanctions	
	It is against the spirit of sports	
	Other:	

28. Do you feel that you possess enough information about supplements to make an informed decision?

Yes	No
-----	----

29. Do you feel that you possess enough information about banned substances to make an informed decision?

Yes	No
-----	----

30. What would you suggest is the best way to educate young athletes about supplements?

31. What would you suggest is the best way to educate young athletes about banned substances?

APPENDIX H

LETTER OF CONSENT TO PARENT/GUARDIAN

LETTER OF CONSENT TO PARENT/GUARDIAN

Amanda Welthagen
PO Box 29250
Danhof, 9310
amanda.wel@hotmail.com
Phone: 072 651 8859

Dear Parent/Guardian

The development of a measuring instrument to determine the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances

The use of sports supplements and banned substances are becoming more popular in sports. To better understand this, we need to gather information about the athletes' knowledge of and attitude toward using these supplements and banned substances to improve performance in sports. This information will prove valuable in the development of educational programmes for athletes.

I, Amanda Welthagen, am undertaking a research study among elite adolescent athletes at the University of the Free State Athletics Club.

The aims and methodology of the survey are presented in the Information Letter.

If you consent, we will test the knowledge and attitudes of your child about the use of sports supplements and banned substances. Data will be gathered by completing an anonymous questionnaire. Participation is voluntary and all data will be treated confidentially at all times. The participant may withdraw from the study at any time. The results of the study may be published. There are no costs or payments involved for the participants.

If you agree please indicate consent: Yes / No

.....
Athlete's name

.....
Parent's name

.....
Parent's signature

Thank you for your consideration in this regard.

Kind regards

Amanda Welthagen

APPENDIX I

LETTER OF CONSENT TO PARTICIPANT

LETTER OF CONSENT TO PARTICIPANT

The development of a measuring instrument to determine the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances.

You have been asked to participate in a research study, as explained to you by Ms Amanda Welthagen, and as described in the information leaflet.

Your participation in this research is voluntary. You will remain anonymous and your data will be treated confidentially at all times. You may withdraw from this study at any time during the completion of the questionnaire. The results of the study may be published. There are no costs or payments involved for the participants.

If you agree to participate in this research, kindly complete the consent form below.

The research study, including the above information has been verbally described to me. I understand what my involvement in the study means and I voluntarily agree to participate.

Name of Participant

Signature of Participant

Date

APPENDIX J

INFORMATION LETTER TO PARTICIPANT

INFORMATION LETTER TO PARTICIPANT

INFORMATION LETTER

The development of a measuring instrument to determine the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances

Dear Participant

We, Amanda Welthagen (researcher), Dr Louis Holtzhausen (study leader) and Dr Pieter van der Merwe (co-study-leader), are doing research on the knowledge and attitudes of adolescent athletes about ergogenic aids and banned substances. In this study we want to learn what knowledge young athletes have about sports supplements and banned substances, as well as their attitudes toward its use.

We are asking/inviting you to participate in a research study.

The study will be done by completing an anonymous questionnaire. You will be asked questions about your knowledge and use of sports supplements and banned substances. Most of the questions are multiple choice questions, with some open questions. Completion of the questionnaire will take you approximately 15 minutes.

Participation is voluntary. The participant may discontinue the study at any time without penalty. There are no costs or payments involved for the participants. There are no risks to you in participating in this study.

Contact details of researchers – for further information:

Amanda Welthagen (072 651 8859) or Dr Louis Holtzhausen (051 401 2530).

Contact details of Secretariat and Chair: Ethics Committee of the Faculty of Health Sciences, University of the Free State – for reporting of complaints/problems: Telephone number (051) 4052812

Dr Annemie Grobler

PhD (English), APed (SATI)member 1003103



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**This is to certify that the following document has been professionally
language edited:**

**THE DEVELOPMENT OF A MEASURING INSTRUMENT TO DETERMINE THE
KNOWLEDGE AND ATTITUDES OF ELITE ADOLESCENT ATHLETES ABOUT
ERGOGENIC AIDS AND BANNED SUBSTANCES**

Author: Amanda Welthagen

Nature of document: Master's dissertation, University of the Free State

Date of this statement: 9 February 2016

AM Grobler