

Exploring the Knowledge, Attitude, Perceptions, and Practices of Pharmacists with Regards to Doping and Medication Use in Sports

Nerine du Plessis

1662927

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG



Supervisors:

Mrs Rubina Shaikh

Mrs Zelna Booth

Professor Demitri Constantinou

A dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Pharmacy.

August 2024

Declaration

I, Nerine du Plessis, declare that this dissertation is my own, unaided work and has not been submitted before for any degree or examination at any other University. All sources that I have used or quoted have been indicated and acknowledged by complete references. This dissertation is being submitted for the degree of Master of Pharmacy at the University of the Witwatersrand, Johannesburg.



Nerine du Plessis

20 August 2024

Date

Ethics declaration

I, Nerine du Plessis, declare that I am registered with the University of the Witwatersrand for the degree in Master of Pharmacy and have read the University's current research ethics guidelines. I accept responsibility for the conduct of the procedures in accordance with the Human Research Ethics Committee (HREC). I obtained ethical approval from HREC (Appendix 1, M210837) to conduct my research.



Nerine du Plessis

20 August 2024

Date

Dedication

I would like to firstly thank my supervisors Mrs Rubina Shaikh, Mrs Zelna Booth, and Professor Demitri Constantinou for their support, guidance, and help throughout this process. It was incredibly challenging but very worthwhile.

I would like to thank all the participants who took time and effort to contribute to this research.

Thank you to University of the Witwatersrand biostatistician, Prof Clarence Yah for all the assistance.

Thank you to my siblings and my parents for all the support and listening patiently when I complain. A special thank you to my amazing mom who encouraged me to take this leap and helped me through every step along the way, I could not have done this without you.

Lastly, thank you to my fellow peers in the Department of Pharmacy and Pharmacology.

Research Outputs

Presentations

Perceptions related to Doping, and Athlete's use of Medication and Supplements: A qualitative study of Pharmacists in Gauteng, by du Plessis, N. Booth, Z. Constantinou, D. Shaikh, R. Poster presentation, abstract submitted March 2024 for consideration to the 82nd FIP World Congress of Pharmacy and Pharmaceutical Sciences, Cape Town 2024. (Appendix 2)

Perceptions related to Doping, and Athlete's use of Medication and Supplements: A qualitative study of Pharmacists in Gauteng, by du Plessis, N. Booth, Z. Constantinou, D. Shaikh, R. Poster presentation, abstract to be submitted for the 20th SASMA Congress, Stellenbosch 2024

Drafts of research for submission for publication

Review Article

du Plessis, N. Booth, Z. Constantinou, D. Shaikh, R. Pharmacists in Sport and Anti-Doping: A Brief History, Opportunities, and Challenges. (Aimed to be published in the Journal of Sports Medicine and Doping Studies)

Research Papers

du Plessis, N. Booth, Z. Constantinou, D. Shaikh, R. Attitudes and perceptions of doping and medication use in sports: A qualitative study of South African Pharmacists. (Aimed to be published in the South African Journal of Sports medicine)

du Plessis, N. Booth, Z. Constantinou, D. Shaikh, R. Knowledge, Attitude, Perceptions, and practices of Pharmacists with regards to Doping and Medication Use in Sport: A survey of South African Pharmacy Personnel. (Aimed to be published in the South African Journal of Sports Medicine, and Journal of Pharmacy Practice)

Abstract

Background: Sports medicine has become a more prominent field of specialization in recent years, with growing interest in appropriate medication use in athletes. However, pharmacists appear to have little involvement in sports medicine. Pharmacists are optimally skilled to manage medication specific needs of patients and should play a more pertinent role in managing the use of medication in athletes. Efforts should consider the unique physiology and lifestyle of an athlete and align with World Anti-Doping Agency regulations. Limited literature reports on the South African pharmacists' perception or interest in this field, and the hindrances to potential involvement in sports medicine.

Aim: The aim of the study is to explore the knowledge, attitudes, perceptions, and practices of pharmacy personnel with regards to medication use and doping in athletes, to better inform future actions and guidelines in South Africa.

Method: An explanatory mixed method research design was utilized to meet the objectives of the study as approved by the University of the Witwatersrand Health Research Ethics Committee. The initial quantitative phase relied on data collected through self-administered surveys completed by pharmacy personnel currently working in community pharmacies in Gauteng. The results were analysed and displayed through various means including descriptive statistics as well as Student T-test, ANOVA, and Kruskal-Wallis tests. The qualitative phase followed, relying on information collected through interviews, with the assistance of a semi-structured interview guide, with participants from the initial qualitative phase. These responses underwent thematic analysis to extract meaningful data.

Results: A total of three hundred and thirty-two (332) pharmacy personnel participated in the survey. The knowledge, attitude and perceptions, and practices scores obtained indicated that while participants have a positive opinion of sports medicine and pharmacy's involvement in the field, with mean score of 67% with regards to attitude and perception. It is suggested that barriers may exist that have affected participants opinions regarding their involvement limiting the mean score. Participants self-declared knowledge received a mean score of 51%, this appears comparable with other studies. However the tested knowledge of participants indicates much poorer knowledge with a mean score of 37%, indicating possible poor education on the topic of sports medicine. Participants current practices with regards to sports medicine appear to be limited with a mean score of 50%. The extent of involvement can be associated with the indicated limited knowledge and possible resultant lack of confidence in the field. Correlations indicated that qualification and associated professional affiliation

1 have a significant impact on participants knowledge, attitude, perceptions, and practices related to
2 doping and medication use in athletes.

3 These results were further emphasised during the interview process. Seventeen pharmacists
4 participated in the qualitative phase. Pharmacists have awareness of, and a positive perception
5 towards the field of sports medicine, and agree that pharmacists can have an impact on anti-doping
6 efforts and appropriate medication use, specific limitations have hindered their involvement thus far.
7 The most significant limiting factor to pharmacist involvement in sports medicine identified was that
8 of pharmacists' limited knowledge, resulting in poor counselling and assistance on issues related to
9 sports medicine. Additional limitations that have a notable impact were related to the regulation of
10 supplements causing decreased involvement by pharmacists as well as the outward perception of
11 pharmacists' potential impact. The positive response to the proposed implementation of specific local
12 guidelines or courses related to sports medicine, provides an indication of pharmacists' willingness,
13 and interest to become better educated in the field, leading to increased confidence and thus
14 involvement.

15
16 **Conclusions:** The findings of this research confirmed pharmacist potential impact in sports medicine
17 while alluding to specific problems that have hindered the involvement of pharmacists in sports
18 medicine. With increased educational opportunities, the inclusion of appropriate resources, and
19 efforts to include pharmacists in matters related to medication use in athletes, specifically in anti-
20 doping, pharmacists can have a significant impact on the future of sports medicine.

1	Table of Contents	
2	Declaration	i
3	Ethics declaration	ii
4	Dedication	iii
5	Research Outputs.....	iv
6	Abstract.....	v
7	List of Abbreviations.....	- 1 -
8	List of Figures	- 2 -
9	List of Tables.....	- 3 -
10	Chapter 1.....	- 3 -
11	List of Equations	- 4 -
12	Chapter 1: Introduction.....	- 5 -
13	1.1. Background	- 5 -
14	1.2. Problem Statement	- 12 -
15	1.3. Aims and Objectives	- 13 -
16	1.4. Significance of the study	- 14 -
17	1.5. Synopsis of Dissertation	- 15 -
18	Chapter 2: Literature Review	- 17 -
19	2.1. Introduction	- 17 -
20	2.1.1. Search Strategy	- 18 -
21	2.2. History	- 18 -
22	2.2.1. The Misuse of Pharmaceutical Products for Increased Performance	- 18 -
23	2.2.2. Doping in Sport and the World Anti-Doping Agency	- 19 -
24	2.2.3. Accidental Doping	- 19 -
25	2.2.4. International Regulation and Compliance	- 20 -
26	2.2.5. Consequences for Athletes	- 20 -
27	2.3. Opportunities	- 21 -
28	2.3.1. Custodians of Medicine in Sports	- 21 -
29	2.3.2. Acknowledging the Potential Role	- 22 -
30	2.3.3. A Place for Pharmacists in Sport	- 22 -
31	2.3.4. Sports and Nation Building	- 24 -
32	2.4. Challenges	- 25 -
33	2.4.1. Pharmacists' Knowledge and Training	- 25 -
34	2.4.2. The Issue of Supplement Regulation	- 26 -
35	2.4.5. Ineffective Anti-Doping Initiatives	- 28 -

1	2.4.6. Athlete Identification	29 -
2	2.5. Conclusion	30 -
3	CHAPTER 3: Methodology	31 -
4	3.1 Study Design	31 -
5	3.2. Phase 1: Quantitative data collection	32 -
6	3.2.1. Study Setting.....	32 -
7	3.2.2. Study Population and sampling methods.....	32 -
8	3.2.3. Sample Size	32 -
9	3.2.4. Data collection Tools	33 -
10	3.2.5 Study Procedure	36 -
11	3.2.6. Data analysis.....	37 -
12	3.2.7. Ethical considerations	37 -
13	3.3. Phase 2: Qualitative data collection	37 -
14	3.3.1. Study setting.....	37 -
15	3.3.2. Study Population and Sampling methods	38 -
16	3.3.3. Sample size	38 -
17	3.3.4. Data Collection Tool	39 -
18	3.3.5. Participant Recruitment and Study Procedure.....	39 -
19	3.3.6. Data organization	40 -
20	3.3.7. Data analysis.....	40 -
21	3.4. Phase 3: Integration of Phases 1 and 2.....	41 -
22	Chapter 4: Results and Discussion-Phase 1.....	42 -
23	4.1. Purpose of Phase 1	42 -
24	4.2. Participant Response and Demographics	42 -
25	4.2.1. Demographics.....	42 -
26	4.3. Results.....	44 -
27	4.3.1. Descriptive Statistics	44 -
28	Figure 4.3: Pharmacy personnels response distribution on general practices related to sports	
29	pharmacy and medication use in athletes	47 -
30	4.3.2. Correlations	48 -
31	4.3.3. Discussion	52
32	4.3.3.1. Knowledge.....	52
33	4.3.3.2. Attitudes and Perceptions	53
34	4.3.3.3. Practice.....	54
35	Chapter 5: Results and Discussion – Phase 2	57
36	5.1. Purpose of Phase 2	57

1	5.2. Participant Demographics:	57
2	5.3. Qualitative Analysis Results	58
3	5.3.1. Theme 1: The role of the pharmacist in sports pharmacy	58
4	5.3.2. Theme 2: Sports pharmacy related training and education	62
5	5.3.3. Theme 3: Regulatory framework and guideline development	66
6	5.3.4. Theme 4: Barriers in practice that limit pharmacists' involvement in sports pharmacy ..	68
7	5.3.5. Summary	70
8	5.4. Phase 2: Qualitative Phase Discussion	71
9	5.4.1. Theme 1: Pharmacists recognised the potential role that they could play in sports	
10	pharmacy	71
11	5.4.2. Theme 2: Sports pharmacy related training and education	73
12	5.4.3. Theme 3: Regulatory framework and guideline development	74
13	5.4.4. Theme 4: Barriers in practice that limit pharmacists' involvement in sports pharmacy ..	76
14	Chapter 6: Integration – Phase 3	78
15	6.1. Purpose of Phase 3	78
16	6.2. Integration	78
17	6.2.1. The role of pharmacists in sports pharmacy	78
18	6.2.2. Knowledge and education of pharmacist	79
19	6.2.3. Guidelines and Regulatory frameworks	80
20	6.2.4. Lack of pharmacists' involvement	81
21	Chapter 7: Strengths, Limitations, Conclusions and Recommendations	83
22	7.1. Strengths and Limitations	83
23	7.1.1. Strengths	83
24	7.1.2. Limitations	83
25	7.2. Conclusions and Future Recommendations	84
26	7.2.1. Conclusions	84
27	7.2.2. Future Recommendations	85
28	References	87
29	Appendix 1: Ethics Clearance Certificate	96
30	Appendix 2: Abstract submitted for consideration for poster presentation at the 82nd FIP World	
31	Congress of Pharmacy and Pharmaceutical Science	98
32	Ms Nerine du Plessis¹, Ms. Zelna Booth¹, Prof Demitri Constantinou², Mrs Rubina Shaikh¹	98
33	¹ University of the Witwatersrand, Faculty of Health Sciences, Department of Pharmacy and	
34	Pharmacology, South Africa	98
35	² University of the Witwatersrand, Department of Exercise Science and Sports Medicine, South	
36	Africa	98
37	Appendix 3: Pharmacy Personnel Survey	100

1	Appendix 4: Participant information Sheet (Phase 1 data collection)	110
2	Appendix 5: Participant Information Sheet (Phase 2 data collection)	113
3	Appendix 6: Interview Consent Form	115
4	Appendix 7: Audio Recording Consent Form	116
5	Appendix 8: Interview Demographic Questions	117
6	Appendix 9: Semi-structured Interview Guide.....	119
7	Appendix 10: Turnitin Report.....	121
8		121
9		

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List of Abbreviations

3	CPD	Continued Professional Development
4	FIP	International Pharmacy Federation
5	HREC	Human Research Ethics Committee
6	OTC	Over-The-Counter
7	PIS	Participant Information Sheet
8	SAIDS	South African Institute for Drug Free Sport
9	SAHPRA	South African Health Product Regulatory Authority
10	SAPC	South African Pharmacy Council
11	WADA	The World Anti-Doping Agency

List of Figures

Chapter 1

Figure 1.1: Schematic overview of the study methodology.....	8
---	---

Chapter 3

Figure 3.1: Research design process using explanatory mixed method research design.....	30
--	----

Figure 3.2: Flow diagram demonstrating the process of survey development.....	33
--	----

Figure 3.3: A six-phase approach to thematic analysis (Braun and Clarke, 2012)	39
---	----

Chapter 4

Figure 4.1: Pharmacy personnels' response distribution for knowledge on sports pharmacy and medication use in athletes.....	44
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Figure 4.2: Pharmacy personnels' response distribution on their attitudes and perceptions related to sports pharmacy and medication use in athletes.....	45
---	----

Figure 4.3: Pharmacy personnels response distribution on general practices related to sports pharmacy and medication use in athletes.....	46
--	----

Figure 4.4: Pharmacy personnels confidence levels on counselling athletes on various topics.....	46
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Chapter 5

Figure 5.1: An overview of participants demographic information.....	56
---	----

List of Tables

Chapter 1

Table 1.1: Examples of claims of accidental doping.....	8
--	---

Chapter 4

Table 4.1: A depiction of participants demographic information.....	42
--	----

Table 4.2: Mean score for knowledge, attitudes, and perceptions of pharmacy personnel.....	43
---	----

Table 4.3: Participants' knowledge, attitudes and perceptions, practices, and tested knowledge according to demographic characteristics.....	49
---	----

Chapter 5

Table 5.1: Themes and Subthemes identified upon analysis.....	57
--	----

1
2
3
4
5

List of Equations

Chapter 3

Equation 3.1: Sample size calculation.....32

Chapter 1: Introduction

This chapter provides background and insight into sports medicine as it relates to medication and supplement use in athletes and highlighting the potential involvement of pharmacists in sports medicine. The need and significance of this particular study is expressed, and details of the specific chapters is presented.

1.1. Background

In this new era of pharmacy, the focus has shifted to one that allows pharmacy personnel to dedicate more time to patient-centred care (Abduelkarem, 2014; John, 2016). This requires that pharmacy personnel account for the variability that exists with each patient, and use this to inform and drive decisions around the patients' health and medication needs (Abduelkarem, 2014; John, 2016). In certain cases, specific groups of individuals who share a common condition, that requires additional consideration during prescribing and dispensing, are classified together as a special population group (Grimsurd *et al.*, 2015). One such set of individuals are athletes (Kawaguchi-Suzuki *et al.*, 2021) and in addition one such special group to be considered is professional athletes.

Sports and medicine have been associated with one another since the time of the gladiators (Ergen, 2016). The current specialisation of sports and exercise medicine encompasses a multidisciplinary approach, with healthcare teams working to provide diagnostic, curative, rehabilitative, and preventative health services to athletes (Ergen, 2016). These health care professionals are under obligation to not only treat illness and injuries, but to prepare athletes to reach their peak physical capabilities while avoiding injury or increased health risk, and uphold the integrity of sport (Ergen, 2016). Despite the multidisciplinary approach to this specialisation, until recently, pharmacists have had minimal involvement (Sturgil, 2020). Recently, the potential role that pharmacy personnel could play was recognised as it aligns with the changing role of pharmacy personnel in patient interactions (Bomfim, 2020; Yee *et al.*, 2020). This potential has been recognised and supported by leading heads in the pharmacy industry such as the International Pharmaceutical Federation (FIP), who's guidelines demonstrate how the pharmacy industry can have a greater impact in the various facets of sports medicine (FIP, 2014).

Athletes are defined as individuals who are trained and skilled in sports or games that require physical strength, agility, or stamina (Merriam-Webster, 2021). It is reasonable to conclude that the aim of a competitive athlete is to achieve physical excellence over that of their peers, this results in the highly

1 competitive environment that is seen in sport (Madigan *et al.*, 2019). With this highly competitive,
2 physically demanding environment, immense strain is placed on the athletes' bodies that surpasses
3 that of other individuals, which needs to be considered when working towards meeting the health and
4 medication needs of an athlete (Kawaguchi-Suzuki *et al.*, 2021). All competing athletes are also subject
5 to the World Anti-Doping Agency's (WADA) regulations and code which place restrictions on their
6 medication use which must be considered (WADA, 2022).

7
8 The WADA was established in 1999 with the mission to lead the fight against doping in sport. WADA
9 aims to protect athletes, promote the value of clean sport, and uphold the spirit of sport through its
10 anti-doping endeavours and regulations (WADA, 2022). WADA's regulations among other things,
11 dictates what substances athletes may and may not use and under what conditions they may or may
12 not be used (WADA, 2022). This limitation on medication use needs to be considered when making
13 decisions around the health and medication needs of an athlete (Yee *et al.*, 2020). These additional
14 considerations place athletes in a special population group requiring additional attention and advise
15 from pharmacy personnel on interactions to meet the athletes' health and medication needs (Mottram
16 and Stuart, 2013; Kawaguchi-Suzuki *et al.*, 2021). This is where the concept of sports pharmacy
17 originates. In broad terms, sports pharmacy encompasses many facets of pharmaceutical care,
18 including the provision of drug information, selection of appropriate treatment, and doping prevention
19 and control to ensure compliance with the WADA Code (Starzak *et al.*, 2016; Hooper *et al.*, 2019).
20 Sports pharmacy is inclusive of all medication use in addition to nutritional supplement use. The
21 importance of considering how any medication and/or supplement used acutely or chronically in an
22 athlete in conjunction with an athlete's physiology and training needs is essential and surpasses what
23 can be considered nutrition in sports. A definition for sports pharmacy is provided.

24
25 Doping in the context of sport refers to the use of a substance or method prohibited by an anti-doping
26 agency, as the use thereof may enhances the performance of an athlete in comparison to their
27 competitors or poses a risk to the athletes' health (Vlad *et al.*, 2018). Doping in sport is an unfortunate
28 consequence of the competitive nature of sport that drives athletes to utilise any means that may
29 provide an advantage over their competitors (Madigan *et al.*, 2019).

30
31 Sport in South Africa has a major influence as a soft power being associated with national pride and
32 respect (Labuschagne, 2010). Therefore, a vested interest in expanding and developing sport in the
33 country has been fostered (Department of Sports, Arts, and Culture, 2013). Multiple initiatives exist
34 with the aim of creating "An Active and Winning Nation" ensuring a vast pool of recreational and

competitive athletes spanning different sporting codes and competitive levels (Department of Sports, Arts, and Culture, 2013). As a soft power sport functions as ‘a mechanism of non-administrative impact on public perception and the collective representation’ (Korneeva and Ogurtsov, 2016). This influence is directly linked to athlete performance and public perception which is negatively impacted by unsportsmanlike practices such as match fixing and doping (Qi Ge and Humphreys, 2020). The National Department of Sport, Art, and Culture thus prioritises the development of ethical sporting practices in all sporting codes (Department of Sports, Arts, and Culture, 2013). This endeavour is met by supporting the South African Institute of Drug Free Sport and as signatories to WADA, ensuring their commitment to drug free sport and anti-doping are upheld (WADA, 2021). As per the WADA regulations, all international and national level athletes are subject to the rules laid out in the WADA. Furthermore, the South African Institute of Drug-Free Sport (SAIDS) requires that “nationals or residents in South Africa as well as all athletes present in the country either for competition or training” shall be subject to the local anti-doping rules (SAIDS, 2021). The implication of this is that regardless of an athletes age, rank, or sporting code every person that participates in a sport competitively is subject to the local and international doping rules and must be aware of the prohibited list, the circumstances under which they may be tested and the penalty for rule violations (SAIDS, 2021; WADA, 2021). The criteria for a substance (or method) being on WADA’s list of Prohibited substances are if it meets any two of the following (i) It has the potential to enhance or enhances sport performance, (ii) It represents an actual or potential health risk to the athlete, (iii) It violates the spirit of sport (SAIDS, 2021; WADA, 2021).

One of the responsibilities of WADA is to identify athletes who have committed doping offenses by means of intelligence and security work, whistleblowing, and targeted testing and apply the relevant sanctions accordingly (WADA, 2022). This is a reactive approach to doping prevention and while it is important and necessary, it results in WADA being one step behind athletes with doping intent (Vlad *et al.*, 2019). As new methods of doping are potentially developed at a faster rate than anti-doping agencies detection methods, a gap is created for potential doping occurrences to occur unnoticed (Vlad *et al.*, 2019).

The WADA has identified this as an issue and have implemented new strategies to effectively limit doping from the onset. These strategies promote a preventative approach where education is the main focus (Juma *et al.*, 2022). Education in this context is not limited to athletes but is targeted at all relevant parties that interact with athletes as ‘athlete support personnel’ including health care professionals (WADA, 2022). The benefit of this is that healthcare professionals will be better informed to identify potential doping occurrences, and advise athletes by providing the most correct, relevant,

and up to date information on medication use and anti-doping (Mottram and Stuart, 2012; FIP, 2014). This approach to doping prevention may be perceived as conservative against athletes who are intent on doping, however it has shown effectiveness in decreasing the number of doping occurrences and is considered a primary tool for doping prevention (Juma *et al.*, 2022).

On review of doping occurrences, it is evident that many athletes claim that they have not doped intentionally, but rather profess innocence under the basis of accidental doping (Chan *et al.*, 2017). While athletes are experts in their fields, they are lay people in terms of medication usage. While athletes may be aware of doping and have some knowledge, they are not experts in medication and supplement use. Their knowledge and understanding are limited compared to that of pharmacy personnel. To avoid errors and accidental doping while optimising an athletes' health it is far safer and efficient to consult with a health care professional. Not every athlete competing on an elite level has the same access to assistance and information it cannot be assumed that every athlete will be aware and have a sufficient level of knowledge and understanding to correctly and safely make decisions on medication and supplement use. These errors can lead to unfortunate circumstances for athletes (Shiple, 2000; Allen, 2014; Clarey and Tierney, 2016; Smith-Morris *et al.*, 2018; USADA, 2021; Sky Sports, 2024). There is the real scenario where there is inadvertent doping, particularly among recreational and uneducated athletes who may find themselves in a situation of a doping offense. The relevance of pharmacists is highlighted in such cases (Sturgill, 2020). Indeed, there are incidents that have occurred in high level sport over the years, where athletes have claimed to have unknowingly consumed either over-the-counter (OTC) medication or supplements that were in fact prohibited or contained a prohibited substance, some of which are depicted in Table 1.1.

Table 1.1: Notable claims of accidental doping

Year	Incident	Reference
2000	Romanian Olympic gymnast Andreea Raducan was stripped of gold medals at the 2000 Olympics after testing positive for pseudoephedrine after taking OTC cold medication	(Shiple, 2000)
2014	Swedish ice hockey player Nicklas Backstrom was removed from the line-up before the gold medal game at the Sochi Winter Olympics after testing positive for pseudoephedrine	(Allen, 2014)
2016	Maria Sharapova received a 15 month ban from tennis after testing positive for meldonium shortly after it was added to the prohibited list at the beginning of 2016	(Clarey and Tierney, 2016)
2018	The Canadian Powerlifting Union conducted a study on their World Championship level athletes which demonstrated that nearly half of the athletes were taking at least one banned substance	(Smith-Morris <i>et al.</i> , 2018)
2021	Sha' Carri Richardson who received a 1 month ban for testing positive for THC after taking a supplement for anxiety which resulted in her being unable to complete in the 2021 Olympic games in Tokyo)	(USADA, 2021)

2024	Paul Pogba, Italian soccer player received a 4-year ban from soccer for testing positive for testosterone. He is however appealing this decision based on claims of accidental doping, with the source of the testosterone being a food supplement prescribed by a doctor	(Sky Sports, 2024)
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1

2 Accidental or unintentional doping violations can occur for several reasons but can be generalised to
3 most athletes not having the same level of understanding of medication usage that pharmacy
4 personnel do (Chan *et al.*, 2016). This lack of understanding has led to athletes using medication and/or
5 supplements without being aware of their contents and the potential of consuming a prohibited
6 substance which may result in a doping offense (Gabriels and Lambert, 2013; Chan *et al.*, 2016;
7 Neilson, 2017; Piattoly, 2022). A major contributor to this problem appears to be linked to the
8 consumption of supplements by athletes to support their training and provide possible advantage over
9 their competitors (Petroczi *et al.*, 2008; Vlad *et al.*, 2018; Hooper *et al.*, 2019; Alonso and Fernandez-
10 Garcia, 2020; Piattoly, 2022).

11

12 Globally, OTC and prescription medications are highly regulated with every component contained with
13 these products being known as per the Medicines and Related Substances Act 101, 1965. This
14 transparency makes it possible to determine whether a product contains a prohibited substance or not
15 and thus informed decisions can be made around their use. Supplements are however regulated
16 differently or not at all globally (Starr, 2015; Naidoo *et al.*, 2018). In South Africa, as per the Medicines
17 and Related Substances Act 101, 1965, all health supplements are now classified as category D
18 medications by the South African Health Product Regulatory Authority (SAHPRA) which requires them
19 to be assessed for quality, safety, and efficacy (SAHPRA, 2020). These products, although not as strictly
20 regulated as Schedule 2 – 6 medicines, still fall within the custodianship of pharmacy personnel. This
21 shift will require supplements to be more highly regulated and result in a safer set of products. This is,
22 however, a slow process and allows for products available prior to this implementation in regulation
23 to continue to be produced and sold as before, until such a time that it is assessed (SAHPRA, 2020).
24 Due to poor regulation in the past products may have been produced in a manner that is not compliant
25 with Good Manufacturing Practice standards resulting in possible contamination with prohibited
26 substances (Neilson, 2017). Compounding this problem is the differing requirements for labelling and
27 packaging of these products which has allowed for incomplete and/or inaccurate labelling allowing for
28 possible adulteration with prohibited substances (Neilson, 2017). Adulteration and/or contamination
29 of supplements with prohibited substances not only puts athletes at risk of accidental doping but can
30 be potentially harmful as they may suffer from unknown drug interactions or side effects (Gabriels and
31 Lambert, 2013; Abbate *et al.*, 2015; Gabriels *et al.*, 2015; Naidoo *et al.*, 2018; Duiven *et al.*, 2021;
32 Piattoly, 2022). This barrier makes it increasingly difficult for athletes to make informed decisions on

1 supplement consumption especially in cases whereas lay people athletes are not aware of these
2 potential risks (Gabriels and Lambert, 2013; Chan *et al.*, 2016). It would be ideal if medicines were
3 regulated harmoniously globally however this is difficult considering each nations individual view and
4 use of medication and how regulation and access to medicine differs depending on socio-economic
5 factors. I have thus advocated for improved regulation and clarity with regards to the content of
6 supplement, the safety profiles, and efficacy.

7
8 The sanctions-imposed consequent to doping can vary from a warning to a lifetime ban from all sport.
9 In the case of accidental doping, unintentional presence, use, or possession of a specified substance
10 (any substance that appears on the WADA Prohibited List) often found in OTC and contaminated
11 products, the sanction imposed is a period of ineligibility of two years, this can however vary
12 depending on substance or circumstance (WADA, 2021). This follows WADA's principle of strict liability
13 on substance use, this means that "an athlete is responsible for any banned substance found in their
14 system, regardless as to how it got there or, whether they had any intention to cheat" (WADA, 2021).
15 The consequences of doping are not limited to the official sanction imposed (Korneeva and Ogurtsov,
16 2016; van der Sluijs, 2017; Qi and Humphreys, 2020). Due to the soft power associated with sport and
17 the negative effect that doping has on an athletes' public perception regardless of whether it be
18 accidental or intentional the athlete will suffer consequences linked to their public endorsements and
19 sponsorships as organizations will not wish to align with this image (Korneeva and Ogurtsov, 2016; van
20 der Sluijs, 2017; Qi and Humphreys, 2020).

21
22 To avoid potential consequences, athletes need reliable, credible, informed assistance (Howard *et al.*,
23 2017). Athletes, like most patients, are lay individuals, and as such may not have all the relevant
24 knowledge or understanding to make informed decisions on medication or supplement use (Chan *et al.*
25 *et al.*, 2016). This is where the role of athlete support personnel is established (WADA, 2021). WADA
26 recognises the need for qualified assistance in all fields associated with the athlete but especially with
27 regards to medication and supplement use. As such, athlete support personnel are mandated to
28 ensure that athletes uphold their responsibility towards clean sport by being knowledgeable and
29 complying with the WADA code and using their influence to foster sound anti-doping practices (WADA,
30 2021). In addition to the role played by medical doctors involved with athletes and teams, pharmacy
31 personnel meet these specifications perfectly (SAPC, 2010). In South Africa pharmacists are considered
32 as front-line health care practitioners when seeking OTC (Schedule 1 and 2) and schedule 0 products,
33 which often result in cases of accidental doping. With not all athletes having access to a doctor or
34 medical team that is appropriately equipped to manage athletes' health pharmacists can play a pivotal

1 role in assisting athletes in safe medication usage and compliance with WADA regulations (Mottram
2 and Stuart, 2012; Kawaguchi-Suzuki *et al.*, 2021; South African Pharmacy Council, 2021). In support of
3 the WADA regulations pharmacists as the custodians of medicine act as an additional line of defence
4 against the misuse of medication and can prevent cases of accidental or intentional doping that may
5 have been overlooked. These roles only encompass a patient orientated role limited to those working
6 in community and institutional pharmacies (FIP, 2014). Pharmacy personnel in other sectors can be as
7 influential effecting areas such as the development of guidelines, manufacturing of medication,
8 evaluation of products and so forth, that ensure increased safety in athletes (FIP, 2014).

9
10 If pharmacy personnel take up these roles as recommended (FIP, 2014; Starzak *et al.*, 2016; Hooper *et*
11 *al.*, 2018; Smith-Morris *et al.*, 2018; Mottram and Stuart, 2021) they have the potential to have an
12 immense impact on the number of doping occurrences and enhancing athletes health by ensuring
13 correct and safe use of medication while complying with the WADA code and for filling their scope of
14 practice (SAPC, 2010). As pharmacy personnel the main objective regardless of who the patient is, is
15 to ensure the safe and correct use of medication while protecting the patient and are thus already
16 appropriately skilled to perform the role (Shibata *et al.*, 2017; Bomfin, 2020).

17
18 Pharmacy personnel, despite being highly skilled in evaluation of patient medication needs and
19 counselling, cannot do this effectively if they do not have the appropriate information and resources
20 to make informed decisions (Shibata *et al.*, 2017; Bomfin, 2020). This lack of adequate education and
21 information prevents pharmacy personnel from effectively advise and counsel athletes. Pharmacy
22 personnel thus avoid from sports medicine despite having expressed enthusiasm in involvement if the
23 field (Starzak *et al.*, 2016). This avoidance is compounded in the case of supplement use due to in part
24 the limited regulation (Vlad *et al.*, 2018; Hooper *et al.*, 2019; Alonso and Fernandez-Garcia, 2020).

25
26 As highlighted above supplements in South Africa as per SAHPRA are as category D medications, and
27 have not been regulated in the same manner as other medications (SAHPRA, 2020). As a result,
28 products may be manufactured in a manner that may result in contaminated and/or adulterated
29 products (Nielson, 2017). This may lead to cases of accidental doping cases that are not possible to
30 identify for athletes and pharmacy personnel (Gabriels and Lambert, 2013; Abbate *et al.*, 2015;
31 Gabriels *et al.*, 2015; Neilson, 2017; Naidoo *et al.*, 2018; Duiven *et al.*, 2021; Piattoly, 2022).
32 Furthermore, the packaging and labelling standards for supplements also differ from other
33 medications which may lead to products being sold without appropriate and/or accurate packaging.
34 The result of this that the available information on the products may not be useful to pharmacy

personnel in making informed decisions (Gabriels and Lambert, 2013; Abbate *et al.*, 2015; Gabriels *et al.*, 2015; Neilson, 2017; Naidoo *et al.*, 2018; Duiven *et al.*, 2021; Piattoly, 2022). For pharmacy personnel to effectively use their skills in treatment evaluation and counselling they need to be sufficiently informed and access to the necessary information to make informed decisions. To rectify this issue, guidelines need to be established on medication and supplement use in athletes based on what pharmacy personnel already know and what information is lacking. By doing this it is possible to give pharmacy personnel a framework on which to expand their knowledgeable and apply their skills appropriately.

1.2. Problem Statement

To gain an advantage over their competitors, athletes will utilise various techniques to gain an advantage (Madigan *et al.*, 2019). While this includes utilising different training techniques and efficient diets, it may include the use of pharmaceuticals to gain an advantage over their competitors (Vlad *et al.*, 2018). The use of supplements is not inherently prohibited, however, the risks associated in the event of adulterated and/ or contaminated products can lead to positive doping tests and potential health risks (Backhouse *et al.*, 2013). More concerning is the attempted use of highly regulated medication by athletes without a valid indication that results in performance advantage and potentially severe health risks (Madigan *et al.*, 2019; WADA, 2020). The effect of this is an overall increase in doping occurrences whether they be intentional or accidental.

As per WADA's recommendations, which are further supported by the International Pharmaceutical Federation's recommendations, for pharmacy personnel in attempt to decrease doping in sport a preventative strategy is the primary mechanism (FIP, 2014; WADA, 2020). This preventative approach highlights the use of education and advisement of athletes as well as vigilant dispensing practices. This responsibility falls in line with the scope of practice of pharmacy personnel with specific products that are known to be misused (SAPC, 2010).

A barrier to pharmacy personnel involvement in sports medicine and anti-doping is the lack of specific local guidelines and educational resources that sufficiently advise on the responsibility of medication use and management in athletes and identifying doping attempts. As lay people athletes may have limited knowledge and understanding (Chan *et al.*, 2016) and require credible sources of information from qualified experts in medication who understand and can transfer this knowledge to avoid mistakes that may result in doping occurrences and health risks (Howard *et al.*, 2017). In the case of

1 intentional attempted misuse of medication pharmacy personnel are equipped to identify this
2 situation and act accordingly as the custodians of medicine (Mottram and Stuart, 2021).

3
4 To develop appropriate guidelines, it must first be established what pharmacy personnel know, the
5 information they have access to and the specifics of their formal education, pharmacy personnels'
6 perception is of the field of sports medicine and pharmacy's potential involvement and the standard
7 practices they have established that could contribute to or hinder the prevention of doping in sport.
8 On establishment of this it is possible to determine what guidelines for sports pharmacy should contain
9 and how these guidelines can be implemented in pharmacy practice in a manner that is effective.

10
11 Sports and sports medicine is a growing field, that pharmacy personnel should be involved in, where
12 athletes are viewed as a special population group due to the increased physical strain experienced.
13 This increased strain above what would be considered normal, has driven interest into the field as
14 more research is being conducted to determine the implications of this additional strain, how to
15 minimise this strain while optimising results, and how to maintain optimum performance in training,
16 competition, and recovery whilst remaining compliant with the WADA regulations as medication and
17 supplements any be utilised. Pharmacy as a professional group have the potential to have a greater
18 involvement than previously experienced and the potential to impact multiple areas of sports
19 medicine.

21 **1.3. Aims and Objectives**

22 The primary aim of this study was to explore the knowledge, attitudes, and perceptions of pharmacy
23 personnel with regards to medication use and doping in athletes using a survey and follow up
24 interviews. The secondary aim was to explore the current standard practices (self-declared) of
25 pharmacy personnel that are implemented in determining the appropriateness of medicine use in
26 sports pharmacy with surveys and follow up interviews.

27
28 Through the collection of data from surveys and interviews, the study objectives were:

- 29 • To explore pharmacy personnel's knowledge, attitudes and perceptions of medications
30 and their use by athletes through a survey.
- 31 • To explore the self-reported standard of practices of pharmacy personnel with regards to
32 medication use in athletes

The above-mentioned aim and objectives will be achieved through a mixed methods study design, as described in Figure 1.1 below.

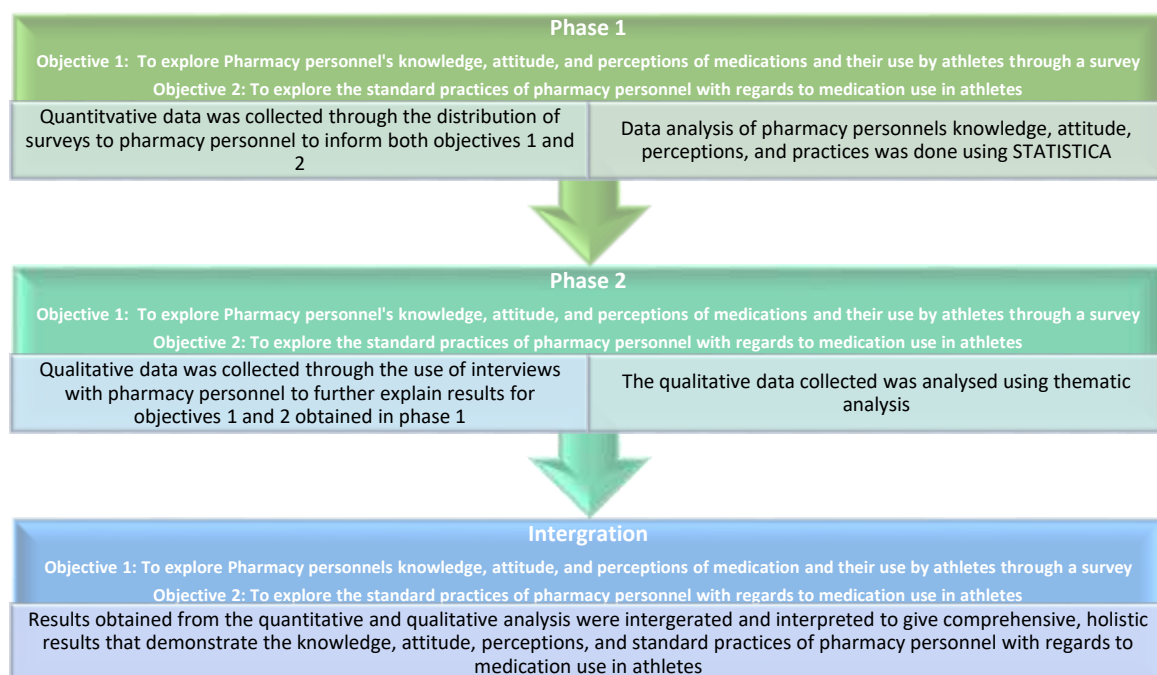


Figure 1.1: Schematic overview of the study methodology

1.4. Significance of the study

Pharmacists and pharmacy personnel work together as the custodians of medicine to meet patients' medicine related needs. This role involves, but is not limited to, ensuring that patients receive the correct medication and appropriate advice to meet their health outcomes, as well as ensuring that medication is not misused and cause undue harm (South African Pharmacy Council, 2010). All patients including athletes, require that athletes' medication needs are met while preventing misuse of medication, doping in sport, avoiding medication that is harmful to the athlete, which seems to have become more and more prevalent regardless of whether it is intentional or accidental doping (Lippi *et al.*, 2008; Vlad *et al.*, 2018).

It is evident that pharmacists and other pharmacy personnel are in the ideal position to identify and prevent doping offence, advise athletes on medication use and applicable doping regulations, and be knowledgeable of the WADA prohibited list and regulations (SAPC,2010; FIP, 2014; Smith Morris *et al.*, 2018; Mottram & Stuart, 2021; Greenbaum *et al.*, 2023; Rotich *et al.*, 2023) however, the undergraduate training received is not sufficient to equip them for this duty (SAQA, 2018; Hailu *et al.*, 2021; SAPC, 2021). For successful fulfilment of this responsibility, pharmacy personnel require appropriate guidelines for the pharmaceutical care of athletes, that comply with WADA regulations, to provide the relevant knowledge that will need to be applied when counselling athletes.

At present, due to the fact that sports pharmacy is still a developing field of interest, there are no established South African guidelines for pharmacy personnel to utilise in meeting the pharmaceutical care needs of the athlete patient.

In order to address the lack of guidelines and standards, it is important to first determine the knowledge gaps that exist, by establishing the current knowledge and standard practices, and the general attitudes and perceptions around doping and medication use in athletes by pharmacy personnel. Such research is useful in informing the development of guidelines and functional tools. The data collected can be analysed and used to provide essential information on doping and medication use in sports and highlight areas that can be targeted for development and implementation of guidelines.

By gaining the relevant information to inform guidelines you give pharmacy personnel the opportunity and the resources to expand their practice to best cater for the needs of athletes as a special population group as they do for all patients. It is a role that directly falls in line with the responsibilities of pharmacy personnel and should thus be given the attention that it previously did not.

1.5. Synopsis of Dissertation

Chapter One of the dissertation provides background information for the study. This chapter outlines the history of sports pharmacy and the issue of accidental doping in athletes and how pharmacy personnel can have an impact on this problem. A summary of the specific aim and objectives is included at the end of the chapter.

Chapter Two of the dissertation is a review of available literature focusing on the issue of doping in sport and the impact that sports pharmacy's role can help in this issue. The review gives further context into pharmacists' current knowledge, attitude, and perceptions of the field of sports pharmacy and the impact they can have as well as looking into the hindrance that prevent pharmacy personnel from undertaking these roles.

Chapter Three of the dissertation focuses on the methodology and design of the study, giving a detailed explanation of the study design followed. The study undertaken follows an explanatory, mixed methods format utilising both a quantitative phase (phase 1) followed by a qualitative phase (phase 2) that are described in this chapter.

Chapter Four of the dissertation discusses the quantitative results of the study. The quantitative data collected is represented by graphs, figures, and tables to demonstrate South African pharmacy personnel's knowledge, attitude, perceptions, and practices related to medication is in sport these results will then be interpreted and discussed.

Chapter Five of the dissertation discusses the qualitative data collected expressing the attitude, perceptions and practices of pharmacy personnel extracted from interview content. The data is presented as the themes identified during qualitative thematic analysis, and quotations as well as the discussion of the themes and subthemes identified.

Chapter Six of the dissertation focuses on the integration of the results obtained from the quantitative and qualitative phases allowing the data to be presented in a comprehensive manner.

Chapter Seven of the dissertation provides details of the strengths and limitations of the study, highlights future recommendations, and provides the conclusion of the study.

Chapter 2: Literature Review

Pharmacists in Sport and Anti-Doping: A Brief History, Opportunities, and Challenges

2.1. Introduction

Athletes are considered to be individuals who are trained or skilled in exercise, sports, or games requiring physical strength, agility, or stamina (Merriam-Webster, 2021). To be successful as an athlete one must achieve physical excellence. This pursuit of excellence results in immense physical strain that is applied to the body, that surpasses what is normally experienced by other individuals daily. The consistent additional physical strain and requirements for athletes, and the effect that this has on their physiology needs to be considered when working towards achieving optimal health, and medical needs of an athlete (Merriam-Webster, 2021). Elite athletes that compete on a national and/or international level are subject to the WADA regulations (WADA, 2021). Additional consideration must also be taken to ensure compliance with WADA regulations, as they apply to substances that an athlete may consume. The additional considerations, designate athletes into a special population group, where additional attention should be placed on their healthcare and medication requirements (Mottram and Stuart, 2013; Kawaguchi-Suzuki *et al.*, 2021). The additional attention required classes sports medicine as a specialised field (Mottram and Stuart, 2013; Ergen, 2016; Kawaguchi-Suzuki *et al.*, 2021).

Sports medicine is defined as a multidisciplinary field that involves the diagnostic, curative, rehabilitative, and preventative medical service, for athletes (Ergen, 2016). This definition highlights medical professionals' obligation to athletes not only to treat injury and disease once it occurs, but to be involved in the instruction and preparation of athletes to maximise their physical capabilities without injury, doping, or increased health risks (Ergen, 2016).

Sports medicine is not a new concept, but rather a speciality that originated in the time of the gladiators who were prepared and treated by specialised physicians "The first team doctors" (Ergen, 2016). Despite its ancient origins, sports medicine is still a thriving field, that is continuously expanding and developing, while incorporating additional disciplines of medicine that have been previously overlooked for their potential contribution to the field, the pharmacy profession is such a discipline (Ergen, 2016; Sturgill, 2020).

2.1.1. Search Strategy

Articles in peer-review journals and published literature in the English language dated in the last 14 years (2010-2024) with full text availability were considered for inclusion. Specifically articles focusing on the involvement of pharmacists in medication use and anti-doping in athletes were searched for. This includes any study investigating the knowledge, attitude, perception, practices, roles, and responsibilities of pharmacists in medication use in athletes and how it may relate to anti-doping. Articles not published in English and that did not focus on the topic specified were excluded.

Online databases that were used to search for eligible literature included, SCOPUS, ResearchGate, and Google Scholar. The search strategy revolved around a few key concepts specifically pharmacists, sports pharmacy, supplement use, and athletes. The search was restricted by date of publication, and English language. Additional resources were identified through the citation chain.

The literature review focused on and is organised into the following sections namely: History, Opportunities, and Challenges. (i) History, highlighting the use of medicines in sport, the issue of doping in sport and the implications of such. (ii) Opportunities, identifies the potential role that pharmacists could play in sports pharmacy and specifically anti-doping practices by highlighting pharmacists' attitudes towards their involvement in sport and, pharmacists' inherent knowledge and skills. (iii) Challenges, highlighting the potential barriers to pharmacists' involvement including pharmacists' potential shortcomings in training, inappropriate regulation of products and so forth.

2.2. History

2.2.1. The Misuse of Pharmaceutical Products for Increased Athletic Performance

Doping is an unfortunate consequence of the competitive nature of sport, where athletes are willing to try anything to gain even the smallest advantage over their competitors, regardless of validity or significant result (Madigan *et al.*, 2019). Doping is defined as the use of a substance or method that is prohibited by an anti-doping agency to enhance the performance of an athlete over that of their competitors (Vlad *et al.*, 2018). Sports in the current environment has evolved outside the range of physical excellence and skill and now encompasses far more reaching fields. Sports is now viewed as an industry where there is a constant interplay between business, politics, and pride, for oneself and a nation (Vlad *et al.*, 2018). In this environment where athletic ability is linked to much more complex

fields the desire to win and resultant reward is sought by any means necessary whether this be legal or not (Vlad *et al.*, 2018).

While these strategies may include various training techniques and altered diets, it does occur that pharmaceutical products including scheduled medications and supplements, that are believed to provide performance enhancing effects, are used outside of their registered indications. This appears to be done regardless that these methods can lead to increased health risk for athletes (Gabriels and Lambert, 2013; Howard *et al.*, 2017). However, the use of any pharmaceuticals, creates an opportunity for doping occurrences whether this be intentional or accidental (Gabriels and Lambert, 2013; Howard *et al.*, 2017).

2.2.2. Doping in Sport and the World Anti-Doping Agency

The concept of doping in sport, dates to the first Olympics and has unfortunately continued into the modern age (Vlad *et al.*, 2018). The WADA was established in 1999 with the mission to lead the movement of drug-free sport globally (WADA, 2022). It is a relatively young organization tackling a long-standing issue of doping with the aim of upholding the integrity of sport and ensuring the health of athletes (Kawaguchi-Suzuki *et al.*, 2021). Despite efforts from anti-doping agencies to limit doping, the prevalence of doping continues, with athletes seemingly always one step ahead of WADA doping detection methods (Read *et al.*, 2018). Until recently, WADA has focused its efforts on detecting doping as this is one of the main responsibilities, however this reactive approach leaves WADA out manoeuvred, allowing doping occurrences to go unnoticed or undetected (Read *et al.*, 2018). The new approach being implemented focuses rather on education and preventing doping before the offence occurs which has been proven to be more effective at limiting doping occurrences from the onset (Juma *et al.*, 2022; WADA, 2022). Pharmacists in this context are ideally placed to provide deliver educational information and identify potential doping occurrences (Kawaguchi-Suzuki *et al.*, 2021).

2.2.3. Accidental Doping

When reviewing doping cases, it is evident that a substantial portion of them claim to be accidental, without unethical intent and wish their case to be viewed as such (Shiple, 2000; Allen, 2014; Clarey and Tierney, 2016; Smith-Morris *et al.*, 2018; USADA, 2021; Sky Sports, 2024). Accidental doping occurs when a prohibited substance is consumed by chance without the intention to cheat (Chan *et al.*, 2017; WDA, 2021), and can occur for various reasons with claims related to the use of OTC medication or supplements that contained prohibited substances unbeknownst to the athlete (Shiple, 2000; Allen, 2014; Clarey and Tierney, 2016; Smith-Morris *et al.*, 2018; USADA, 2021).

There are two main contributors to accidental doping violations, namely, athletes' lack of knowledge and understanding related to medication, and lack of regulation relating to supplement manufacturing and marketing. While athletes are experts in their respective sporting codes, they are still lay people and do not necessarily have the same level of understanding as the health care professionals do, in medication and its usage (Bomfim, 2020; Yee *et al*, 2020). The poor, or non-existing regulation of supplements has led to the occurrence of adulteration and contamination of these products (Gabriels and Lambert, 2013; Chan *et al.*, 2017; Neilson, 2017; Piattoly, 2022). By classing athletes as lay individuals in terms of medication usage it is understandable that without correct advisement errors can easily occur. Medication usage is a complicated concept and when an additional barrier of the Prohibited List is applied, it can make it challenging for athletes to understand what medication they can and cannot use, and the appropriate actions to take when making decisions, as they are not equipped with the vast background knowledge that pharmacy personnel would have.

2.2.4. International Regulation and Compliance

The WADA regulations apply to all eligible international and national athletes, requiring them to uphold the rules and regulations as set out in the WADA Code. In addition to the WADA code which governs and sets standards on a global level, local anti-doping agencies will enforce local law that will apply to athletes in that location. In South Africa the South African Institute for Drug Free Sports (SAIDS) enforces local law by requiring that all athletes whether they be national or resident in South Africa as well as athletes in South Africa for the purpose of training or competing, are subject to the local anti-doping rules (SAIDS, 2021). In short, this implies that all competing athletes regardless of age, rank, or sporting code participating competitively are subject to local and international anti-doping rules and regulations. This requires that athletes be aware of the WADA code and SAIDS regulations as well as how it applies to them as athletes, inclusive of the Prohibited List and the restrictions with in (SAIDS, 2021; WADA, 2021).

2.2.5. Consequences for Athletes

The WADA regulations hold athletes within the concept of strict liability (WADA, 2021), this states that the athlete is solely responsible for what they consume, or what is found in their body (WADA, 2021). This concept applies regardless of whether the doping offense was intentional or accidental. The consequences of doping offense may vary. In the case of accidental doping, a 2-year period of ineligibility in a commonly imposed sanction rather than the base 4-year sanction (WADA, 2021). However, in addition to these sanctions, regardless of intent, doping violations affect the manner in

1 which the general population views the athlete (Korneeva and Ogurtsov, 2016; van der Sluijs, 2017; Qi
2 Ge and Humphreys, 2020). Doping offenses reflect negatively on an athlete and the reputational
3 damage is transferred to the organisation and country they represent. These organisations often cut
4 ties and remove their support for the athlete or team whether the violation was intentional or
5 accidental (Qi Ge and Humphreys, 2020).

6 This consequence greatly impacts athletes, making it challenging to weigh up the need for the
7 potential performance benefit that a supplement may provide, with the risk of unintentionally
8 consuming a prohibited substance (Backhouse, 2023). In order to avoid such consequences and health
9 risks athletes require reliable and credible sources of information to assist in minimising accidental
10 doping incidents (Close *et al.*, 2022). Wada allocates this responsibility to those defined as athlete
11 support personnel, stipulating that these individuals be knowledgeable and comply with the WADA
12 code, and to use their influence to foster sound anti-doping practices (WADA, 2021). Pharmacists have
13 the potential to contribute to this role in supporting athletes, by using their expertise to provide
14 reliable and credible information to the athletes (WADA, 2021).

16 **2.3. Opportunities**

17 **2.3.1. Custodians of Medicine in Sports**

18 The necessity of the pharmacy profession and contributions is effectively captured in this statement,
19 “it is important for every patient to understand why medication is prescribed, what it is indicated for,
20 and how to administer medication properly” (Sturgil, 2020). As the custodians of medicine, it is the
21 duty of the pharmacist regardless of the patient and the additional considerations that are attached
22 to them, to ensure that medication is used correctly, safely, and for its intended purpose, while meeting
23 the health needs of the patient (South African Pharmacy Council, 2010).

25 The pharmacy profession has, until recently, been uninvolved in sports medicine and athlete support
26 (Sturgil, 2020). This is however, evolving as the focus of the pharmacy profession shifts. In this new era
27 of the pharmacy profession, the focus has changed from one rooted purely in pharmacology, to a more
28 patient-centric approach (Abduelkarem, 2014; John, 2016). This evolved role requires that the
29 pharmacy personnel consider the variability that naturally exists between patients and use this to
30 inform and drive decisions around the individuals’ specific health and medication needs (Abduelkarem,
31 2014; John, 2016). In the case of athletes, the common variable to consider, is the effect of persistent
32 physical strain on their physiology as well as the need to comply with the WADA regulations, resulting
33 in the informal specialisation of sports pharmacy. Sports pharmacy, in broad terms, encompasses many
34 facets of pharmaceutical care, including the provision of drug information, selection of the appropriate

treatment, and doping prevention and control to ensure that athletes uphold WADA regulations (Starzak *et al.*, 2016; Hooper *et al.*, 2019). This new role in pharmacy has become recognised for the potential benefit it contributes to the field, and the health and safety of athletes (FIP, 2014; Smith-Morris *et al.*, 2018). As such, this emerging role is promoted by thought leaders in the pharmacy industry, including the International Pharmaceutical Federation (FIP). The FIP have subsequently developed guidelines that outline how the pharmacy industry can contribute to sports medicine (FIP, 2014).

2.3.2. Acknowledging the Potential Role of Pharmacists

Leading figures in the pharmacy industry such as the FIP, are supporting an increased involvement of pharmacy personnel in sports medicine (FIP, 2014), due to the potential benefit that the industry could have on sports medicine and athlete health (Sturgill, 2020). While the focus in this study is on patient orientated roles, such as personnel working in community and institutional pharmacies, pharmacy personnel in other sectors have just as an important role. This can be expressed in the development of guidelines, manufacturing medication, evaluation of products or athlete samples for testing, and other roles, that while less apparent, can influence the risk safety profile of medication and supplements consumption, making it far safer for athletes to utilise these products (FIP, 2014; Mottram and Stuart, 2021). If pharmacy personnel take up these roles as recommended, the positive influence that they can have on athletes by assisting them in making informed decisions regarding medication and supplement use; and providing them with the necessary relevant information on doping; including the potential consequences; as well as identifying misuse of medication for the purpose of doping, it is possible to firstly protect the patient from health risks, ensure the safe and correct use of medication, and so contribute, to potentially decrease the number of doping occurrences (FIP, 2014; Smith Morris *et al.*, 2018; Mottram and Stuart, 2021). While the sector of sports medicine may be new for the pharmacy industry the actions and skills performed are in line with the scope of practice of the pharmacy profession (SAPC, 2010).

2.3.3. A Place for Pharmacists in Sport

Various studies and reviews have been conducted over recent years that have explored the role and impact that pharmacists can have in the field of sports medicine with specific reference to anti-doping endeavours (Laure and Kriebitzsch-Leieune, 2000; Starzak *et al.*, 2016; Shibata *et al.*, 2017; Aldewachi *et al.*, 2021; Hailu *et al.*, 2021; Lamettila *et al.*, 2021). Findings from these studies indicate that pharmacists have a positive perception relating to the role of the pharmacist in relation to sport and anti-doping. The global response from nations including South Africa, Ethiopia, France, Finland, Japan,

1 and Iraq indicate that when encountered with the concept of pharmacists' potential impact in sport
2 an average of 71.31% appeared enthusiastic and expressed their agreement that pharmacists had a
3 role and should participate in anti-doping with particular emphasis on accidental doping (Laure and
4 Kriebitzsch-Leieune, 2000; Starzak *et al.*, 2016; Shibata *et al.*, 2017; Aldewachi *et al.*, 2021; Hailu *et al.*,
5 2021; Lamettila *et al.*, 2021). In addition to and supporting these results, specific studies were
6 conducted in the United States, Japan, and Iraq aimed at demonstrating and identifying the benefit
7 that pharmacists could bring to athletes through the form of medication and supplement management
8 (Shibata *et al.*, 2017; Howard *et al.*, 2018; Aldewachi *et al.*, 2021). These studies it indicated that
9 participants were in support of pharmacists undertaking the responsibility of the management of
10 medication and supplement use by athletes.

11
12 In the work of (Howard *et al.*, 2018; Perry *et al.*, 2020) the potential has been recognised not only by
13 pharmacists but by athletes who have identified the benefit that pharmacists' knowledge and
14 assistance could have on their medication and supplements use. The assistance of pharmacists could
15 not only optimise the athletes health outcomes, but in addition limit the chances of unintentional
16 doping (Howard *et al.*, 2018; Perry *et al.*, 2020). A study conducted in Canada demonstrated this
17 benefit by working with elite-level competitive strength athletes (Smith-Morris *et al.*, 2018). In this
18 study athletes' medication and supplement usage was assessed by a pharmacist to ensure that athlete-
19 patients safety and compliance with the WADA prohibited list. It was found that 48% of the athletes
20 were consuming one or more substances contained in the WADA prohibited list unknowingly, the most
21 common being pseudoephedrine, a commonly used over the counter medication (Smith-Morris *et al.*,
22 2018). The effect of this is that continued use of medication or supplements without correct and
23 proper advisement can increase the occurrence of unintentional doping that could have otherwise
24 been avoided.

25
26 In contrast to unintentional doping, pharmacists may also be exposed to and have the responsibility
27 to prevent intentional doping occurrences where medication is misused (SAPC, 2010). Whilst limited
28 research has been conducted on pharmacists' exposure to intentional doping one such study
29 conducted in France from 1998 to 1999 indicated that in a 12 month period 25% of pharmacists had
30 been contacted for information on performance enhancing substances, 17% had encountered
31 suspicious prescriptions, most related to anabolic steroids, and 6% had been offered financial and
32 other incentives for supply of performance enhancing substances (Laure and Kriebitzsch-Leieune,
33 2000). These results may differ now (2024) compared to when the study was originally conducted
34 (1998) due to the establishment of WADA in 1999 it cannot be ruled out as cases of intentional doping

do still occur (WADA, 2022). Similar results had also been obtained in more recent studies (2019) with 67.9% of Finish pharmacists admitting to having encountered cases of intentional doping (Lemettila *et al.*, 2019) highlighting the continuing issue of doping.

The establishment of sports pharmacy as a specialization can have a great impact on athletes' health and safety however its implementation does require that the pharmacy industry respective nations to achieve a position where patient orientated care is at the forefront of pharmacy practice (Khan *et al.*, 2018). The changing role of pharmacy from a profession rooted purely in pharmacology to one more focused on patient care requires pharmacists to take on the additional duties that would allow them to assist athletes in an appropriate way (Abduelkarem, 2014; John, 2016). This intent is illustrated a review conducted in Pakistan to examine sports pharmacy as an emerging health science field concluded that before developing sports pharmacy in Pakistan, the pharmacy profession must first develop and adopt the changing role of pharmacists as it has in other countries such as Japan and the USA (Khan *et al.*, 2018). It should thus be expected for all pharmacists globally to at least recognize or acknowledge the concept of sports pharmacy and the role of the pharmacist in context, is required, until a patient centred approach to health and pharmacy can be accomplished successfully.

2.3.4. Sports and Nation Building

These endeavours to decrease doping appear to align with the goals of sporting organizations and nations who have a vested interest in fostering sound anti-doping practices in the country due to the impact that sports plays (Department of Sports, Arts, and Culture, 2013). In South Africa, sport as in many countries, is significant, as it impacts on the country's identity (Korneeva and Ogurtsov, 2016). The soft power of sports is considered to, bring immense amounts of pride and respect to a nation. This is due to the impact on public perception and the collective representation of a nation (Korneeva and Ogurtsov, 2016). As such, the country has a vested interest in expanding and developing sport, with multiple initiatives aimed at creating an "Active and Winning Nation, ensuring a vast pool of recreational and more importantly competitive athletes, spanning a variety of sporting codes and levels (Department of Sports, Arts, and Culture, 2013). The impact of soft power, in this case sport, is directly linked to the performance of athletes with successes reflecting positively on a nation. However this is a double-edged sword, where the perception of a country is tainted by unethical behaviour, such as match-fixing or doping offenses (Qi Ge and Humphreys, 2020). The Department of Sports, Arts, and Culture in South Africa is thus prioritises the development of ethical sporting practices across all sporting codes (Department of Sports, Arts, and Culture, 2013). One of the methods employed to foster anti-doping practices, is supporting organizations such as the South African Institute for Drug-Free Sport (SAIDS), and as signatories to WADA, ensuring that their commitments to drug free sport

and anti-doping are upheld as per the WADA regulations (WADA, 2021). The sporting industry is a multi-million-dollar industry that is supported by governments globally, and many organisations are willing to invest large sums of money in sport and athletes, in return for the status and pride that is associated with a athletes' performance. This would include supporting efforts to prevent the occurrence of doping in sport (Korneeva and Ogurtsov, 2016; van der Sluijs, 2017; Qi Ge and Humphreys, 2020).

2.4. Challenges

2.4.1. Pharmacists' Knowledge and Training

Pharmacists' acknowledgement of their potential to impact athletes' health, medication management, and accidental doping is the commencement of the pharmacy industries involvement in sports medicine (FIP, 2014; Smith Morris *et al.*, 2018; Sturgill, 2020; Mottram and Stuart, 2021). This acknowledgement and interest are of limited benefit if not supported with the appropriate knowledge base and training. The barrier of insufficient knowledge and limited appropriate training has been identified by various researchers. Results looking at pharmacists current training in sports medicine indicates that over 90% of pharmacists from regions including South Africa, Ethiopia, and Finland respectively have never received training either at university or as a form of continued professional development (Starzak *et al.*, 2016; Hailu *et al.*, 2021; Lementtila *et al.*, 2021). Following on from this point and reviewing reports of training received the conclusions disappointing with 28% of pharmacists in the United States (Howard *et al.*, 2018), 6% of French pharmacists (Laure and Kroebitzsch-Lejeune, 2000), and 21% of Japanese pharmacy students (Shibata *et al.*, 2017) had ever received training in sports pharmacy either at a university or due to personal interest. The consequence of this is that pharmacists feel that their current limited knowledge prevents them from advising athletes appropriately (Howard *et al.*, 2018).

These outcomes may be the result of lack of access to available educational resources on the specific topic. Studies conducted in Australia and the United States have made similar deductions noting the limited available training in sports pharmacy and anti-doping (Kawaguchi-Suzuki *et al.*, 2021; Greenbaum *et al.*, 2022). These studies highlighted that a contributor to the limited access to training may be due to sports pharmacy not being fully established in these countries and thus not included in standard educational requirements (Kawaguchi-Suzuki *et al.*, 2021). This is however not true for all countries. Japan has been identified as a country where sports pharmacy and anti-doping practices are more established and access to the correct education easier (Shibata *et al.*, 2017; Kawaguchi-Suzuki *et al.*, 2021). The Japan Anti-Doping Agency (JADA) in conjunction with pharmacy authorities

1 have established the Sports Pharmacy System (JADA, 2015). This system aims to certify qualified
2 pharmacists who are trained in anti-doping and can provide accurate and appropriate doping, have
3 access to relevant knowledge on anti-doping and prohibited substances, and so forth. The effect of
4 this system is to ensure and develop a strong anti-doping environment that benefits athletes (JADA,
5 2015). The success of this approach to educate and train pharmacists has led to the system being used
6 as a model for other nations, such as the United States, to develop their own country specific local
7 programmes (Kawaguchi-Suzuki *et al.*, 2021).

8
9 The results of these studies which collectively demonstrate the global perspective of pharmacists is
10 that pharmacists have limited knowledge in the field of sports pharmacy and anti-doping, the
11 consequence of this is a lack of confidence in counselling and advising athletes. The development of
12 appropriate accessible educational systems would be beneficial in order to equip pharmacists to
13 successfully perform this role in sports pharmacy.

14
15 While Pharmacists' specific knowledge base appears to be limited the inherent abilities and mindset
16 developed through pharmacy education provides pharmacists with appropriate skills to correctly assist
17 athletes with their health and medication needs. This statement is supported by a study conducted in
18 Australia in which a simulated-patient study was conducted to explore the knowledge and skill of
19 pharmacists in preventing the use of prohibited medicine by athletes (Greenbaum *et al.*, 2023). In a
20 telephonic scenario 90% of the pharmacists contacted identified the scenario as requiring additional
21 specific advice and counselling. Thereafter 52% of pharmacists could provide at least minimal anti-
22 doping and clinical advice, and 11% could provide comprehensive advice as deemed by the study
23 parameters (Greenbaum *et al.*, 2023). This effectively demonstrates how pharmacists who correctly
24 skilled to identify an issue requiring additional professional consideration and act accordingly. The
25 addition of appropriate knowledge and available resources would elevate their recommendations to
26 provide accurate and relevant information consistently to the athlete patient (Greenbaum *et al.*, 2023).

27 28 **2.4.2. The Issue of Supplement Regulation**

29 Supplement use in sport is a common occurrence. Athletes use supplements to support their general
30 health and training regimens. Athletes believe that such products assist in recovery, muscle
31 development, increased endurance, and improved overall performance, greater than that of their
32 competitors (Petroczi *et al.*, 2008; Vlad *et al.*, 2018; Hooper *et al.*, 2019; Alonso and Fernandez-Garcia,
33 2020; Piattoly, 2022). Evidence of the efficacy of supplements is however limited, but due to the highly
34 competitive environment of sport, even the smallest advantage could mean the difference between

1 selection to a national team, winning or losing, and potential sponsorship agreements (Petroczi *et al.*,
2 2008; Vlad *et al.*, 2018; Hooper *et al.*, 2019; Alonso and Fernandez-Garcia, 2020; Piattoly, 2022).

3
4 In essence the use of supplements is not prohibited, however the issue arises with the potential
5 contamination and/or adulteration of these products and the potential for accidental doping becomes
6 a factor (Duiven *et al.*, 2021; Backhouse, 2024). Research has indicated that contamination of
7 supplements can be as high as 38% (Duiven *et al.*, 2021). In contrast, scheduled medication, such as
8 OTC medications, which are highly regulated, with each ingredient contained known, making it easier
9 to determine whether a medicine contains a prohibited substance, and for the athlete or pharmacy
10 personnel to make an appropriate informed decision accordingly (SAHPRA, 2020).

11
12 This is not only a local issue, with supplements often being regulated differently compared to other
13 medications, despite calls from consumer protection and anti-doping agencies to regulate
14 supplements more strictly (Gabriels and Lambert, 2013; Naidoo *et al.*, 2018; Starr, 2015). In South
15 Africa there has been a move to change the regulation of supplements categorising them as category
16 D medications by SAHPRA which requires that supplement products be assessed for quality, safety and
17 efficacy (SAHPRA, 2020). This shift should result in supplements being held to a higher standard and
18 a much safer product produced as was previously done (SAHPRA, 2020). While this is admirable, it is a
19 slow process, and allows products already on the market to continue to be sold, until such a time that
20 they are assessed. The limited regulation of supplements has allowed products to be produced in a
21 manner that may not align with current Good Manufacturing Practices, allowing for the contamination
22 with prohibited substances, to occur (Neilson, 2017). The previous regulations in South Africa also did
23 not regulate packaging and labels of products (SAHPRA, 2020). The implication of this is that the
24 products containing prohibited substances, that remain undeclared, are thus adulterated (Neilson,
25 2017; Close *et al.*, 2022). The consumption of such supplements now increases the risk for athletes, as
26 adulterated and/or contaminated products containing prohibited substances, could result in not only
27 a doping violation, but also potentially increase the risk of severe side effects and drug-drug
28 interactions (Gabriels and Lambert, 2013; Abbate *et al.*, 2015; Gabriels *et al.*, 2015; Naidoo *et al.*, 2018;
29 Duiven *et al.*, 2021; Piattoly, 2022).

30
31 The respective risk becomes a concern considering that, supplement use in athletes has increased to
32 meet athletic requirements in particular for elite level athletes where up to 70% utilise supplements
33 (Knapik *et al.*, 2016; Martinez-Sanz *et al.*, 2017; Vlad *et al.*, 2018; Hooper *et al.*, 2019; Alonso and
34 Fernandez-Garcia, 2020). This growth is facilitated in particular by uncontrolled claims made by

1 manufacturers and aggressive marketing strategies (Colby *et al.*, 2010. Gabriels and Lambert, 2013).
2 This is evident from the financial growth of the supplement industry (Piattoly, 2022), despite limited
3 scientific evidence of efficacy (Hooper *et al.*, 2019). The increase in supplement usage by athletes
4 coupled with the potential for contamination and/or adulteration in supplements, and athletes
5 misunderstanding of supplement safety has contributed to an increase in accidental doping. This has
6 led to supplements being viewed as the biggest cause of accidental doping in athletes (Backhouse *et*
7 *al.*, 2013; Neilson, 2018; Close *et al.*, 2022).

9 Research conducted in South Africa revealed that 47% of nutritional supplements evaluated contained
10 undeclared melamine (Gabriels *et al.*, 2015). While the quantity of melamine contained was deemed
11 low, the effect of the chronic consumption and potential interaction that may occur are not clear and
12 may result in health risks (Gabriels *et al.*, 2015). Additionally, another study conducted in South Africa
13 revealed that of 70 protein powders from various manufacturers evaluated, 80% contained differing
14 protein content compared to the quantity disclosed on the packaging (Naidoo *et al.*, 2018).
15 Furthermore, research conducted in the United Kingdom reviewing 24 nutritional supplements
16 revealed that 38% of products were potentially contaminated and/or adulterated. Pharmacists in this
17 study appear to not be ignorant of this issue and the challenges it causes for both athletes and
18 pharmacists when attempting to make informed decisions on appropriate supplement use (Hailu *et*
19 *al.*, 2021).

21 This barrier of poor supplement regulation is significant, as supplement use in athletes is reported to
22 be 88% higher than other consumers (Perry *et al.*, 2020). This high use of supplements coupled with
23 the poor supplement regulation and the resultant undeclared prohibited substances increases the
24 probability of unintentional doping (Perry *et al.*, 2020). For pharmacists the difficulty arises when
25 attempting to determine whether a particular nutritional supplement would be appropriate for athlete
26 consumption. In the current environment it is impossible to confidently state that all the components
27 contained within the nutritional supplement are permitted for use and are safe for the athlete
28 (Backhouse, 2024). This inability to confidently ascertain the safety status of a product is a major
29 barrier and results in pharmacists being unable to effectively counsel athletes and support anti-doping
30 endeavours (Howard *et al.*, 2018; Krishnan *et al.*, 2022).

32 **2.4.5. Ineffective Anti-Doping Initiatives**

33 As observed, doping is a long-standing issue globally that has yet to be resolved. The reasons for this
34 lack of control and prevention is that current anti-doping measures are ineffective whether they be

targeted at intentional or accidental doping (Read *et al.*, 2018). Previous measures to control anti-doping practice focused primarily on detection of doping occurrences. This strategy is however reactive and allows for potential doping violations to go unnoticed due to limited detection techniques (Read *et al.*, 2018). More recent strategies have been altered to allow for a more preventative approach focusing on education of athletes and athlete support personnel to ensure correct and appropriate information is disseminated and actions be taken in context of improved knowledge (WADA, 2021). This approach may seem conservative in preventing doping but has been proven to be effective and thus has been deemed as a primary tool for the prevention of doping (Juma *et al.*, 2021).

The barrier that has been identified by pharmacists to their involvement in sports pharmacy and anti-doping is that current formalised strategies do not accommodate for their presence as athlete support personnel (Laure and kriebitzsch-Lejeune, 2000; Backhouse and Mckenna, 2011; Starzak *et al.*, 2016). Research conducted has demonstrated the benefit of focusing on awareness and education as a form of doping prevention. However, these strategies have been focused on athlete support personnel including coaches and managers as distributors of information to athletes rather than utilising health care professionals such as pharmacists (Juma *et al.*, 2022). For pharmacists to effectively be involved in anti-doping activities and initiatives, anti-doping agencies and stakeholders in sport need to develop structures that allow for the involvement of pharmacists in education and athlete advisement. The implementation of such strategies would allow pharmacists to impart valuable information and offer their specific skills set to athletes and support personnel.

2.4.6. Athlete Identification

Regardless of whether pharmacists be sufficiently equipped or not, athlete identifying their competitive status is essential for effective patient management. With any additional requirement that affects a patients' health and medication needs, if there is not full disclosed by the patient athlete, it cannot be considered in the treatment plan limiting its effectiveness. This appears to be the situation with many athletes (Howard *et al.*, 2018; Perry *et al.*, 2020). Evidence of this was expressed in a research study conducted in Australia where it was noted that despite athletes increased use of prescription medication and supplements over that of others, in addition to this 91% of athletes tended to obtain prescription and non-prescription medication from a pharmacist. Furthermore 60% of these athletes did not identify themselves as such to pharmacists during dispensing of the medication preventing pharmacists from providing accurate advise (Perry *et al.*, 2020). The concern by pharmacists was mirrored in a study conducted in the United States where only 35% of athletes claimed to consult with a pharmacist with regards to their OTC medication (Perry *et al.*, 2020).

1 However, in contradiction to the study conducted in Australia 75% of athletes stated that they believed
2 that pharmacists would be a valuable resource for information on medication and supplement use
3 (Howard *et al.*, 2018). Similarly, research conducted in Canada indicated that athletes viewed
4 pharmacists as trusted sources of information on anti-doping but did not approach them with regards
5 to this topic (Smith-Morris *et al.*, 2018). While the studies conducted in North America contradicted
6 that of the Australian study, this may be due to how pharmacists are viewed in society and/or the
7 typical level of service and advice elicited that is expected on consultation (Howard *et al.*, 2018). Data
8 from South Africa on this specific matter is not available.

10 **2.5. Conclusion**

11 A niche in sports medicine and anti-doping has been identified for pharmacists. While pharmacists
12 appear to be enthusiastic to fulfil this role, taking up this responsibility has proven challenging with
13 multiple barriers in place that need to be overcome for pharmacists to have an impact in sports
14 medicine and specifically anti-doping.

- 15 • The changing role of pharmacists needs to be instilled allowing for a patient-centred approach
16 to health to occur.
- 17 • Pharmacist education in the topic of sports medicine and anti-doping needs to be
18 implemented in an accessible format to better prepare pharmacists for the challenges
19 presented by athletes.
- 20 • Pharmacists' confidence in advising athletes and express their knowledge and skills on the
21 topic on a formalised platform as well as in day-to-day practice may encourage athletes to be
22 more forthcoming with their athlete status allowing pharmacists to properly advise on health
23 and medication needs.
- 24 • Supplement regulation in South Africa will continue to be a barrier for pharmacists and
25 athletes until such a time that regulations allow for transparency allowing pharmacists and
26 athletes to make informed decisions around supplement use. Until such a time an inherent
27 risk will continue to exist associated with supplement use.

CHAPTER 3: Methodology

This chapter outlines the research methodology that was used to conduct this research. The chosen method is described explaining the appropriateness for the aim of the study. This chapter describes the study design, procedure, sampling, data analysis process and ethical considerations.

3.1 Study Design

An Explanatory Mixed Method Research Methodology (Creswell, 2014) was utilised to comply with the objectives of the study. The research methodology makes use of a quantitative phase followed by a second qualitative phase based on the initial findings. The approach was selected as neither quantitative nor qualitative approach alone would provide sufficient insight to achieve the aims and objectives of the study (Guest and Fleming, 2014). The mixed method approach is thus more appropriate as it provides more in-depth explanatory results that would otherwise not be highlighted.

The Mixed Method approach utilised was divided into sequential phases as depicted in Figure 3.1:

Phase 1: Quantitative data collection using survey methodology

Phase 2: Qualitative data collection through interviews

Phase 3: Integration of Phase 1 and 2

Phase 1 utilised a validated, self-administered survey to collect data on pharmacy personnels' knowledge, attitude, perceptions, and practices related to doping and medication use in athletes. Phase 2 included interviews with pharmacy personnel to provide additional insight into results obtained during Phase 1. Phase 3 allowed for the results obtained to be analysed independently as well as in conjunction with one another to obtain comprehensive results (Guest and Fleming, 2014).

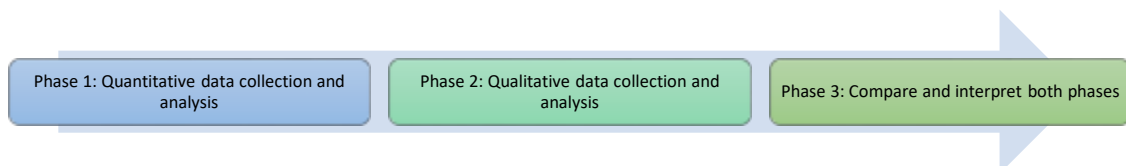


Figure 3.1: Research design process using Explanatory Mixed Method Research Design

3.2. Phase 1: Quantitative data collection

3.2.1. Study Setting

Phase 1 of the study was carried out in Gauteng, South Africa. Pharmacy personnel working in retail pharmacies in Gauteng were approached in person by the researcher to participate in the study. The specific pharmacies were approached based on a convenience sampling strategy, selected due to their proximity for the researcher and large number of both independent and franchise pharmacies in the areas indicated (Taherdoost, 2016). These facilities were selected based on the probability of encountering athletes seeking medication or advice related to medication use.

3.2.2. Study Population and sampling methods

The study population includes pharmacy personnel defined as; Pharmacists, Community Service Pharmacists, Pharmacy Interns, Pharmacist Assistants (Pre- and Post-basic), and Pharmacy Technicians.

The inclusion criteria for this study required that pharmacy personnel be registered with the South African Pharmacy Council (SAPC) and be working currently in a retail or hospital pharmacy in Gauteng. Participants who did not meet the requirements of the inclusion criteria were excluded from the study.

The selected personnel were chosen due to the possibility of encountering an athlete in a pharmacy setting seeking pharmaceutical products and/or advice related to medication and/or supplement use. The responsibility of the sale and dispensing of medication and supplement, and provision advice and information falls in line with the scope of practice of pharmacy personnel selected (SAPC, 2010).

The convenience sampling method was used to recruit potential participants as this involved selecting participants what were conveniently located for the researcher to conduct the quantitative data collection (Taherdoost, 2016). Potential participants were sourced through pharmacy franchise groups as well as pharmacies in proximity to the researcher, located in the Johannesburg area. The pool of participants provided sufficient variation to ensure that all demographic factors could be determined and compared.

3.2.3. Sample Size

The sample size was determined to be 364 participants based on the total number of community pharmacists registered in Gauteng (approximately 6653) (SAPC, 2024) with a minimum response rate

of 4%. This sample size is based off the Raosoft Sample Size Calculations as seen below Equation 3.1 (Raosoft, 2004).

$$N = \frac{z^2 p(1 - p)}{d^2}$$

Equation 3.1: Sample size calculation; where N = Sample size; Z = Z statistic for level of confidence (95%), P = expected prevalence or proportion (in proportion of one; if 50%, P = 0.5), and d = precision (in proportion of one, if 5%, d = 0.05).

A total of 500 surveys were distributed by the researcher to pharmacies throughout Gauteng in order to ensure the sample size was met, of the surveys distributed, 360 were returned. Of those received, 332 were completed and underwent the required analysis.

3.2.4. Data collection Tools

A pre-validated, self-administered survey (Appendix 3) was utilised to meet objective 1 of the study, specifically to explore pharmacy personnel's knowledge, attitudes, and perceptions of doping and medication use in sports through the use of a survey.

The survey was divided into 4 sections, described as follows:

- Section 1: Demographic questions such as age, gender, qualification, and professional affiliation.
- Section 2: Knowledge-based questions to establish participants self-declared and tested knowledge with regards to the WADA and their regulations, appropriate medication uses and sports pharmacy.
- Section 3: Attitudes and perceptions questions to establish participants feelings with regards to sports pharmacy and its relevance, WADA regulations, medication use and safety in athletes.
- Section 4: General or standard practices questions to establish practices and sources of information utilised when considering the use of medication in athletes.

On completion of the survey questions above, a question was included to determine whether the participant would consider participating in Phase 2 of the study. On agreeing the participant was asked to provide an appropriate email address by which they can be contacted for the recruitment of Phase 2. All contact information obtained was de-linked from the survey responses prior to analysis in order to maintain participant confidentiality, and responses anonymity.

3.2.4.1. Survey Development

For effective collection of quantitative data, a data collection tool was developed in the form of a self-administered survey. The process of survey development required several phases namely the review of relevant literature, the initial survey design, face and content validation of the survey by a pool of experts, amendments, and then conducting a pilot study. These phases as depicted in Figure 3.2.



Figure 3.2: Flow diagram demonstrating the process of survey development

3.2.4.1.1. Survey design

Prior to the design and development of the survey as a data collection tool the researcher reviewed the available relevant literature on the topic of sports pharmacy, with particular emphasis on the role of pharmacists in medication use and anti-doping in athletes.

The data collection tool designed was a self-administered survey (Appendix 1) targeted towards pharmacy personnel working in retail and hospital pharmacies in South Africa. The survey designed was divided into five sections each assessing a different specific factor. The first section comprises of demographic questions such as age, qualification, and professional affiliation. The second section focuses on knowledge-based questions, to establish participants self-declared knowledge with regards to sports pharmacy, anti-doping, and appropriate medication use in athletes. The third section aimed to determine participants attitude and perceptions with regards sports pharmacy and its relevance. The fourth section aimed to establish participants general or standard practices when considering the use of medication in athletes. The fifth section aimed to test participant knowledge of medication use in athletes as it relates to the WADA regulations. The design of this survey was with the intent to meet the aims and objectives proposed by the researcher and as presented in chapter 1.

Thereafter, this survey then underwent further review to ensure validity and reliability of the survey tool.

3.2.4.1.2 Face and Content validity

The process of face and content validity involved the experts reviewing each question proposed and determining its appropriateness and relevance to the aim and objectives of the research study and

commenting on this. Also part of the reviewing process the survey was commented on, including the layout, use of language, and clarity of the instructions. The various responses by the experts were reviewed and modified to achieve the final questionnaire. Six experts in the field of pharmacy and pharmacology, sports medicine, and anti-doping in sport provided their insight (Desai and Patel, 2020).

3.2.4.1.2.a. Face Validity: Fleiss' kappa index

In addition to the comments provided by the experts on the overall language, layout and appropriateness of the questions to determine the measure of agreement between the experts on their impression of the survey, a Fleiss' Kappa index was determined. This measure was utilised over that of the Cohen's kappa index as it accounts for more than two raters' responses. Three ($n=3$) experts provided their insight on the overall appropriateness of the survey. Fourteen (14) questions were posed to the experts requiring yes or no responses. A Fleiss' Kappa index of 0.417 was calculated indicating a moderate level of agreement in favour of the appropriateness of the survey and is thus valid (Jalal, 2023).

3.2.4.1.2.b. Content validity: Cohen's kappa index

In addition to the comments provided by the experts on the survey content to determine the measure of agreement between the experts a Cohen's kappa index should be calculated. The value indicates whether the experts agree that the questions were relevant and appropriate for the underlying aim of the study. The experts provided insight by indicating whether each question posed was appropriate or not. In this instant the Cohen's kappa index was not an appropriate measure of agreement. Despite the two experts provided their insight on the content of the survey both experts did not agree to exclude any single point making it not possible to determine Cohen's kappa. The percentage agreement between the experts is however 98.77% and can thus show the high level of agreement between the individuals. This level of agreement can render the content valid (DATAtab, 2023).

3.2.4.3. Pilot study

On completion of the survey validation process, taking into account the additional amendments made to obtain the best result outcomes, the proposed survey questions underwent approval by the University of the Witwatersrand Human Research Ethics Committee (HREC) allowing for the pilot study to commence (Appendix 1).

A pilot study was then conducted using approximately 10% of the total sample size, received from 30 participants. On approval by the HREC, the researcher distributed paper-based surveys to pharmacies

for the personnel to complete. The data collected was manually captured into Microsoft Excel by the researcher.

A Cronbach alpha analysis was used to determine whether the survey showed signs of validity by proving the internal consistency of the survey (Ahdika, 2017). The results of this analysis yielded a value of 0.925, this shows the level of reliability was acceptable (Ahdika, 2017) and proves that the results received have internal consistency and will yield valuable and reliable outcomes during the main data collection for this study. Additional comments received on the survey content were considered and minor changes were applied, and ethics approval was obtained allowing the main data collection to commence (Appendix 1).

3.2.5 Study Procedure

On completion of the pilot study and final ethics approval was received from the HREC the survey was distributed. The system utilised in this study for data collection was REDCap™, a software system intended for survey development and analysis of data with the assistance of visuals such as graphs. The quantitative data collection occurred in person. Paper based surveys were distributed to pharmacies in Gauteng by the researcher. Pharmacists were approached and provided the patient information sheet (PIS) for Phase 1 (Appendix 4). On agreement of the terms as stated in the PIS participants were provided with a survey form to complete. The researcher followed up on the completion of the survey form 1 week after initial contact, unless otherwise requested by the participant, following this the research followed up with the participants every week for collection of survey responses. On receipt all information collected with regards to participation in Phase 2 of the study was detached to ensure confidentiality. Responses collected were captured by the researcher into REDCap™ for further analysis.

The survey distributed received 360 responses which is aligned with the required sample size as calculated above. The distribution method reached 500 pharmacy personnel the response rate for the survey is given as seventy two percent (72%). The data collection period extended from April 2023 to October 2023 (7-month period). On review, surveys that were less than 80% complete were removed from further analysis. This amounted to 30 surveys being excluded from the study analysis. Three hundred and thirty two (332) responses that were thus analysed.

3.2.6. Data analysis

The quantitative data collected was extracted from REDCap™ into Microsoft Excel to be cleaned and organized prior to analysis. All data collected during the proceedings was stored on a password protected device that was available to the researcher only, and the supervisors on request.

The survey distributed received 360 responses which is online with the required sample size as calculated above. The data collection period extended from April 2023 to October 2023 (7-month period). Data analysis was only conducted on surveys that were 80% or more complete, as such thirty (30) surveys were excluded meaning the analysis was conducted on three hundred and thirty two (332) completed surveys.

The data collected are described using descriptive statistics (Trochim, 2020), and presented as graphs, percentages, mode, frequencies, and other statistical values to provide a view of the ordinal data collected. T-tests, ANOVA, and Kruskal-Wallis tests was used to expand on the results identified to better understand the meaning behind observations by establishing whether any correlation exists between WADA and sports pharmacy knowledge, attitude and perceptions, and standard practices (Trochim, 2020). The data collected was analysed in Statistica™ in addition to REDCap™ and Microsoft Excel to assist data presentation, visualization, statistics, and reporting.

3.2.7. Ethical considerations

Approval from the University of the Witwatersrand HREC was sought before data collection for the pilot study as well as prior to the main data collection due to the involvement of human participants (Appendix 1). On receiving approval from the ethics committee, the data collection could occur. Informed consent was collected from the participants for their voluntary participation in the study with the use of a participant information sheet (Appendix 4) and a consent question given on opening the survey for Phase 1. Privacy and confidentiality were maintained throughout the study by ensuring that all forms of identifiable information collected in preparation of Phase 2 interviews will be delinked from the survey responses and will not be included in the write up. All data collected during the study is saved to a password protected device, accessible to only the researcher and the supervisors.

3.3. Phase 2: Qualitative data collection

3.3.1. Study setting

Phase 2 interviews were conducted with Pharmacy personnel throughout South Africa via Microsoft Teams or in-person depending on the participants preference. Pharmacists in the Gauteng region were invited to participate in the interviews.

3.3.2. Study Population and Sampling methods

Participants were identified through the surveys distributed in Phase 2 of the research study. This was done by requesting whether participants who had completed Phase 1 of the study be interested and willing in participating in Phase 2 of the research study. Interested participants were redirected via a link to a REDCap™ survey where their contact information was collected. Paper based surveys included the request for participation in Phase 2 on the last page of the surveys and could be detached from the survey questions. The contact information collected was used to arrange for an appropriate appointment for the interview to be conducted. The details collected have been delinked from the survey responses collected to maintain anonymity. This recruitment process follows on the convenience sampling method that was utilised in the Phase 1 data collection targeting pharmacy personnel situated in Gauteng. These participants were contacted via email requesting their inclusion in Phase 2 of the research. Interviews were scheduled with the willing participants at their earliest convenience. The interviews were completed during October to November 2023.

The inclusion criteria required that only participants who participated in Phase 1 of this research study were eligible to participate in Phase 2 of the research study. The inclusion and exclusion criteria for Phase 1 of the research study apply to Phase 2 with the additional requirement that they had participated in and completed Phase 1 of the research study.

3.3.3. Sample size

Interviews were conducted with pharmacists who had expressed interest in participating in Phase 2 of the research study and met the inclusion criteria as expressed.

The total number of participants for qualitative data collection was determined by data saturation being the point at which no additional codes are emerging and no further insight is given (Sebele-Mpofu, 2020) Data saturation was reached at 17 interviews (n=17) after which no further new information was identified and was assumed that any further research would yield similar results (Faulkner and Trotter, 2017).

This assumption is supported by the repetition of common themes noted in the researchers notes and later during data analysis where strong themes were apparent throughout the data collected. The decision to stop data collection was made by the researcher and supervisors.

3.3.4. Data Collection Tool

A Demographic questionnaire (Appendix 8) and semi-structured interview guide (Appendix 9) were developed for the interview process. Prior to conducting the interviews, the guide questions were assessed by experts in pharmacy and pharmacology as well as experts in sports medicine and anti-doping in sport to ensure that the questions posed, and likely responses received were valid and answered the underlying research aims and objectives. The validation process allowed for the interview guide to be altered and refined to ensure the responses yielded were valid. The experts approached provided comments and feedback on the questions posed. Alterations made to the interview guide were submitted for approval to the University of the Witwatersrand HREC prior to conducting the interviews (Appendix 1).

The interview proceedings were recorded on Microsoft Teams or on the researcher's cellular device depending on the preferred interview setting as determined by the participant. The recording obtained were transcribed verbatim into Microsoft Word for further analysis.

3.3.5. Participant Recruitment and Study Procedure

Participants who indicated their interest to participate in Phase 2 of the research study during the Phase 1 data collection were emailed to invite them to participate in Phase 2, participants were recruited through the same streams as mentioned for Phase 1 of the research until such time as data saturation was met. Participants were emailed with the PIS, the researcher and the participant arranged for an appropriate date and time for the interview to take place over the period of October-November 2024. The interviews were conducted based on appointments booked dependant on the participants availability. The interviews were approximately 20 minutes and were conducted via Microsoft Teams or in person depending on the preference of the participant and proximity for the researcher. The interviews conducted were recorded and then audio transcribed verbatim into Microsoft Word (Jamshed, 2014). Consent for the inclusion of data collected to be used in the research as well as consent to record the interview were obtained prior to starting the interview process. The participants demographic information (Appendix 8) was collected once consent had been obtained from the participant. The interview process was facilitated with the use of a semi-structured interview guide (Jamshed, 2014). Questions probed into the participants standard practices, and sources of information with regards to the use of medicines in athlete. On completion of the interview the participants were given the opportunity to make comments on the specific research study. The interview was then transcribed from the recording into Microsoft Word to ensure accuracy with regards to the participants answers.

3.3.5.1. Trustworthiness

The researcher ensured that the research findings were reliable, credible, transferable, and dependable (Stahl and King, 2020) by conducting the interview using standardised questionnaires and ensuring that language used is not bias and does not steer the participants answers (Elo *et al.*, 2014). Prolonged engagement with the data recordings and transcriptions was emphasized to ensure familiarity with the data to ensure credibility. Throughout the interview process the researcher documented the participants thoughts to reflect on the interviews conducted, questions posed, and responses received as well as the researcher's own perspectives allowing for reflection and confirmability (Nowell, *et al.*, 2017). On transcription of the recordings, potential codes and themes were identified and noted to assist in conveying the researchers thought process assisting again in confirmability. Peer discussions were held with the researcher's supervisor during the analysis process to assist in credibility of the results. All recordings, as well as transcriptions and initial notes related to potential codes and themes were retained to create an audit trail. These actions work to establish trustworthiness in the qualitative data collected (Nowell, *et al.*, 2017).

3.3.6. Data organization

The transcriptions obtained following the interview process were cleaned and organized in Microsoft Word to allow for analysis to be conducted. Recordings obtained were transcribed verbatim into Microsoft Word dictate function following which the researcher corrected any errors that occurred due to differing pronunciations and faint audio recordings. Participants were allocated a code, i.e., P1-P17 and the researcher allocated the code R, which was used during the transcription process. Such coding appears in the transcriptions to depict who was making the statement. As part of the cleaning process any form of identifiable information such as names of the participants, pharmacies, patients, or any other details of such a nature were redacted to ensure anonymity.

3.3.7. Data analysis

Thematic analysis as depicted in Figure 3.3 was utilised to identify, analyse, describe, and report themes identified in the data collection in order to allow researcher to comprehend and scrutinise the information obtained during qualitative research (Braun and Clarke, 2012). Following the process involved in thematic analysis, codes were developed to identify specific points of relevance, which were categorised into themes that relate to the research question, following which the themes were reviewed and defined based on the participants knowledge, attitudes, perceptions, and practices related to medicine use in athletes, this allowed for analysis and production of reports (Braun and Clarke, 2012).

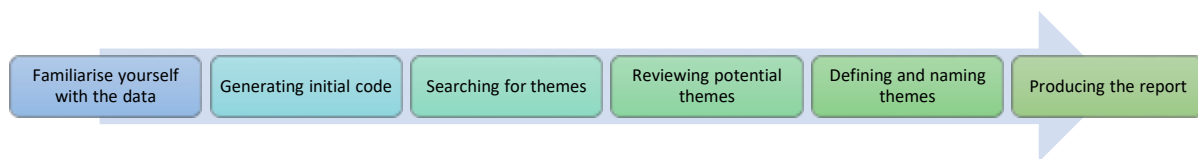


Figure 3.3: A Six-Phase Approach to Thematic Analysis (Braun and Clarke, 2012)

3.4. Phase 3: Integration of Phases 1 and 2

Phase 3 of the study involved the integration of the data collected from the Phase 1 survey and the Phase 2 interviews once the analysis of these phases was completed. In order to ensure that the research questions were met, interpretation-level integration was utilised to merge the results obtained from the forementioned quantitative and qualitative research (Phase 1 and 2). Integration occurs through various approaches; in this case a narrative approach was utilised highlighting themes present in both data sets and a joint display where the correlating data is joined through a visual means. This form of integration allowed the researcher to draw cohesive conclusions from the data collected (Fetters *et al.*, 2024).

Chapter 4: Results and Discussion-Phase 1

This chapter comprises of various sections, detailing the purpose of the quantitative phase of research, participant demographics, and the results of the statistical analysis. The chapter concludes with a discussion of the results obtained.

4.1. Purpose of Phase 1

The quantitative phase of the study was used to provide the researcher with insight into the participants knowledge, perceptions, and practices around medication use in sports. This chapter aims to meet Objective 1 of the study, as described in Chapter 1, section 1.3.

4.2. Participant Response and Demographics

A total of 500 surveys were distributed by the researcher, with 360 received, a response rate of 72% was obtained. The data collection period extended from April 2023 to October 2023 (7-month period). Of the surveys received those completed less than eighty percent (80%) were excluded from any further analysis. The final statistical analysis was conducted on three hundred and thirty two (332) completed surveys (n=332).

4.2.1. Demographics

Table 4.1 below displays the participants demographics as obtained during the quantitative phase of the study. The demographic information collected aimed to identify the participants age, gender, which health care and pharmacy sectors they practiced in, qualification, and professional affiliation. Specific demographic factors have been redefined for the purpose of statistical analysis to avoid results that would be statistically insignificant.

Table 4.1: Demographic profiles of the study participants (n=322).

Variables	Total participants (n)	Frequency (%)
Age (years)		
20 - 29	103	31.2
30 - 39	115	34.8
40 - 49	66	20
> 49	46	13.9
Gender		
Male	112	33.7
Female	208	62.7
Other*	12	3.6
Healthcare Sector		
Private	303	92.4
Public	19	5.8
Both	6	1.8
Pharmacy Sector		
Retail	326	98.8
Hospital	4	1.2
Qualification		
Diploma	65	21
BPharm	169	54.7
Masters	13	4.2
Other	62	20.1
Professional Affiliation		
Responsible Pharmacist	102	31
Pharmacist	80	24.3
Locum pharmacist	11	3.3
Clinical Pharmacist	2	0.6
Pharmacy Intern	6	1.8
Pharmacy Assistant	124	37.7
Pharmacy Technician	1	0.3
Other	3	0.9
Pharmacy Position		
Pharmacist	195	59.3
Other Pharmacy Personnel	134	40.7

*in the current social environment individuals may choose not to be classed as male or female and that consideration was taken into account. The “Other” option is inclusive of the alternative gender identities. As the demographic question asked for gender rather than sex the “Other” option needed to ethically be made available.

4.3. Results

4.3.1. Descriptive Statistics

Specific descriptive statistics were extracted from the responses obtained. These results provide an indication of participants knowledge, attitudes and perceptions, and practices of doping and medication use in athletes (Table 4.2).

Table 4.2: Mean score for knowledge, attitudes, and perceptions of pharmacy personnel (n=322)

Variable	Maximum Score Possible	Average possible Score based on testing method	Mean Score $\pm$ Standard Deviation	Mean Score $\pm$ Standard Deviation (%)
Knowledge (Self-declared)	23	11.5	11.85 $\pm$ 5.06	51.52 $\pm$ 22
Knowledge (Tested)	13	6.5	4.82 $\pm$ 2.52	37.09 $\pm$ 19.42
Attitudes and Perceptions	130	78	88.32 $\pm$ 14.68	67.93 $\pm$ 11.29
Practices	94	61	47.61 $\pm$ 10.44	50.65 $\pm$ 11.11
Total KAP Score	260	157	152.60 $\pm$ 32.70	58.69 $\pm$ 12.58

4.3.1.1. Knowledge

The results from participants in the study shows a mean score of 11.85 $\pm$ 5.06 (51%) with regards to their knowledge associated to doping and medication use in athletes. This value can be considered an average result based the yes-no question structure with yes value of 1 and no value of 0. Results of similar studies conducted in Finland, Kenya, Ethiopia, and Malaysia have reported alike values for pharmacists' knowledge related to doping and sports medicine (Hailu *et al.*, 2021; Lemettila *et al.*, 2021; Voravuth *et al.*, 2022; Rotich *et al.*, 2023)

Specific results that contribute to the insight into participants' knowledge of sports medicine and the use of medication in athletes as depicted in Figure 4.1. The majority of participants 74% reported to understand the term sports pharmacy, with 63% claiming to be aware of the classes of prohibited substances in sport. In addition, 73% being aware of WADA as a global organization. However, this decreases with increased specificity with 54% being aware of the South African Institute of Drug Free Sport, and fewer still being aware of the FIP guidelines relating to pharmacist's contribution to sports medicine at 32%. Approximately half of participants 45% indicated that they had received training at university in sports medicine or anti-doping, with 17% seeking training as a form of continued professional development.

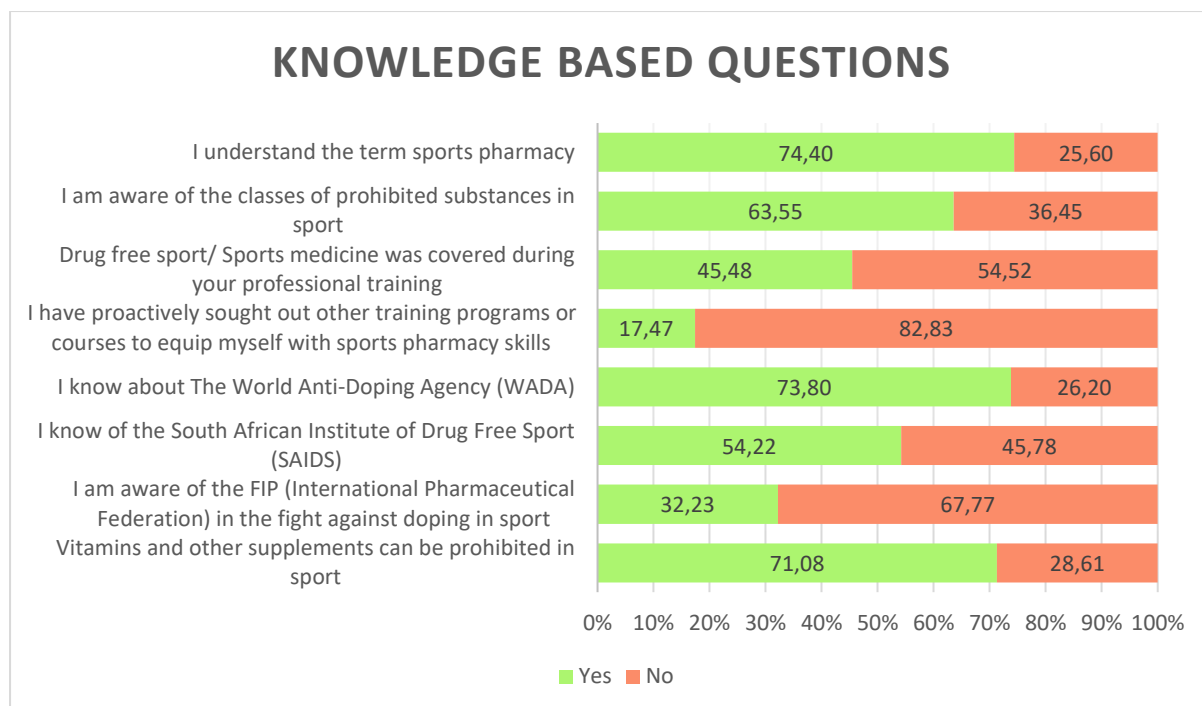


Figure 4.1: Pharmacy personnels response distribution for knowledge on sports pharmacy and medication use in athletes.

4.3.1.2. Tested knowledge

Participants tested knowledge on the classes of prohibited substances provided a mean score of 4.82 ± 2.52 (37%). This score is low based on correct answers valued at 1 and incorrect answers valued at 0. These results indicate a lack of knowledge and possible limited education.

4.3.1.3. Attitudes and Perceptions

Participants received an overall mean score of 88.32 ± 14.68 (67%) with regards to their attitude and perceptions associated to doping and medication use in athletes. This value can be considered a fair result based on the Likert scale with the lowest and highest score of 1 and 5 respectively, and a mean value of 3 indicates the average response. A similar positive opinion appears globally but is however affected by the nations' infrastructure (Howard *et al.*, 2017; Shibata *et al.*, 2017; Hailu *et al.*, 2021; Lemettila *et al.*, 2021; Voravuth *et al.*, 2022; Rotich *et al.*, 2023).

.

Specific results that contribute to the insight into participants' attitude and perception related to sports medicine and the use of medication in athletes is depicted in Figure 4.2. It was determined that 89% of participants agreed that pharmacists could play a pertinent role in healthcare of athletes and 60% of participants agreeing that pharmacists are appropriately placed to assist athletes in learning about drug-free sport and safe medicine choices. In addition, 91% of participants see the importance

of this role and the need for athletes to consult with health care professionals prior to medication and supplement use. Participants have agreed that additional training in drug-free sport and/or sports pharmacy would be beneficial for patient counselling with 88% of participants seeing the value. However, the majority of participants 82% do however hold the opinion that all high-level athletes have specialised medical teams or doctors attending to them, negating the need for pharmacists in sport.

ATTITUDE AND PERCEPTION BASED QUESTIONS

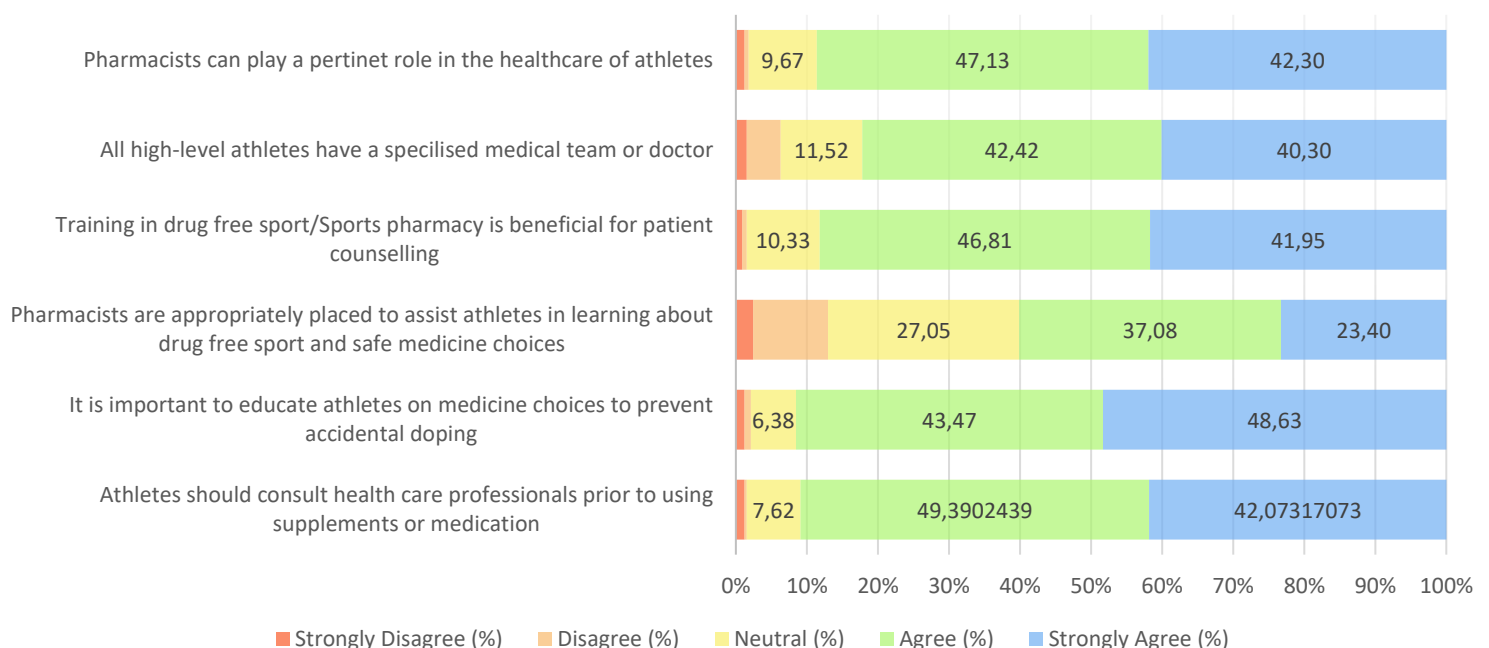


Figure 4.2: Pharmacy personnels response distribution on their attitudes and perceptions related to sports pharmacy and medication use in athletes.

4.3.1.4. Practices

Participants received an overall mean score of 47.61 ± 10.44 (50%) with regards to their current practice associated to doping and assisting athletes their health care needs. This value can be considered a poor result based on the Likert scale where the lowest and highest score of 1 and 3 respectively, and a mean value of 2 indicates the average response. Pharmacists in Kenya, while having similar exposure to doping cases specifically reported to have more frequent interactions with athletes and cases related to sports medicine (Rotich *et al.*, 2023).

Specific results that contribute to the insight into participants' practice in sports medicine and the use of medication in athletes in Figure 4.3 and Figure 4.4.

Of the participants 65% stating that they had never been approached by an athlete for assistance with prohibited substances and 32% having been approach on occasion. Furthermore 30% of participants had never dispensed medication to an athlete with 67% only having done so on occasion.

When asked to specify their confidence level in counselling athletes on specific topics, participants felt the most confident in counselling on safe medicine choices and supplement use however this was only 57% and 40% respectively. Other doping specific topics received far lower scores with only 22% of participants feeling confident in counselling on doping control processes, 16% feeling confident in anti-doping testing procedures and 16% feeling confident in therapeutic use exemption.

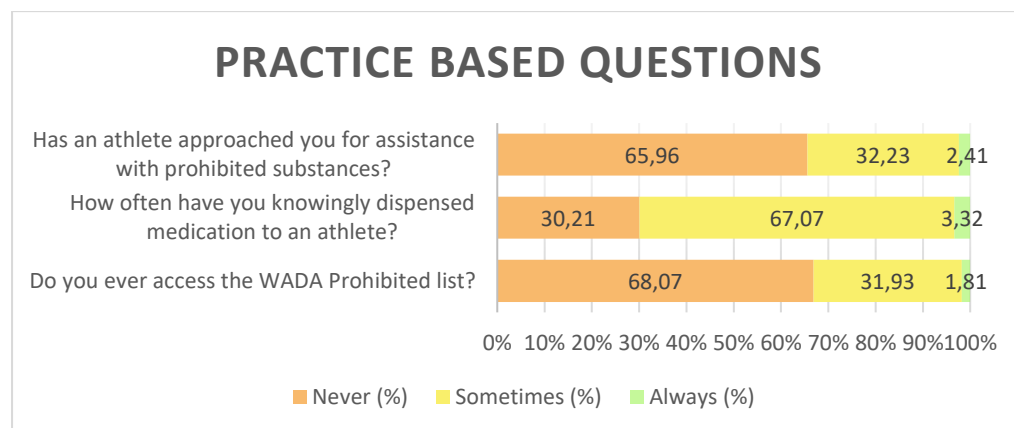


Figure 4.3: Pharmacy personnels response distribution on general practices related to sports pharmacy and medication use in athletes

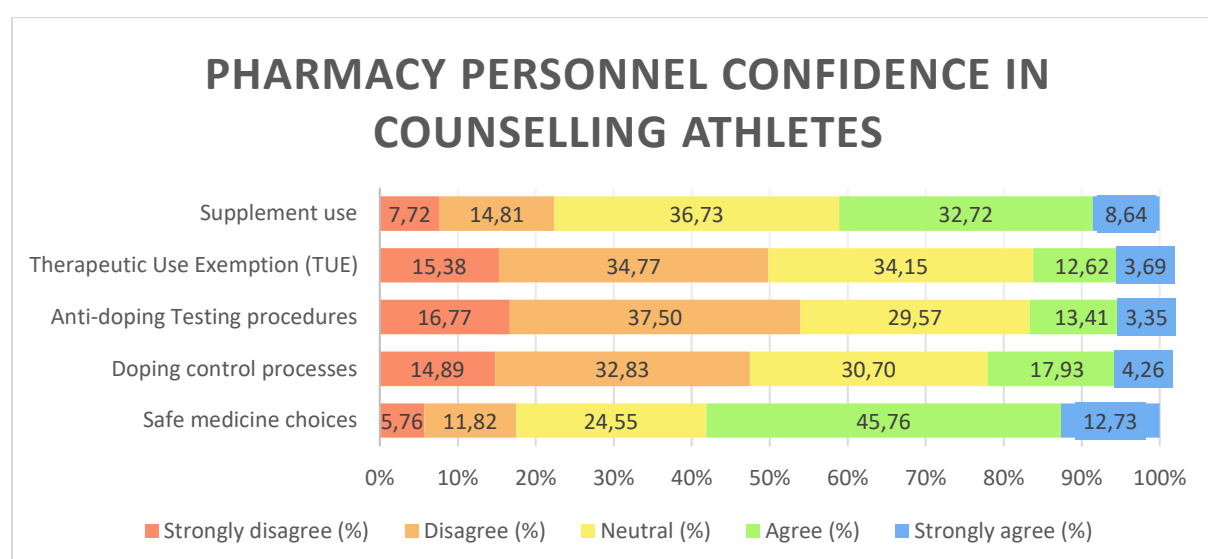


Figure 4.4: Pharmacy personnels confidence levels on counselling athletes on various topics

4.3.2. Correlations

The demographic information collected allowed for correlations to be identified. T-tests and ANOVA were utilised in the case of nominally distributed data, which was reported as mean and standard deviation. Kruskal-Wallis analysis was utilised in the case of non-nominally distributed data, which was reported as observations and Ranksum. Significance was determined from p-values obtained during the analysis (statistical significance set at $p < 0.05$) as depicted in Table 4.3.

4.3.2.1. Knowledge

Findings of the above tests demonstrated that there was no significant difference in participants knowledge with regards to age, gender, health care, or pharmacy sector ($p > 0.05$). Significance was however identified in areas related to qualification and professional affiliation. An ANOVA test showed that there was a significant difference in the self-declared knowledge of participants ($p < 0.05$) with regards to qualification. The participants who held a Master's degree had reported a higher level of knowledge compared to those holding a Bachelor of Pharmacy degree or diploma. Participants with alternative qualifications (those that selected other, including Bachelor of Science or diploma) reported the lowest level of knowledge. When looking at pharmacy position, pharmacists have a significantly higher level of self-declared knowledge over other pharmacy personnel ($p < 0.05$) as determined by Kruskal-Wallis analysis.

These results show that participants self-declared knowledge increased with increasing level of education, with participants holding diplomas or certifications having the lowest scores and those with Master's having the highest. This finding can further be demonstrated when noting pharmacists higher self-declared knowledge scores over other pharmacy personnel.

4.3.2.2. Tested knowledge

Similar results were noted when analysing participants tested knowledge. The above tests conducted indicated that no significant difference was noted in participants age, gender, health care, or pharmacy sector ($p > 0.05$). Significance was noted with regards to qualification and pharmacy position. An ANOVA test indicated that a significant difference existed ($p < 0.05$) with regards to participants qualification and tested knowledge. Participants holding a Master's qualification scoring higher on average, with participants holding diplomas scoring the lowest. Following the Kruskal-Wallis analysis, results indicated a significant difference ($p < 0.05$) with regards to pharmacy position. Participants holding the position of pharmacists scored higher than other pharmacy personnel.

4.3.2.3. Attitudes and Perceptions

Findings of the above tests demonstrated that there was no significant difference in participants attitude and perceptions with regards to age, gender, health care, or pharmacy sector ($p > 0.05$). Significance was however identified in areas related to qualification and professional affiliation. Kruskal-Wallis analysis of participants qualification with regards to attitude and perception revealed a significant difference ($p < 0.05$). Participants holding a Master's degree, or Bachelors in Pharmacy had a more positive opinion of pharmacy's involvement in sports medicine over those holding a diploma or other qualification. In addition, Kruskal-Wallis analysis indicated a significant difference ($p < 0.05$) in pharmacists and other pharmacy personnel's attitudes and perceptions. With pharmacists having a more positive opinion of pharmacy's involvement in sports medicine compared to pharmacy assistants, technicians, and interns.

4.3.2.4. Practices

Findings of the above tests indicated that no significant difference was noted in participants age, health care, or pharmacy sector, qualification, or pharmacy position with regards to participants current practices related to sports medicine. Significance was only noted with regards to gender. Kruskal-Wallis analysis indicated that a significant difference was noted ($p < 0.05$) with regards to participants gender, with male participants having had a higher level of interaction with athletes and anti-doping compared to females and other genders.

Table 4.3: Participants' knowledge, attitudes and perceptions, practices, and tested knowledge according to demographic characteristic

	Total Knowledge			Tested Knowledge			Total Attitudes and Perceptions			Total Practices		
Variables Nominally Distributed Data	Mean	Std. dev.	p-value	Mean	Std. dev.	p-value	Mean	Std. dev.	p-value	Mean	Std. dev.	p-value
Variables Non-Nominally Distributed data	Obs	Ranksum	p-value	Obs	Ranksum	p-value	Obs	Ranksum	p-value	Obs	Ranksum	p-value
Age	Mean	Std. dev.	0.0834	Obs	Ranksum	0.147	Obs	Ranksum	0.0861	Mean	Std. dev.	0.4504
20-29 Years	11.49	4.88		103	15940		103	17214		47.85	8.99	
30-39 Years	11.53	5.07		115	19163		115	17644		47.07	10.56	
40-49 Years	11.83	4.90		66	10624.5		66	12539		46.83	10.06	
>49 Years	13.60	5.18		46	8887.5		46	7218		49.61	10.40	
Gender	Mean	Std. dev.	0.5089	Mean	Std. dev.	0.2499	Obs	Ranksum	0.836	Obs	Ranksum	0.0015*
Male	12.26	4.91		90.19	15.02		112	18158		112	21586	
Female	11.59	5.16		87.64	14.39		208	35090.5		208	31643	
Other	12.17	3.59		85.41	16.58		12	2029.5		12	2049	
Health Care Sector	Mean	Std. dev.	0.6186	Obs	Ranksum	0.809	Obs	Ranksum	0.5161	Mean	Std. dev.	0.1270
Private	11.79	4.98		303	50084.5		303	49527.5		47.35	9.87	
Public	12.89	6.12		19	2865.5		19	3551.5		51.89	11.03	
Both	11.17	5.53		6	1006		6	877		45	9.61	
Pharmacy Sector	Mean	Std. dev.	-0.5733	Obs	Ranksum	0.504	Obs	Ranksum	0.5569	Mean	Std. dev.	0.0683
Retail	11.80	5.00		326	53826.5		326	53842.5		47.59	9.95	
Hospital	13.25	6.95		4	788.5		4	772.5		42.57	11.14	

	Total Knowledge			Tested Knowledge			Total Attitudes and Perceptions			Total Practices		
Variables Nominally Distributed Data	Mean	Std. dev.	p-value	Mean	Std. dev.	p-value	Mean	Std. dev.	p-value	Mean	Std. dev.	p-value
Variables Non-Nominally Distributed data	Obs	Ranksum	p-value	Obs	Ranksum	p-value	Obs	Ranksum	p-value	Obs	Ranksum	p-value
Qualification	Mean	Std. dev.	0.0007*	Obs	Ranksum	0.0249*	Mean	Std. dev.	0.0001*	Obs	Ranksum	0.164
Diploma	12.05	5.73		65	8947		4.03	2.47		65	11352.5	
BPharm	12.70	4.19		169	28421		5.36	2.42		169	25737.5	
Masters	13.15	4.02		13	2147		5.77	2.92		13	2114	
Other	9.79	5.46		62	8379		4.09	2.57		62	8691	
Pharmacy Position	Obs	Ranksum	0.0000*	Obs	Ranksum	0.0002*	Obs	Ranksum	0.0000*	Mean	Std. dev.	0.4086
Pharmacist	195	35927		195	35347.4		195	36032.5		47.70	9.77	
Other Pharmacy Personnel	234	18358		134	18937.5		134	18252.5		47.25	10.09	

Std.dev. _ Standard deviation Obs_ Observations

Correlations in nominally distributed data were determined using t-tests and ANOVA, depicted in the table using mean and standard deviation, with significance determined from the P-value.

Correlations in non-nominally distributed data were determined using Kruskal-Wallis, depicted in the table using observations and Ranksum, with significance determined from the P-value.

* Denotes statistical significance

4.3.3. Discussion

4.3.3.1. Knowledge

While participants overall score with regards to knowledge associated to doping and medication use in athletes can be considered an average result, it is concerning considering pharmacy personnel's responsibilities and duties patient athletes. This lack of knowledge was further emphasised on evaluating participants tested knowledge scores which were deemed very poor. These results may indicate that participants' knowledge base is lacking, specifically in-depth knowledge, associated with anti-doping and medication use in athletes, due to a lack of appropriate education.

Majority of participants reported to understand the term sports pharmacy as well as being aware of the classes of prohibited substances in sport. These individual results give the impression that pharmacy personnel should have a good knowledge of sports pharmacy and anti-doping, this may however be overestimated due to participants self-professed knowledge. Participants tested knowledge scores give a more accurate indication of their knowledge, these scores were much lower than participants self-declared knowledge. Similar studies indicate that pharmacists generally have a poor knowledge related to sports medicine aligning with the tested knowledge scores (Laure and Kroebitzsch-Lejeune, 2000; Starzak *et al.*, 2016; Shibata *et al.*, 2017; Howard *et al.*, 2018; Hailu *et al.*, 2021; Lementtila *et al.*, 2021; Voravuth *et al.*, 2022; Rotich *et al.*, 2023).

Approximately half of participants (45%) indicated that they had received training at university in sports medicine or anti-doping, with a portion having sought training as a form of continued professional development. Nations such Finland, Ethiopia, and Malaysia have reported having received almost no education on doping or sports medicine, with the United States only having received minimal education. The South African level of education thus appears above a similar comparison (Laure and Kroebitzsch-Lejeune, 2000; Starzak *et al.*, 2016; Shibata *et al.*, 2017; Howard *et al.*, 2018; Hailu *et al.*, 2021; Lementtila *et al.*, 2021). The discrepancy between education received and the associated knowledge in South Africa may indicate inappropriate quality of training. In the South African context, sports pharmacy does not specifically appear in the qualification standards for pharmacy (SAQA, 2018; SAPC, 2021). In the event of sports medicine or sports pharmacy not being a fully established profession in a country, as is the case for South Africa, Finland, Ethiopia, and Malaysia, may contribute to the discrepancy in education received and knowledge (Hailu *et al.*, 2021; Kawaguchi-Suzuki *et al.*, 2021; Lementtila *et al.*, 2021; Greenbaum *et al.*, 2022; Voravuth *et al.*, 2022; Rotich *et al.*, 2023). Nations such as Japan and specific areas of the United States, where a fully established educational program for the education of medication use in sport and anti-doping exists, may have a

1 higher level of knowledge (Ambrose, 2008; Kawaguchi-Suzuki *et al.*, 2021). This may explain why
2 participants knowledge and awareness appears to be common knowledge and not highly specific.
3 A demonstration of this is how pharmacists' knowledge of doping related concepts appears to
4 decrease with increased specificity as presented in figure 4.1 and figure 4.4. The World Anti-Doping
5 Agency is a recognised organization with the majority of participants (73%) and pharmacists globally
6 being aware of this structure. However, awareness of the national anti-doping agency, the South
7 African Institute of Drug-Free sport, was far less (Figure 4.1). Similar results with regards to awareness
8 of the national anti-doping agencies were noted in Malaysia and Ethiopia (Hailu *et al.*, 2021; Voravuth
9 *et al.*, 2022). Furthermore, even fewer participants were aware of the FIP guidelines related to
10 pharmacist contributions to sports medicine. These results emphasise pharmacists' awareness and
11 knowledge being limited to widely known information rather than nation and profession specific.

12 Participants with a higher level of education indicated a higher level of self-declared knowledge as well
13 as receiving a higher tested knowledge score compared to those with less professional education. This
14 highlights the specific benefit of additional education on pharmacy personnel's knowledge of sports
15 medicine. Similar global studies have concluded that additional education in anti-doping and
16 medication use in athletes would prove beneficial in increasing pharmacy's involvement in sports
17 medicine as this appears to be a significant barrier. It was noted that decreased knowledge resulted in
18 a lack of confidence in topics related to sports medicine leading to pharmacists absconding from
19 athlete related cases (Laure and Kroebitzsch-Lejeune, 2000; Starzak *et al.*, 2016; Shibata *et al.*, 2017;
20 Howard *et al.*, 2018; Hailu *et al.*, 2021; Lementtila *et al.*, 2021 Greenbaum *et al.*, 2022; Voravuth *et al.*,
21 2022; Rotich *et al.*, 2023). In environments with better educational opportunities the management of
22 sports medicine cases is improved (Ambrose, 2008; Kawaguchi-Suzuki *et al.*, 2021; Greenbaum *et al.*,
23 2022)

25 4.3.3.2. Attitudes and Perceptions

26 Participants positive response with regards to their attitude and perceptions associated with doping
27 and medication use in athletes does indicate participants acknowledgment of the pharmacy industries'
28 potential involvement in sports medicine and anti-doping activities. The result (Figure 4.2) indicates
29 potential barriers that affects participant opinions on pharmacy's involvement in sports medicine. This
30 positive perspective was held globally with nations such as Ethiopia, Kenya, Malaysia, Finland and
31 France holding similar perspectives on pharmacy's involvement in sport (Laure and Kroebitzsch-
32 Lejeune, 2000; Howard *et al.*, 2017; Shibata *et al.*, 2017; Hailu *et al.*, 2021; Lemettila *et al.*, 2021;
33 Voravuth *et al.*, 2022; Rotich *et al.*, 2023). Nations that have better infrastructure and a stronger sports
34 medicine environment such as Japan and the United States had more positive opinions with regards

to pharmacy's involvement in sport, which may be associated with fewer barriers due to the available infrastructure (Howard *et al.*, 2017; Shibata *et al.*, 2017; Greenbaum *et al.*, 2022).

Study participants appear to have a positive perception around anti-doping and medication use in athletes. This perception arises from the agreement that pharmacists could play a pertinent role in healthcare of athletes noting that pharmacists are appropriately placed to assist athletes in learning about drug-free sport and safe medicine choices. The importance of this role and the need for athletes to consult with health care professionals prior to medication and supplement use has been identified in various studies from a pharmacists' and athletes' perspective (Howard *et al.*, 2017; Smith-Morris *et al.*, 2018; Perry *et al.*, 2020). These results are indicative of pharmacists recognising the potential impact and position that they may have in sports medicine. Such roles have been highlighted in literature globally as it related to the scope of practice of pharmacist (SAPC, 2010; Abduelkarem, 2014; FIP, 2014; John, 2016; Smith Morris *et al.*, 2018; Hooper *et al.*, 2019; Mottram and Stuart, 2021; Piattoly, 2022; Greenbaum *et al.*, 2023; Rotich *et al.*, 2023) this potential impact is however reliant on pharmacy personnel being sufficiently equipped to perform the duties expected. Participants agree that additional training in drug-free sport and/or sports pharmacy would be beneficial for patient counselling. Finnish pharmacists' comments mirror those expressed, highlighting that the greatest barrier to their involvement in sports medicine was a lack of education (Lemettila *et al.*, 2021). Correlations (Table 4.3) also indicated that increased education resulted in a more positive opinion of the involvement of pharmacy in sports medicine. Participants holding a Bachelor of Pharmacy or Master's degrees have a more positive outlook on the involvement and impact of pharmacy in sports medicine and the health and medication needs of athletes than other qualifications. Similarly, those participants holding the position of pharmacists expressing a more positive opinion than other pharmacy personnel, due to a higher degree of professional education.

The majority of participants do however hold the opinion that all high-level athletes have specialised medical teams or doctors attending to them (Figure 4.2). This perception affects pharmacists' willingness and desire to become educated and be involved in sports medicine as they believe these roles have already been fulfilled (Laure and Kriebitzsch-Lejeune, 2000; Backhouse and Mckenna, 2011; Starzak *et al.*, 2016; Juma *et al.*, 2022).

4.3.3.3. Practice

Participants poor result with regards to current practices related to assisting athletes in their health and medication needs indicates potential barriers to pharmacists' involvement and potential

1 interactions with athletes. Pharmacists in France and Kenya expressed having a similar level of
2 interaction with athletes and exposure to doping cases as participants in South Africa (Laure and
3 Kroeibitzsch-Lejeune, 2000; Rotich *et al.*, 2023). This can be considered as less than expected
4 considering athletes increased utilisation of medications and supplements, taking into account the
5 responsibilities of pharmacy personnel in history taking, the provision of advice, and control over
6 access to pharmaceuticals (Laure and Krieibitzsch-Lejeune, 2000; SAPC, 2010; Backhouse and Mckenna,
7 2011; Starzak *et al.*, 2016; Perry *et al.*, 2020; Juma *et al.*, 2022).

8
9 Participants appear to have minimal involvement with athletes and sports medicine. Participants did
10 indicate that they had on occasion knowingly dispensed medication to an athlete. This appears to be
11 a widespread issue with athletes not identifying themselves as such on consultation with pharmacy
12 personnel despite increased medication use (Howard *et al.*, 2017; Perry *et al.*, 2020), however this may
13 also be due to poor history taking and counselling on the pharmacists' front due to limited training.
14 An additional indicator for pharmacists' lack of involvement in sport medicine is the lack of utilisation
15 of antidoping references. In this case a sizable proportion (68%) of study participants had never
16 accessed the WADA prohibited list, which forms an essential part of counselling and advising athletes
17 on safe and appropriate medication use (Figure 4.3). Participants interaction with doping and
18 prohibited substances was slightly higher than pharmacists in France and Kenya, with a third of
19 participants having been approached regarding prohibited substances in sport (Laure and Krieibitzsch-
20 Lejeune, 2000; Rotich *et al.*, 2023). This result is concerning considering participants determined lack
21 of knowledge as it is unclear as to whether the correct action with regards to these incidents was
22 taken.

23
24 Alongside participants actions the practice-based questions also provided an indication of the
25 participants confidence in counselling on sports pharmacy related topics. The results (Figure 4.4)
26 indicate that the participants had limited confidence in counselling athletes. Participants felt the most
27 confident in counselling on safe medicine choices and supplement use. Other doping specific topics
28 including, counselling on doping control processes, anti-doping testing procedures, and therapeutic
29 use exemption received far lower scores. These topics fall in line with appropriate counselling points
30 for athlete on dispensing medication or providing advice (SAPC, 2010). Similar lack of confidence has
31 been noted in literature and other studies, concluding that a lack of appropriate training and
32 knowledge leads to lack of confidence in managing cases related to athletes and sports pharmacy
33 (Laure and Kroeibitzsch-Lejeune, 2000; Starzak *et al.*, 2016; Shibata *et al.*, 2017; Howard *et al.*, 2018;
34 Hailu *et al.*, 2021; Lementtila *et al.*, 2021).

1 Correlations revealed that male pharmacy personnel had significantly more interaction with anti-
2 doping and athletes with regards to medication use than other genders. This proves to be an additional
3 barrier to pharmacists' involvement in sports medicine. Representation in sports has favoured males
4 over females (O' Reilly *et al.*, 2019; Mattson *et al.*, 2022). This inequality extends to female
5 representation in sports medicine as well (Table 4.3). While research in this particular topic has not
6 extended to the field of pharmacy specifically, the potential affect this has on athletes' perception on
7 the benefit that female pharmacy personnel can have should be considered (O' Reilly *et al.*, 2019;
8 Mattson *et al.*, 2022).

Chapter 5: Results and Discussion – Phase 2

This chapter comprises of various sections, detailing the purpose of the qualitative phase of research and the participant demographics. The results obtained by undertaking thematic analysis of the interviews conducted are presented. The chapter concludes with a discussion of the results obtained in the qualitative data analysis.

5.1. Purpose of Phase 2

The qualitative phase of the study was used to provide the researcher with additional insight into the participants knowledge, perceptions, and self-declared standard practices around medication use in sports. This chapter aims to meet Objective 2 of the study, as described in Chapter 1, section 1.3.

5.2. Participant Demographics:

A total of 17 participants (n=17) participated in the qualitative phase of the study. The demographic information obtained were to identify age, involvement in which health care sector, involvement in which pharmacy sector, highest qualification, and job title. Figure 5.1 as seen below provides a summary of the demographic data from the study participants included in Phase 2 of the study.

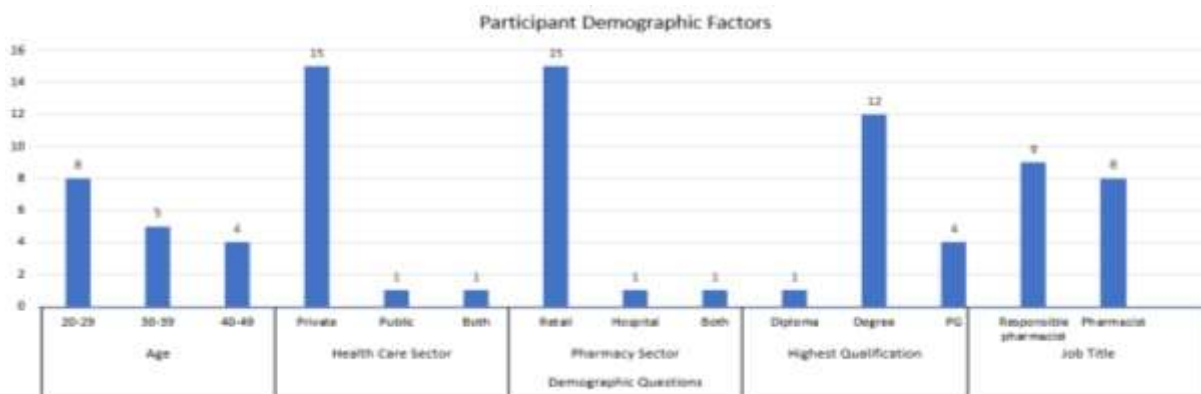


Figure 5.1: An Overview of Participants Demographic Information

5.3. Qualitative Analysis Results

During the thematic analysis four main themes were identified, with three of these containing two subthemes each. The themes and subthemes are presented below in Table 5.1.

Table 5.1: Themes and Subthemes identified upon analysis

Themes	Subthemes
5.3.1. Theme 1: The role of the pharmacist in sports pharmacy	5.3.1.1. The role as the custodians of medicine to control access to medication as it related to anti-doping 5.3.1.2. Pharmacists ensuring best practice in treatment plans and counselling of athletes
5.3.2. Theme 2: Sports pharmacy related training and education	
5.3.3. Theme 3: Regulatory framework and Guideline development	5.3.3.1. The limited regulation of supplements has led to pharmacists being concerned and lacking knowledge on the use of these products 5.3.3.2. The lack of guidelines related to sports pharmacy
5.3.4. Theme 4: Barriers in practice that limit pharmacists' involvement in sports pharmacy	5.3.4.1. Pharmacists are not recognised for their ability to assist athletes in their medical needs 5.3.4.2. Pharmacists have a limited involvement with supplements which form a large part of an athletes' health regiment

5.3.1. Theme 1: The role of the pharmacist in sports pharmacy

A theme identified during the analysis was participants acknowledgment of the potential role that could be undertaken by pharmacists in sports medicine, specifically in a retail pharmacy setting. The

two subthemes identified namely: the role as the custodians of medicine to control access to medication as it relates to anti-doping as well as the role of ensuring best practice with regards to treatment plans and counselling of athletes.

5.3.1.1. The role as the custodians of medicine to control access to medication as it related to anti-doping

During the interview process a number (n=13) of the participants expressed that as pharmacists, or pharmacy personnel, as part of their duties is to ensure control over all medication, which include those that could be used for the intent of doping in sport. This perception is demonstrated by the quote by **P9** below.

P9: *“So a pharmacist we’re custodians of medicine, so most of the medication that is sold on the floor or on the market is through the pharmacies. So, as a pharmacist, we can help to regulate what is sold to athletes and what is not sold to athletes. And based on the need, we can also use that to see who really does need it and who doesn’t. So, we (are) literally the gatekeepers of what kind of medication it gets available to the people.”*

Similar statements expressing the importance of ensuring vigilance with regards to the provision of medicine in order to prevent the misuse of medication for the intent of doping in sport were made as quoted by **P12** and **P1**:

P12: *“I think we hold in just... play quite a huge role as people who tend just to control after (the) use of medicine like in terms of also control of medicine as well.”* **P12** commented on pharmacists’ responsibility to control access to medication to ensure misuse does not occur. Expressing that this forms a huge part of the role of a pharmacist and actions taken that align with this role may assist in preventing the misuse of medication particularly as this pertains to attempted doping in sport.

P1: *“As a pharmacist, right. Your role is really being very vigilant, right?”*

The aforementioned statements demonstrate that pharmacists believe, that included in their responsibilities as mandated in the scope of practice of a pharmacist in South Africa, is to be vigilant and ensure the careful control of medicines and identification of potential misuse of medicine. This

misuse extends to use with the intent of doping in sport, which violates the regulations as set by WADA.

P5 further elaborated on the actions that a pharmacist can take to limit the doping in sport, as per the following statement:

P5: *"So we... we can also help, especially in retail we can have campaigns against the Misuse of Drugs in sports and yeah, we can promote the right drugs that are used in sports as well."*

The perception of pharmacists' ability to have an effect of the misuse of medicine in sports was not unanimous as **P14** expressed that regardless of the control that pharmacists may wish to place over medication, an athlete with the intent of doping will acquire the medication desired. This can be seen in the quote below:

P14: *"In terms of, I don't think we will control over it, because anyone can cheat that anyone who's seen athletes whose doing athletics can cheat that. In the sense we were, for example, with the steroids if we can deny giving them. If we cannot give them in [pharmacy name retracted to ensure confidentiality], they can still go and buy them at another pharmacy where they don't know them."*

5.3.1.2. The role of ensuring best practice with regards to treatment plans and counselling of athletes.

All of the participants (n=17) highlighted that, as with other patients, it is their duty to provide the patient with the best possible service in the form of the provision of the correct medication, treatment plan, and associated advice while taking into consideration that specific patients history and circumstance. This duty was expressed in various ways by the participants, but the broader concept can be seen in the quotes below.

P6: *"Right, so my laymen understanding is guiding our professional athletes on, the appropriate medication, but in their sense substances to use whilst in practice within their profession, making sure that they... they don't end up... on the right side of the field, yeah."*

P2: *"...that firstly we need to know what it's safe for sportsmen to take and what they're allowed to take from a competitive angle and but also where we could help them with the endurance and performance without breaking the law."*

Other participants expressed this role in more specific terms detailing the specific actions that could be taken to assist athletes with their health and medication needs. This was clearly expressed by **P10** who commented:

P10: *"I think pharmacists can come up with drug usage plans.... So, if I had a patient who happens to have other comorbidities but is also in sport to make sure that there's a: no drug interactions with any other medicines that they use, but also that they are doping free... just to assist them also to have an understanding of how medicines work and to be aware of any potential risks of using it".*

This perception was further supported by statements made by other participants, as provided below:

P8: *"...on the consultation side of things where people want to check if it is safe for them to be taking certain medication... Yes, pharmacists can provide more information because they are more inclined with the information".*

P12: *"I think they would hold it an integral part because we could then be able just to advise on the side effects. We could then advise on just in the potential problems that could result in the drug-drug interactions that could result, just in terms of the medicines that gets to be prescribed inclusive of the vitamins that the patient will take up over the counter".*

While **P12** provided similar opinions on advising athletes on medication use, the participant further elaborated that in addition to advising on prescribed or chronic medication, advice should be inclusive of OTC medication and supplements that the athlete is taking. **P1** encapsulated the pharmacist responsibility into a single statement:

P1 *"just making sure that you really do communicate and interact with your patient right to ensure that then their needs are met"*

This quote demonstrates how the role of the pharmacist does not vary depending on the patient. It is the duty of the pharmacist to ensure that the patient's needs are met regardless of history or circumstance. This sentiment would include that on identification of an athlete patient, the pharmacist would take that information and the implications that it may have on a patients' health needs and

1 medication use into consideration and act, accordingly, as would be in line with sports pharmacy
2 recommendations.

4 **5.3.2. Theme 2: Sports pharmacy related training and education**

5 Correct training and education in a specialized topic are essential if a pharmacist is expected to execute
6 their duties related to that topic. On discussion with pharmacists, it was made apparent that there is
7 insufficient training and education opportunities related to sports pharmacy in South Africa. This can
8 be seen in the statement from **P15**, as seen below:

9
10 **P15:** *"I think the pharmacists need to be educated on the topic. They're not educated on it, so*
11 *they're not confident in talking about it"*

12
13 This is a sentiment that all the interview participants (n=17) agreed on. When asked specifically
14 whether pharmacists were sufficiently equipped to manage the medication needs of athletes, all the
15 participants stated that pharmacists were not sufficiently equipped, and additional training would be
16 required to become confident in managing these specific cases. **P3** and **P1** provided quotes
17 commenting on this matter:

18
19 **P3:** *"I'm not equipped enough with, for example resources or to know where to turn to answer*
20 *athletes' questions"*

21
22 **P1:** *"I would also say lack of education on our end because then we don't really, you know put*
23 *on like you said, really... umm... have or placed much emphasis on sports medicines and we*
24 *don't really consider these people as you know a special population group".*

25
26 **P2 and P13** concurred that this limited training effects pharmacists' confidence and thus involvement
27 in sports pharmacy:

28
29 **P2:** *"We could play a bigger role there is a lot of people would come to us first before they go*
30 *to... to their doctor or their physio and but I think you're just in case of we haven't had the*
31 *training, so we don't feel confident in"*

32
33 **P13:** *"Yes, if we have more training on it and what we can give them because like I said, I know*
34 *like asthma pumps and certain things that aren't allowed because there are stimulants or they*

1 *make them breathe better, but if we have more of education on it, it will definitely help us,*
2 *especially with your athletes that comes and say what medicine can I use that is not going to*
3 *affect them?"*

4
5 This lack of training and limited knowledge appears to be associated with a lack of comprehensive
6 education opportunities. This finding can be supported by a quote from **P9**, which highlights the
7 limited formalised education opportunities:

8
9 **P9:** *"They have very little knowledge when it comes to sports pharmacy in South Africa,*
10 *especially in our curriculum. We do a lot of chronic diseases, training and learning, but when it*
11 *comes to athletics (it) is seen as a recreational so that is an additional course that you have to*
12 *do on the side and not many people have got exposed to that, so I think there's very little*
13 *information to sports pharmacy you have to either initiate the learning process by yourself out*
14 *of curiosity, or you remain ignorant."*

15 The various interview participants had different levels of exposure to sports pharmacy with
16 participants never having received any formal training (n=11) in the field, as described by the following
17 statement made by **P11** and **P7**.

18
19 **P11:** *"I would say it's a lack of training, like in my days as a student, I don't remember ever*
20 *doing something about sports medicine"*

21
22 **P7:** *"I hadn't heard about it until your questionnaire... but I think there is space for us to have*
23 *more knowledge on it and no, in pharmacy, we don't really learn about. Sports specifically".*

24
25 Participants that had some exposure to sports pharmacy during university, as an undergraduate (n=4)
26 expressed that this training was isolated with no follow up as stated below.

27
28 **P6:** *"Probably 4th year. That was the last time ever, because that's when I came across these*
29 *sports medicine references and prohibited substances in sports and and that in my 15 years".*

30
31 Adding to this lack of continued education opportunities, the training received at a university level
32 appears to be overlooked by students, this is pointed out by **P1** and **P5**:

33
34 **P1:** *"I think sports medicine is that chapter that we all skip in pharmacology"*

1
2 **P5:** *"But I feel like it's just a the... the topic is just hurdled over"*

3
4 None of the participants expressed that they had had an opportunity to become educated on sports
5 pharmacy on a post graduate level, or as a form of continued professional development.

6
7 The effect of this limited education and training opportunities has resulted in poor pharmacy practice
8 in a retail setting. Two of the participants had encountered specific scenarios where a lack of training
9 resulted in poor practice.

10
11 **P1** *"That golfer situation I only picked up that hang on when something is off, when you know,*
12 *as I was just chatting with him. And you know, I was just inquiring"* in this instance the
13 pharmacist had encountered a professional golfer who collected a prescription for diuretics,
14 which are prohibited in sport. During the consultation the patient revealed their status as an
15 athlete by stating that they were to compete in an upcoming tournament. This caused the
16 pharmacist to doubt the prescription and the indication for use but provided the medication
17 regardless.

18
19 **P3** *"...I have helped a girl who actually had like a podium finish at the marathon in Pretoria*
20 *and they did a test of her blood for doping, because she did so well. And then, luckily, she*
21 *passed because she didn't have any anything. But I mean, I wouldn't know if I gave her some*
22 *anti-inflammatory, muscle relaxants or whatever, and it actually would have taken away the*
23 *title from her."*

24
25 In these instances, the pharmacists were aware of the of the athletes' status as such during the
26 dispensing process but were unaware of what actions to take. The result of this is that athletes with
27 the intent of doping are gaining access to prohibited substances as in the case with **P1** and athletes
28 who are seeking reputable assistance are potentially being misled as in the case of **P3**.

29
30 Education of this nature should not be limited to scheduled substances but rather include all
31 pharmaceutical products that can be utilised by athletes to support their performance, specifically
32 supplements. When asked if they felt confident in recommending or counselling on supplement use,
33 6 participants stated that they only felt confident in counselling on vitamins and minerals, 5 of the
34 participants claimed not to have sufficient knowledge to recommend a supplement at all, and a further

4 participants stated that they would refer the patient to a consultant in the “health aisle” as they themselves were not sufficiently equipped to counsel on the matter.

Quotes by the participants demonstrate the varied responses received on pharmacists’ confidence levels and thus involvement with regards to supplement use. In the case of **P11** who expressed confidence in recommending vitamins and minerals specifically whereas **P13** expressed minimal confidence in their own knowledge and trust of these products resulting in the need to refer patients to consultants who may not have the same skill set as a pharmacist.

P11: *“Not a lot. I know I I mostly know the stuff in vitamins. What you can maybe take as a supplement with vitamins, but when it comes to your protein bulk and all of that, I have no idea what goes on there”*

P13: *“Yeah, I referred them to our consultants to help them with what they need because they are more trained”*

Despite the current standing of education in sports pharmacy in South Africa all of the participants (n=17) expressed an interest in receiving additional education on medication use in athletes as well as supplement use. This has been made evident in the quotes below:

P3: *“So I would really like to know more because I actually do think this, do play a good role and important role”*

P10: *“So firstly I think we do need to have proper knowledge about sports medicines and doping and how the extent to... to which doping?”.*

P13: *“If we have more training on it. Yes, because we don't get training on it. Honest, we don't get the supplements (training) before coming to us... If we have more training because we do get a lot of patients coming to us and then we refer them back, yeah.”*

P7: *“...considering it something we should be more knowledgeable on, we should be looking after, I mean because they're technically pharmaceuticals.”*

5.3.3. Theme 3: Regulatory framework and guideline development

5.3.3.1. *The limited regulation of supplements has led to pharmacists being concerned and lacking knowledge on the use of these products*

Supplements in South Africa have had, until recent, limited regulation, resulting in pharmacists being concerned around the safety and effectiveness of these products. This concern limits pharmacists' willingness to recommend these products which are highly utilised by athletes. When the participants were asked whether they had any concerns related to supplements, all (n=17) expressed concerns, the quote from **P10** demonstrates this point effectively.

P10: *"Absolutely. Absolutely. Especially if they're not evaluated by SAHPRA. You know, a lot of the stuff that we give out. You know in the pharmacy because they've gone through some sort of, you know, testing process, but they're not evaluated by SAHPRA. Yes so, I'm always sceptical as to whether they A: can do what they you know, claim to do or toxicity interactions, or the actual you know, components of the supplements. Yeah. So definitely."*

A similar sentiment was made by **P7** who went further to express that the lack of regulation has allowed for patient to access these products without proper advisement by a pharmacist, as limited is known about them.

P7: *"I mean it's so easy. For anybody to walk into a health aisle, pick up out a bunch of random vitamins because they read online, or somebody else is taking them and have no clue what they're taking and end up damaging their bodies in the long run. Yeah, because they don't know what they're doing and considering it (is) something we should be more knowledgeable on we should be looking after, I mean because they're technically pharmaceuticals"*

This concern has been shown to be valid with a participant having witnessed a serious adverse reaction related to supplement misuse.

P13: *"yes, I had a friend of mine taking supplements and due to overuse of supplements he's intestines perforated, and he died"*

This incident effectively explains a comment made by **P6**.

P6: *"Yeah, just because it's a supplement or natural doesn't mean it's safe for you"*

1
2 In addition to causing this level of concern in pharmacists the lack of regulation has affected the
3 availability of evidence-based knowledge products. Leading to limited information on the use and
4 properties of these products. The resultant effect is that pharmacists are not educated on the matter
5 and are untrusting of information provided on labels. This concern and acknowledgment of limited
6 knowledge is expressed below in the quote by P7.

7
8 **P7:** *"Yes because supplements are not approved by Medicines Council. It is all natural products,*
9 *etcetera, etcetera and it has that little disclaimer there that you can't really hold them to what*
10 *they are saying on that label. So, it is a bit dangerous because I don't have any foundational*
11 *knowledge of what those molecules are or what they do?"*

12 13 5.3.3.2. The lack of guidelines related to sports pharmacy

14 Currently, there is not an available, local guideline related to sports pharmacy in South Africa. This lack
15 of validated pharmacy specific written resource has made it increasingly difficult for pharmacists to
16 assist in the medication use in athletes. As no evidence based, concise, and approved reference has
17 been made available.

18
19 **P7** expressed this thought by comparing sports pharmacy to HIV. In this case the participant stated
20 that there are guidelines that exist that a pharmacist can refer to in the event that a patient with HIV
21 presents to the pharmacy, whereas such a resource does not exist for sports pharmacy.

22
23 **P7:** *"...like for example I know if I have HIV patient, I know where to get my HIV guidelines. You*
24 *know I don't deal with HIV patients often, but if I need to, I know where to refer to, but sports*
25 *pharmacy absolutely nothing"*

26
27 When asked whether they felt that a standardized local guideline would be beneficial for pharmacy
28 practice, all (n=17) of the participants were positive about the prospects.

29
30 **P14:** *"I can go through the guideline, I think they must consider doing a guideline for us."*

31
32 **P2:** *"...definitely a formalized set of guidelines, yeah this specially for you know for our field*
33 *and the great international field as well yeah if they're that good"*

1 **P5:** *"Yeah, I feel like there should be a readily available guideline."*

2 3 **5.3.4. Theme 4: Barriers in practice that limit pharmacists' involvement in sports pharmacy**

4 **5.3.4.1. Pharmacists are not recognised for their ability to assist athletes in their medical needs.**

5 Select participants (n=5) expressed that pharmacists' involvement in the sports medicine field has
6 been hindered by athletes or to an extent the sporting industries perception. Specifically related to the
7 service that pharmacists provide or the effect that medication or supplement use can have on the
8 performance of an athlete. This was expressed by **P1**, **P6**, and **P3** in the quotes below:

9
10 **P1:** *"I would say the sports industry, as well as pharmacists to themselves, sports industry in*
11 *the sense where obviously they don't really look at the impacts that medications do have on*
12 *the athletes themselves and obviously, they in that sense that they don't recognize our own*
13 *role"*

14
15 **P6:** *"I really think the bodies also don't believe pharmacists can do it or they haven't given it a*
16 *chance and the pharmacists have just left it to the sports medicine people"*

17
18 **P3** *"I think industry is not utilising us the way they should, could. Yeah, they definitely could*
19 *utilize us more".*

20
21 **P7** went to the extent of commenting that to the general public pharmacists are not valued for their
22 ability to provide a holistic service.

23
24 **P7** *"I think a lot of health views pharmacy, or we just glorify pill pushers".*

25
26 The comment related to allowing sports related cases to be managed by other professions has also
27 been reoccurring with pharmacists saying.

28
29 **P10** *"They probably have an advisor on a team, particularly if they're professional, they'll*
30 *probably be a team of advisors who do the research for them. And so, it doesn't necessarily*
31 *have to be a pharmacist"*

32
33 **P3** *"They don't think they were necessarily turned to a pharmacist. I hope they would have a*
34 *coach(that) would know more and something like that."*

This demonstrated how pharmacists believe that they are viewed by athletes and the sporting industry as not useful and have in turn refrained from being involved in hopes that a different profession will fulfil the role that the pharmacist would play in such instances.

In addition to the broader sporting industries views, athletes' perception of pharmacists has led to them not identifying themselves as such during consultations. These actions are due to possible lack of confidence in pharmacists' abilities to assist in sports pharmacy matters.

Pharmacists appear to have experienced this. Expressing that, athletes do not disclose their athletic status during pharmacist-patient interactions, preventing pharmacists from being able to provide the correct and sufficient level of care and advice that would be relevant to them as an athlete. This was expressed by **P11** in the quote below:

P11 *"I feel sometimes because they don't disclose that they are [an athlete], it's difficult. I mean, you get a script and you're in that mode of just doing the script. Yes, you don't know, must I look out for something? And even if they disclose it, some people just ignore it and go on with, disclose it with putting through the prescription, not worrying what it's going to do to them."*

This apparent lack of exposure due to athletes not disclosing their status as such has led to pharmacists not being involved in sports. This lack of exposure may be false, during the interviews, all pharmacists (n=17) commented that they mostly interacted with recreational athletes, a portion (n=6) commented that they had interacted with elite and/or professional athletes in the past with this information being disclosed through the consultation process and all (n=17) participants had assisted school level athletes as ascertained from their appearance on interaction. Both these groups are subject to the WADA rules and regulations.

5.3.4.2. Pharmacists have a limited involvement with supplements which form a large part of an athlete's health regimen

A large portion of athletes health and medication needs appears to involve the use of supplements. From the interviews it is evident that pharmacists have been rather uninvolved with the dispensing, counselling, or advice related to supplement use. This lack of involvement appears to be associated

1 with a lack of knowledge of supplements and a lack of trust in the products due to the limited
2 regulation as previously mentioned.

3
4 When participants were asked about whether they felt confident in recommending supplements to
5 patients, the answers varied with only 6 of the participants stating that they would be confident in
6 recommending vitamin or mineral supplements, 5 of the participants claimed to not have sufficient
7 knowledge to recommend a product and 4 of the participants stated that they would refer the patient
8 to the consultants in the “health aisle”.

9
10 Quotes by the participants demonstrate the varied responses received on pharmacists’ confidence
11 levels and thus involvement with regards to supplement use. In the case of **P11** who expressed
12 confidence in recommending vitamins and minerals specifically whereas **P13** expressed minimal
13 confidence in their own knowledge and trust of these products resulting in the need to refer patients
14 to consultants who may not have the same skill set as a pharmacist.

15
16 **P11:** *“Not a lot. I know, I, I mostly know the stuff in vitamins. What you can maybe take as a*
17 *supplement with vitamins, but when it comes to your protein bulk and all of that, I I have no*
18 *idea what goes on there”*

19
20 **P13:** *“Yeah, I referred them to our consultants to help them with what they need because they*
21 *are more trained”*

22 23 **5.3.5. Summary**

24 The thematic analysis was conducted, and themes described above identified throughout the analysis.
25 The results of the analysis showed that pharmacist have a positive attitude towards sports pharmacy.
26 Recognizing the role that they could play in sports medicine specifically as the custodians of medicine
27 in controlling access to medicines that could be used for doping. As well as ensuring that athlete
28 patients receive the best, most relevant service possible as it relates to specific treatment plans and
29 counselling points. Pharmacists in this study have indicated that they are, however, insufficiently
30 equipped to manage the medication needs of athletes, particularly owing to limited access to
31 education opportunities in sports pharmacy and supplement use. Pharmacists do, however, express a
32 desire to become more educated on the matter to improve their ability to assist athletes. Furthermore,
33 the limited regulation of supplements and the lack of specific local guidelines increases pharmacists’
34 difficulty in assisting athlete. Pharmacists ability to contribute to the field of sports pharmacy has been

further hindered by various factors including the sporting industries lack of recognition of pharmacists ability to assist athletes, athletes lack of self-identification in pharmacy interaction that prevent pharmacists from providing correct and relevant advice and pharmacists lack of involvement with supplement use due to a lack of training resulting in the patient being referred to other consultants that do not necessarily have the same skill set as pharmacists but have a greater exposure to the supplement products.

5.4. Phase 2: Qualitative Phase Discussion

The participants of the interviews consisted of pharmacy personnel currently practicing in retail pharmacies who had successfully participated in and completed the phase 1 questionnaire. The main themes were identified from the interview transcripts, following which subthemes were determined to best display the findings. The themes and respective subthemes were determined based on commonalities expressed through the statements and quotes provided by all the participants. This section will discuss each theme and respective subthemes presented in the results.

5.4.1. Theme 1: Pharmacists recognised the potential role that they could play in sports pharmacy

The participants provided a positive response when approached with questions related to pharmacists' impact in sports medicine and the effect that they could have on athletes' health and medication usage. The participants responses highlighted two main contributions that were generally agreed on.

5.4.1.1. The role as the custodians of medicine to control access to medication as it related to anti-doping

When discussing the role of pharmacists, all of the participants felt that pharmacists had a role to play in sports medicine although this was expressed in differing extents. Most of the participants agreed that pharmacists as the custodians of medicine have a responsibility to ensure the correct control over medication that may be utilised for doping activities or influence potential doping violations. This duty corresponds with those as prescribed by the South African Pharmacy Council (SAPC), to ensure that medication is used correctly, safely, and for its intended purpose, while meeting the health needs of the patient (South African Pharmacy Council, 2010). This legal requirement allows pharmacists to decide to not dispense medication to a patient as it may be a potential risk to the patient, this is inclusive of the risk of doping whether this be accidental or intentional. These actions which aim to limit athletes' access to medication for illegitimate practice have been supported by leaders in the pharmacy industry, including the International Pharmaceutical Federation (FIP) whose guidelines

1 specify the need to be vigilant with regards to intent of medication use and if deemed appropriate, to
2 refuse the supply of medication in circumstances where medication could be used illegitimately for
3 performance enhancement (FIP, 2014; Hooper *et al.*, 2019; Piattoly, 2022; Rotich *et al.*, 2023). This
4 view, was however, not accepted by all pharmacists, with a small portion expressing that regardless of
5 pharmacists' legal authority to control the access to medication, athletes who are intent on doping,
6 including misuse of medication, will do so.

7 8 *5.4.1.2. The role of ensuring best practice with regards to treatment plans and counselling of athletes.*

9 A matter that all pharmacists agreed on was that, as with other patients, it is their duty to provide
10 patients with the best possible service in the form of the provision of the most appropriate medication,
11 treatment plan, and associated advice while taking into consideration that specific patients history and
12 circumstances. These actions fall in line with the scope of practice of a pharmacist as well as the
13 minimum standards for dispensing medication as specified by the SAPC (South African Pharmacy
14 Council, 2010) as well as the specifications made by the FIP guidelines related to the provision of
15 information to prevent doping in sport (FIP, 2014). In addition to abiding by the legal requirements of
16 pharmacy practice, pharmacy as a profession has shifted its main focus from pure pharmacology to a
17 more patient-centric approach allowing these specific roles to be more highly emphasised
18 (Abduelkarem, 2014; John, 2016).

19
20 Literature looking at the role that pharmacists could play in sports medicine and anti-doping
21 endeavours highlight similar potential roles with regards to the provision of medicine and associated
22 advice (FIP, 2014; Smith Morris *et al.*, 2018; Mottram and Stuart, 2021). This is with the aim of ensuring
23 safe and effective medication use, allowing the athlete to make informed decisions with regards to
24 medication and supplement use. This extends to the provision of relevant information on anti-doping
25 and the potential risks associated in doping (SAPC,2010; FIP, 2014; Smith Morris *et al.*, 2018; Mottram
26 and Stuart, 2021; Greenbaum *et al.*, 2023; Rotich *et al.*, 2023). Specific studies conducted in Canada
27 have effectively demonstrated how pharmacists exercising these recommended skills can have a
28 profound impact on athletes' medication use, ensuring safety and limiting the occurrence of potential
29 doping incidents (Smith Morris *et al.*, 2018). All the pharmacists recognised that this service is one that
30 they are skilled enough to provide with the correct resources. The additional impact that providing
31 this service could have for athletes as well as the sporting industry in ensuring safe and effective
32 medication use, accurate provision of information and effective anti-doping activities was also
33 highlighted and recognised by the participants.

5.4.2. Theme 2: Sports pharmacy related training and education

Sports pharmacy does not currently form part of the specific learning outcome for Bachelor of Pharmacy qualification. Sports pharmacy and the assistance of athletes as members of a special population group is applicable to actions specified in the exit level outcomes for the qualification. The specific outcomes include but are not limited to dispensing medication and ensuring optimal care, providing pharmaceutical care, initiating treatment, and the promotion of public health (SAQA, 2018). Based on applicability to the various sectors of pharmacy practice it would be relevant and valuable to include sports pharmacy in the educational requirements for undergraduate pharmacists as well as in the form of continued professional development.

Participants have expressed their enthusiasm at being more involved in the speciality of sports pharmacy and anti-doping efforts, their involvement has however been hindered by a lack of confidence associated with a limited knowledge of the field and what it necessitates. All of the participants involved agreed that they are currently insufficiently equipped to manage athletes' medication needs and, in order for pharmacists to advise athletes successfully and confidently on matters related to medication use additional information was required. This point has been mirrored in other studies which concluded that pharmacists limited knowledge, in sports pharmacy and supplement use, prevents them from advising athletes appropriately (Howard *et al.*, 2018).

This lack of knowledge appears to be associated with a lack of education opportunities with a large proportion of the participants having never received any form of training in sports medicine or anti-doping at a university level or as a form of Continued Professional Development (CPD). From the available literature it is evident that this issue is not limited to South Africa but is rather a global problem with pharmacists having limited (Laure and Kroebitzsch-Lejeune, 2000; Shibata *et al.*, 2017; Howard *et al.*, 2018) or no (Starzak *et al.*, 2016; Hailu *et al.*, 2021; Lementtila *et al.*, 2021) access to appropriate education opportunities in sports medicine or anti-doping (FIP, 2022). This lack of education opportunities has been associated with sports pharmacy not being fully established within a nation, thus does not form a significant part of standard educational requirements (Kawaguchi-Suzuki *et al.*, 2021; Greenbaum *et al.*, 2022). This is the case for South Africa, as sports medicine is not currently yet highlighted in the qualification standards as mentioned above (SAQA, 2018; SAPC, 2021).

The minimal emphasis that is currently placed on sports pharmacy in South Africa has affected the manner in which pharmacy students perceive the specialization in the event that it is taught at an undergraduate level. Pharmacists that had had the opportunity to become educated in sports

pharmacy at university expressed that little emphasis or effort was placed on the topic and was thus overlooked as a specialisation by pharmacy students (Hailu *et al.*, 2021). When the concept of sports pharmacy is overlooked in this manner it is apparent why pharmacists feel unequipped to manage cases related to athletes and sports medicine (Voravuth *et al.*, 2022) as well as why limited autodidacticism has occurred and the demand for additional formalised education is not emphasised. Despite this, all the participants displayed a positive response when presented with the prospects of having access to a CPD and/or a standardised local guideline on sports medicine and anti-doping. Indicating that it is possible if educational resources are made accessible to pharmacy personnel, they would undertake that learning opportunity to better improve their ability to assist athletes with safe and effective choices and thus be more involved in the specialisation of sports pharmacy (Shibata *et al.*, 2017; Dabrowska *et al.*, 2024).

The need for education of this nature should however not be limited to scheduled substances but rather include all pharmaceutical products that can be utilised by athletes to support their performance, specifically supplements. While supplement use is not inherently restricted to athletes, they are highly utilised by athletes as part of their training regimen (Knapik *et al.*, 2016; Martinez-Sanz *et al.*, 2017; Vlad *et al.*, 2018; Hooper *et al.*, 2019; Alonso and Fernandez-Garcia, 2020). Pharmacist knowledge of these products would thus contribute to the advice that they could provide to athletes. Due to limited regulation and knowledge of the products pharmacists' knowledge with regards to their use is limited (Howard *et al.*, 2018; Krishnan *et al.*, 2022).

5.4.3. Theme 3: Regulatory framework and guideline development

Further improvement of regulations pertaining to supplements, as these effects athletes, with curbs pharmacists concerns around the use of these products. While additional development of credible, up to date guidelines on sports pharmacy will support pharmacy practice and help inform recommendations given to athletes.

5.4.3.1. The limited regulation of supplements has led to pharmacists being concerned and lacking knowledge on the use of these products

Supplements often form a significant part of an athletes training regimen to assist in their physical preparation to perform as required. In essence, supplement use is not prohibited in sport, however, there appears to be an inherent distrust of these products among pharmacists due to the limited regulation. All the participants when asked expressed concern related to supplement use due to the historic lack of regulation by SAHPRA despite the current move to regulate supplements as category D

1 medications in South Africa (SAHPRA, 2020). This prior lack of regulation has allowed products to be
2 sold off the shelf with undeclared components, which may be prohibited in sport, and inaccurate or
3 incomplete labels (Neilson, 2017; Naidoo *et al.*, 2018; Close *et al.*, 2022). The implication of this is that
4 it is impossible for pharmacists to determine what the products comprised of and what effect they
5 would elicit and whether the consumption could result in an anti-doping rule violation. The effect of
6 this is that pharmacists lack any accurate knowledge about how these products can be safely and
7 effectively be used in patients. There is thus a concern around recommending and advising on such. In
8 addition to the above concerns the current regulation allows for these products to be sold freely
9 without the need to consult with any pharmacy professional. The concern exists that these products
10 will be used incorrectly without advisement of any kind. This open access to these products limits
11 pharmacists' control over the access to these products and decreases the likelihood of the required
12 counselling occurring. These concerns have been proven justified with participants witnessing serious
13 adverse events related to supplement use as well as evidence of products being contaminated with
14 prohibited substances and providing inaccurate labelling (Gabriels and Lambert, 2013; Denham, 2017;
15 Martinez-Sanz *et al.*, 2017; Duiven *et al.*, 2021; Kozhuharov *et al.*, 2022).

16 17 5.4.3.2. *The lack of guidelines related to sports pharmacy*

18 In the current standing there are no South African specific clinical practice guidelines related to sports
19 pharmacy or medication use in athletes. The difficulty that this poses to pharmacy practice is that
20 pharmacists do not have an easily accessible, and reliable resource to refer to in the event that they
21 encounter an athlete. As mentioned by one of the participants in instances where there is a specific
22 condition that is not frequently dealt with guidelines exist to provide the necessary information to
23 assist in the management of the patient's health and medication needs. Such a resource would be
24 extremely valuable for pharmacists in a retail or hospital setting who may encounter athletes on
25 occasion. This sentiment was supported by all the participants when asked whether having access to
26 a comprehensive guideline would be valuable. Currently the regulations that exist on an international
27 front include the FIP guidelines on "The role of the pharmacist in the fight against doping in sport" this
28 however provides broad roles without specific details that would assist in case management (FIP,
29 2014). The benefit of adopting guidelines in South Africa has been shown to be beneficial in improving
30 the quality of care that the patient receives (Watkins *et al.*, 2015; Bronkhorst *et al.*, 2020). While clinical
31 practice guidelines do not replace correct and sufficient education their implementation supports
32 learning and offers credible information to inform actions taken by the pharmacist. This is particularly
33 relevant for less prominent topics where the pharmacist may not be as well informed or up to date
34 with recent recommendations and evidence-based case (Brown, 2015). This is the case for sports

pharmacy in community or hospital setting, as pharmacists may not encounter these patients as frequently as other population groups, guidelines thus provide a valuable resource for credible information.

5.4.4. Theme 4: Barriers in practice that limit pharmacists' involvement in sports pharmacy

There are additional factors that have been identified through the interview process that contribute to pharmacists' lack of involvement in sports pharmacy.

5.4.4.1. Pharmacists are not recognised for their ability to assist athletes in their medical needs.

Select participants expressed that they perceived there to be a barrier imposed by the sporting industry and athletes preventing pharmacists from being involved in sports medicine and anti-doping activities. The assumption is that athletes and other stakeholders in the sporting industry do not recognize the potential role that pharmacists could play in preventing doping and the benefit this could have on an athletes' performance, and the current formalised strategies for anti-doping practices and medication use in athletes do not accommodate for the presence of pharmacists and their skills. These responsibilities have been designated to other professions, including but not limited to coaches, managers, and other health care professional holding the title of athlete support personnel, who may not be as skilled to manage cases of medication use in athletes as a pharmacist. This concept has been supported by other studies who commented specifically on the lack of involvement of pharmacists in anti-doping endeavours. In these cases, the duties that align with the scope of practice of a pharmacist were allocated to coaches, managers, and in a few cases to team doctors (Laure and kriebitzsch-Lejeune, 2000; Backhouse and Mckenna, 2011; Starzak *et al.*, 2016; Juma *et al.*, 2022).

Furthermore, athletes' actions when presenting to a pharmacy may indicate a degree of mistrust in the pharmacists' abilities. Participants had experienced despite a willingness to be involved in advising athletes they were hindered by athlete limited disclosure of their status as such. Most participants indicated that they were not likely to interact with or encounter an elite athlete, with the majority their interactions being with recreational or school level athletes. These athletes still require specific advice. It appears as if elite athletes do not interact with pharmacists, this statement may be inaccurate as almost half of the participants noted that they had determined that a patient was an elite level athlete through history taking and consultations. This may indicate that athletes do not disclose their status as an athlete to pharmacists. This conclusion has been made in other studies where athletes despite having an increased medication consumption habits did not disclose their status as an athlete during consultations (Perry *et al.*, 2020). The result of this lack of disclosure prevents pharmacists from

1 providing the required patient specific advice that would benefit the athlete in their recovery or
2 performance. This has been expressed by athletes in the United States and Australia, doubting
3 pharmacists' knowledge on sports pharmacy related topics adding that the pharmacists' physical
4 appearance effected their perception on pharmacists' ability to provide sufficient and accurate advice
5 (Mitchell *et al.*, 2017; Perry *et al.*, 2020).

6 7 *5.4.4.2. Pharmacists have a limited involvement with supplements which form a large part of an* 8 *athletes' health regimen*

9 As stated previously, supplement use is increased in athletes to support their training regimen (Knapik
10 *et al.*, 2016; Martinez-Sanz *et al.*, 2017; Vlad *et al.*, 2018; Hooper *et al.*, 2019; Alonso and Fernandez-
11 Garcia, 2020). As nutraceuticals, or category D medication as classified by SAHPRA (SAHPRA, 2020),
12 these products are available in pharmacies. Pharmacists are, however, uninvolved with the provision
13 and counselling of these products. Some of the participants claim to have some knowledge around the
14 use of vitamins and minerals this does not extend to other supplements. Most of the participants
15 claiming to have no knowledge of supplements at all. The result of this lack of knowledge is that
16 pharmacists refer patients to the "health aisle" consultants and as such remain uninvolved in this
17 matter. The issue arises that these consultants may be less qualified in the use of pharmaceutical
18 products on a whole. With the problem of potential effects, reactions, interactions, and risks that the
19 consumption of supplements in specific patients or in combination with other medication may have.
20 Participants had reported that instances such as this had resulted in severe adverse events that could
21 have been prevented with appropriate counselling and use.

22
23 Participants reported that this lack of involvement aside from a lack of regulation is due to a lack of
24 knowledge and training in the use of these products whether this be at university or as a form of CPD.
25 This lack of knowledge and thus involvement with these products hinders pharmacist participation in
26 sports pharmacy due to athletes increased use of these products. Participants expressed that with an
27 increased knowledge of the safe and effective use of these products will allow them to be more
28 involved in the field of sports pharmacy (Howard *et al.*, 2017).

Chapter 6: Integration of Results – Phase 3

Summary

This chapter details the integration of the results obtained during the quantitative phase (Phase 1) and the qualitative phase (Phase 2). Integration occurred through a narrative approach highlighting themes present in both data sets and a joint display where correlating data is joined through visual means where appropriate.

6.1. Purpose of Phase 3

The quantitative and qualitative phases while providing valuable results do not necessarily give an extensive view of the knowledge, attitude, perceptions, and practices of pharmacists with regards to medication use in athletes. By integrating the results from both phases, it has allowed the researcher to draw well rounded, cohesive conclusions from the data collected.

6.2. Integration

On review of the quantitative and qualitative data together, correlations and common themes were identified. The integration of these results provides insight into the quantitative data and further extrapolation of the qualitative data.

6.2.1. The role of pharmacists in sports pharmacy

The qualitative data revealed that pharmacy personnel generally have a positive attitude and perception towards sports pharmacy and anti-doping practices. This thinking stemmed from an agreement of almost all of participants, that pharmacists could play a pertinent role in sports pharmacy and anti-doping practices. This was further highlighted in the quantitative data with almost all of participants agreeing that athletes should consult with a health care professional prior to using medicines or supplements. Furthermore, participants agreed that pharmacists are appropriately placed to assist athlete in making safe medicine choices and acting in a manner that upholds the purpose of drug-free sport. These results allude to pharmacists recognising their potential impact in sports pharmacy.

These results align with the participants responses as provided during the qualitative data collection. During the analysis of the responses, participants identified important roles within sports pharmacy and anti-doping practices where they could have a pertinent effect. These specific roles were associated with control over medicine as it relates to doping and the role of ensuring best practice

with regards to treating and counselling athletes as this related to the scope of practice of pharmacists (SAPC, 2010). The counselling and education of athletes with regards to safe medicine choices and the importance of anti-doping was a specific point of agreement during the quantitative data collection with most of participants agreeing on the relevance of these activities.

Across the two phases of data collection, it is evident that participants could see the potential for pharmacists to have a pertinent impact in sports pharmacy and anti-doping practices. This falls in line with current recommendations, literature, and research that has highlighted the future role of pharmacists within sports pharmacy and anti-doping globally (Abduelkarem, 2014; FIP, 2014; John, 2016; Smith-Morris *et al.*, 2018; Hooper *et al.*, 2019; Mottram and Stuart, 2021; Piattoly, 2022; Greenbaum *et al.*, 2023; Rotich *et al.*, 2023).

6.2.2. Knowledge and education of pharmacist

During the qualitative interview process participants expressed a lack of appropriate knowledge and training opportunities related to sports pharmacy and anti-doping in the country. With a desire to receive additional education to assist in their practice. The results collected in the quantitative phase provided a somewhat different perspective. Participants self-declared knowledge indicated a fair knowledge of sports pharmacy and anti-doping with the majority of participants reporting to understand the concept of sports pharmacy as well as reporting to be aware of the classes of prohibited substances. These results give the perception that pharmacists are more aware of sports pharmacy and anti-doping than was revealed during the interviews. The results of the participants tested knowledge during the quantitative phase aligns more with the perception made during the qualitative phase. Participants scored very poorly when asked to classify active ingredients by their prohibited status as per the WADA regulations.

The quantitative data reported a higher level of education received than expressed during the qualitative interviews. With over half of participants reporting to have received training in sports pharmacy at a university level or having sought out training outside of university. These results are far higher than the interviews suggest as only 2 participants had received training at university and none had encountered training opportunities thereafter. Interviewees that alluded to despite having received this training it was overlooked with little emphasis placed on the relevance in pharmacy. This may provide some insight as to the discrepancy between the reported levels of education and tested knowledge. Limited education and poor knowledge among pharmacists with regards to sports pharmacy and anti-doping appears in literature and research globally (Laure and Kroebitzsch-Lejeune,

2000; Starzak *et al.*, 2016; Shibata *et al.*, 2017; Howard *et al.*, 2018; Hailu *et al.*, 2021; Lementtila *et al.*, 2021). It is however noted that limited education may be associated with sports pharmacy not being established in a country which may be the case in the South African context (Kawaguchi-Suzuki *et al.*, 2021; Greenbaum *et al.*, 2022).

An opinion than appears consistent between the quantitative and qualitative phase is participants desire for additional education, recognising the benefit that this could have on their practice. The majority of participants in the quantitative phase agreed that additional training in sports medicine and drug-free sport would be beneficial for patient counselling. This was mirrored in the qualitative phase with all of the participants stating that additional training, in the form of continued professional development or standardised guidelines, would be beneficial in managing cases related to sports pharmacy. This desire for additional education has been expressed in literature and research associated with sports pharmacy (Shibata *et al.*, 2017; Hailu *et al.*, 2021; Voravuth *et al.*, 2022; Dabrowska *et al.*, 2024). Correlations did indicate that those with a higher level of professional education did have a better understanding of and knowledge related to sports medicine, demonstrating the potential benefit of additional training.

The consequence of this lack of education and knowledge mentioned has resulted in a lack of confidence as expressed throughout the qualitative interviews by participants and thus involvement in sports pharmacy. This was demonstrated during the quantitative data when participants expressed their confidence levels is different aspects related to sports medicine and athlete counselling. Only approximately half of participants felt confident in counselling on safe medicine choices and supplement use. Very few participants expressed having confidence in counselling on anti-doping specific topics. This lack of confidence will further prevent pharmacists from engaging with athletes or the sports industry, limiting any future involvement that may potentially occur.

6.2.3. Guidelines and Regulatory frameworks

Contributors to this lack of education and involvement was associated with additional factors. The limited availability of guidelines to assist in teaching and practice while not a point of consideration during the quantitative phase, this was highlighted heavily during the qualitative phase with participants expressing a desire for standardised guidelines related to sports pharmacy. An additional barrier identified limited was associated to regulation of supplement products resulting in limited knowledge of these products. During the qualitative interviews participants expressed concern over supplement regulation and the ability to safely advise on these products as their knowledge was

1 limited due to the available trusted information. The quantitative data indicated less concern over this
2 issue however over half of the participants did indicate a concern over the accuracy of labels on
3 unscheduled products. A lack of accurate information of these products due to limited regulation thus
4 effects pharmacists' ability to become educated and involved in sports pharmacy. This is in line with
5 literature and research conducted globally (Gabriels and Lambert, 2013; Denham, 2017; Martinez-Sanz
6 *et al.*, 2017; Duiven *et al.*, 2021; Kozhuharov *et al.*, 2022). Of participants during the quantitative phase
7 did however indicate an awareness that vitamins and other supplements have the potential to be
8 prohibited in sport. This may be an indication of pharmacists' awareness of the safety concerns related
9 to supplement consumption in athletes.

11 **6.2.4. Lack of pharmacists' involvement**

12 When noting pharmacists' involvement in the field of sports pharmacy, participants reported to have
13 little overall involvement in sports pharmacy or the assistance of athletes. This was made evident in
14 the quantitative phase highlighting participants previous interactions with athletes being minimal.
15 Participants reported to have never or only on occasion dispensed medicine to an athlete. This is
16 further highlighted when looking at participants likelihood to interact with anti-doping resources such
17 as the prohibited list, which the majority of participants had never accessed. This gives the impression
18 that athletes do not often interact or seek advice from pharmacists frequently. A similar response was
19 obtained during the qualitative interviews with most participants reporting to not interact with
20 athletes. This however was proven to be misleading owing to not a lack of athletes' presence but rather
21 a lack of athlete identification which has been associated in other literature with limited trust in
22 pharmacists' abilities (Mitchell *et al.*, 2017; Perry *et al.*, 2020). An additional barrier noted identified
23 that male participants had more interactions and involvement with athletes and anti-doping than
24 other genders. This appears to result from the bias that exists in sport that has historically favoured
25 males. This potentially implies that athletes would view male pharmacy personnel as more
26 knowledgeable on topics related to sport than other genders and thus consult with them more
27 frequently (O' Reilly *et al.*, 2019; Mattson *et al.*, 2022).

29 The qualitative interviews commented on the sporting industries lack of recognition of the potential
30 impact that pharmacists can have in sport. These roles which align with the scope of practice of a
31 pharmacist has been designated to other professions excluding pharmacists from being involved. This
32 has affected pharmacists' willingness to become involved as they assume elite athletes will be
33 attended to by another health care professional. This was noted during the quantitative phase results
34 with most of participants agreeing that all high-level athletes had specialised a medical team or doctor

1 attending to them, negating the need for a pharmacist (Laure and Kriebitzsch-Lejeune, 2000;
2 Backhouse and Mckenna, 2011; Starzak *et al.*, 2016; Juma *et al.*, 2022).

3

4

Chapter 7: Strengths, Limitations, Conclusions and Recommendations

7.1. Strengths and Limitations

7.1.1. Strengths

To the researcher's knowledge this is the first study exploring the knowledge, attitude, perceptions, and practices of pharmacists with regards to medication use in athletes in South Africa. Minimal research on the topic of sports pharmacy in South Africa has been conducted. This study provides current data on pharmacists' knowledge, attitude, perceptions, and practices related to sports pharmacy. Further the collection of quantitative and qualitative data strengthens the findings. Conclusions and assumptions in the study were made from results obtained through the data collection process and supported by relevant and corresponding literature. Peer examination ensured scrutiny of the methods by experts in quantitative and qualitative research. This topic is relevant in the South African and international context with positive doping cases occurring in high profile elite level athletes globally within the last year indicating a need for additional intervention.

7.1.2. Limitations

The study faced several limitations. Limited previous research on the topic without access to previous validated data collection tools on the subject resulted in the need to develop and validate appropriate data collection tools that would answer the aims and objectives proposed by the research intent. The quantitative data collection was limited to Gauteng due to the convenience sampling method utilised. This sampling method therefore excludes pharmacy personnel from outside of Gauteng the data collected may not be representative of pharmacy personnel outside of the province. This affects the transferability of the data to other provinces in South Africa. The qualitative data collection faced similar limitations with data collected exclusively from pharmacists based in retail pharmacies in Johannesburg and surrounding areas. The data is thus only representative of pharmacists in Johannesburg and may not be transferable to the remainder of Gauteng and/or South Africa. Participation in qualitative data collection elected to participate and were required to consent to participation. The implication of this is that participants that had an interest in the topic of sports pharmacy or anti-doping were more inclined to participate meaning that the results collected through the qualitative phase may not be representative of the general opinions of pharmacist in Gauteng, South Africa, limiting the transferability of the data.

7.2. Conclusions and Future Recommendations

7.2.1. Conclusions

This study aimed to explore the knowledge, attitude, perceptions, and practices of pharmacists with regards to doping and medication use in sport. This was achieved by establishing pharmacy personnel's self-declared knowledge, attitudes, perceptions, and practice as well as their tested knowledge using a validated survey, followed by a set of in-depth semi-structured interviews with pharmacists to obtain more specific information related to the aim of the study.

The findings from this research were able to provide insight into pharmacy personnel's opinions related to medication use in athletes and anti-doping.

The results from the quantitative phase revealed that pharmacists have a positive perception related to sports pharmacy and anti-doping activities their comparative practices are limited, with participants reporting to have minimal or no interaction with athletes or sports pharmacy related cases. Participants had also reported to varied confidence levels related to counselling athletes on several sports medicine related topics. Most participants reported feeling confident in counselling on safe medicine choices, however this was still marginal. Minimal participants reported confidence in other sectors including supplement use, anti-doping testing procedures, or doping control processes. The confidence levels can be associated with a limited knowledge in the field. Participants self-declared knowledge in sports pharmacy is fair with participants reporting to be aware of sports pharmacy, WADA, and the classes of prohibited substances. This however is not reflected when examining participants' tested knowledge score, which indicated that pharmacy personnel's actual knowledge on the classes of prohibited substances is low.

The results from the qualitative phase substantiated those obtained in the quantitative as well as elaborating on the finer details behind these results and highlighting various barriers that have hindered their involvement in sports pharmacy. Pharmacists agreed that they had the potential to make an impact in sports pharmacy specifically with regards to ensuring safe and effective medication use. The specific roles identified related to preventing the misuse of medication for the purposes of doping in sport as well as the provision of advice and appropriate treatment plans for athletes to support their performance. Despite the positive outlook towards pharmacists' involvement in sport there were specific barriers identified that hinder pharmacists' involvement in the field. Those identified included a limited availability of appropriate education leading to diminished confidence, the lack of appropriate practice guidelines and sufficient regulation of commonly used supplements as

well as the sporting industry's lack of acknowledgement of pharmacists' potential benefit, and limited involvement in supplements counselling.

The results obtained from the two phases of research present with complementary results highlighting pharmacists positive outlook on sports pharmacy and the potential impact that could be made. However their abilities to do such is affected by various factors, the main factor that seems to contribute to this lack of involvement is limited educational opportunities resulting in a lack of specific knowledge on the subject.

7.2.2. Future Recommendations

Based on the study conducted, the following recommendations can be made:

- The addition of sports pharmacy to undergraduate curriculum as it pertains to learning outcomes as set by the South African Qualification Authority. In addition, the importance and relevance of pharmacists' involvement in sports pharmacy should be highlighted to undergraduate students to foster further interest in the field.
- Additional education opportunities for qualified pharmacist should be instituted through the form of continued professional development courses or accredited certifications about sports pharmacy. Allowing for pharmacists to be and remain aware of the field and what it comprises and highlight specific actions that should be taken in cases related to sports pharmacy.
- Encourage additional education on supplement products as nutraceuticals as well as the way these products can be used to support health in patients. With attention placed on athlete consumption due to the increased use more so than other patients.
- To develop credible up to date practice guidelines related to sports pharmacy. To support pharmacy practice and the implementation of sports pharmacy in community or institutional pharmacies. Access to credible resources allows pharmacist to have a reference when advising on and managing cases related to sports pharmacy ensuring that the best possible advice is given to the patient.
- Support the improved regulation of supplement products to ensure safety and efficacy of consumption.

- 1 • With improved education opportunities, reliable resources, and reliable products, pharmacists
2 will be better equipped to assist athletes in their medication needs. This increased ability to
3 assist in sports pharmacy allows pharmacists to foster sound medication use and anti-doping
4 practices that allows them to have a greater involvement in the sporting industry and influence
5 the manner in which pharmaceuticals are used in a sporting environment.
6
- 7 • Expand on this research conducted taking into consideration other authorised dispensers and
8 their knowledge, attitude, perceptions and practices related to medication use in athletes

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1 Appendices

2 *Appendix 1: Ethics Clearance Certificate*



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2 **Appendix 1 continued: Change of Study Title**

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Appendix 2: Abstract submitted for consideration for poster presentation at the 82nd FIP World Congress of Pharmacy and Pharmaceutical Science

Perceptions related to Doping, and Athletes use of Medication and Supplements: A qualitative study of Pharmacists in Gauteng

Ms Nerine du Plessis¹, Ms. Zelna Booth¹, Prof Demitri Constantinou², Mrs Rubina Shaikh¹

¹University of the Witwatersrand, Faculty of Health Sciences, Department of Pharmacy and Pharmacology, South Africa

²University of the Witwatersrand, Department of Exercise Science and Sports Medicine, South Africa

Background: Sports medicine has become a prominent field of specialisation in the recent years, with growing interest in appropriate medicine use in athletes. However, pharmacists appear to have little involvement in sports medicine. Pharmacists are optimally skilled to manage medication specific needs of patients and should play a more pertinent role in managing the use of medication in athletes. Efforts should consider the unique physiology and lifestyle of an athlete and align with World Anti-Doping Agency restrictions. Limited literature reports on the South African pharmacists' perception or interest in this field, and the hindrances to potential involvement in sports medicine.

Purpose: The aim of this study was to understand pharmacists' perceptions related to doping in sport and medication and supplement use in athletes, in order to better inform future actions and guidelines in South Africa.

Methods: A qualitative research methodology was utilised as approved by the University of the Witwatersrand HREC. Information was collected through interviews conducted with pharmacists, currently practicing in community pharmacies, in Gauteng with the assistance of a semi-structured interview guide. Meaningful data was extracted from the responses through thematic analysis. The themes identified included 1) the role of the pharmacist in sport, as it relates to anti-doping, and ensuring best treatment practice amongst athletes, 2) the presence and impact of appropriate education and knowledge in sport 3) the effect of the current regulatory framework on supplement use, and the need for additional appropriate guidelines focused on pharmacists role in sports medicine 4) barriers that have limited pharmacists' involvement in the field, include the lack of recognition of a pharmacists' potential contribution by the sports industry, as well as the pharmacist's limited involvement in supplement usage.

Results: Seventeen pharmacists participated in the study. Pharmacists have awareness of, and a positive perception towards the field of sports medicine, and agree that pharmacists can have an impact on anti-doping efforts and appropriate medication use, specific limitations have hindered their involvement thus far. The most significant limiting factor to pharmacist involvement in sports medicine identified was that of pharmacists' limited knowledge, resulting in poor counselling and assistance on issues related to sports medicine. Additional limitations that have a notable impact were related to the regulation of supplements causing decreased involvement by pharmacists as well as the outward perception of pharmacists' potential impact. The positive response to the proposed implementation of specific local guidelines or courses related to sports medicine, provides an indication of pharmacists' willingness, and interest to become better educated in the field, leading to increased confidence and thus involvement.

Conclusion: The findings of this research confirmed pharmacist potential impact in sports medicine while alluding to specific problems that have hindered the involvement of pharmacists in sports medicine. With increased educational opportunities, the inclusion of appropriate resources, and efforts to include pharmacists in matters related to medication use in athletes, specifically in anti-doping, pharmacists can have a major impact on the future of sports medicine.

Topic area: Track 1 – Equitable quality health. Theme: Pharmaceutical practice (Health and medicine information).

Appendix 3: Pharmacy Personnel Survey



Department of Pharmacy and Pharmacology

Faculty of Health Sciences | 7 York Road Parktown, 2193 | Johannesburg | South Africa | Tel: +27 11 717 2552

Pharmacy personnel Questionnaire

Research Topic: Exploring the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and Medication Use in Sport

Section A: Demographics	
Age:	
20-29 Years	
30-39 Years	
40-49 Years	
50-59 years	
60 < Years	
Gender	
Male	
Female	
Other	
I do not wish to disclose	
Health Care Sector	
Private	
Public	
Both	
Pharmacy Sector	
Retail	
Hospital	
Highest qualification	

Diploma	
BPharm	
Master	
PhD	
Other (Please specify):	
Professional affiliation	
Responsible pharmacist	
Pharmacist	
Locum pharmacist	
Clinical pharmacist	
Community service pharmacist	
Pharmacy intern	
Pharmacy assistant	
Pharmacy technician	
Other (Please specify):	
Duration of work experience in total	
Less than 5 years	
6-10 Years	
11-15 years	
16-20 years	
More than 20 years	

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Section B: Knowledge		
	Yes	No
I understand the term sports pharmacy		
Drug free Sport/ Sports medicine was covered during your professional training		
I have proactively sought out other training programs or courses to equip myself with sports pharmacy skills		
I know about The World Anti-Doping Agency (WADA)		
I know the WADA regulations related to medication use by athletes		
I know where to obtain the WADA regulations		
I know where to obtain the WADA prohibited list		
I am aware of the classes of prohibited substances in sport		
I am aware of Therapeutic Use Exemption (TUE)		
I am aware of the process for TUE application		
There are WADA regulations that apply to me as a pharmacist		
I know of the South African Institute of Drug Free Sport (SAIDS)		
I am aware of the FIP (International Pharmaceutical Federation) guidelines on the role of the pharmacist in the fight against doping in sport		
The following level of athletes are required to comply with the drug free sport regulations according to WADA and SAIDS		

Recreational level		
School level		
Club level		
University level		
Provincial level		
National level		
I know the anti-doping control processes and testing procedures		
Vitamins and other supplements can be prohibited in sport		
Vitamins and supplements are currently regulated by SAHPRA		
The labels on unscheduled products (vitamins and supplements) are accurate		

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Section C: Attitude and Perceptions					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Pharmacists can play a pertinent role in the healthcare of athletes (Individually or as part of a Medical team)					
All high-level athletes have a specialised medical team or doctor					
Training in drug free sport /Sports pharmacy is beneficial for patient counselling					
Pharmacists are appropriately placed to assist athletes in learning about drug free sport and safe medicine choices					
It is relevant or necessary to ask whether a patient is an athlete when assisting them in the pharmacy					
Pharmacists should be held accountable for correctly or incorrectly advising athletes on doping in sport					
I have encountered this level of athlete during day-to-day practice					
Recreational level					
School level					
Club level					
University level					
Provincial level					
National level					
This level of athlete would benefit the most from your assistance as a pharmacist					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Recreational level					
School level					
Club level					
University level					

Provincial level					
National level					
Athletes dope intentionally					
Athletes dope unintentionally					
Is it important to educate athletes on medicine choices to prevent accidental doping					
Readily available vitamins and supplements are safe for athletes to consume					
Natural or alternative (Complementary Medicines) vitamins and supplements are safer for athletes than conventional supplements					
I trust what is written on labels or packaging inserts of readily available supplements					
Athletes should consult health care professionals (Pharmacists, GPs, Dieticians, etc) prior to using supplements or medication					
Pharmacists should consult with other health care professionals (team doctor, physio, biokinetics, etc) when they require additional information before assisting an athlete in the pharmacy					

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Section D: Standard Pharmacist Practice			
	Never	Sometimes	Always
Do you ever access the WADA regulations?			
Do you ever access the WADA prohibited list?			
How often have you asked whether a patient is an athlete when assisting them?			
How often has an athlete approached you, as a pharmacist, and told you that they are an athlete during a consultation?			
How often have you knowingly dispensed medication to an athlete?			
Has an athlete approached you for assistance with prohibited substances?			
If so, what kind of products do they seek?			
Stimulants			
Anabolic steroids			
Weight loss			
Diuretics			
Other			
How often have you assisted an athlete by providing advice with regards to prohibited substances?			
How often have you assisted an athlete, as a pharmacist, on a long term/ ongoing basis with their medical needs?			

How often do athletes inform you that they are competing, and about the medication or supplements that they are making use of?					
Can you confidently counsel an athlete on:					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Safe medicine choices					
Doping control processes					
Anti-doping Testing procedures					
Therapeutic Use Exemption (TUE's)					
Supplement use					
Which of the below resource documents would you consult when assisting an athlete?					
	Never		Sometimes		Always
MIMS					
South African Medicines Formulary					
Daily Drug Use					
Standard Treatment Guidelines					
Martindale					
WADA prohibited list					
Drug Free Sport South Africa Website					
Other (Please specify)					
What supplements do you commonly recommend to athletes?	I am confident that these products comply with the WADA regulations				
Product	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

I would not recommend any supplements to an athlete. If yes, why?					

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Classify the drugs below as per their doping status without consulting any resources (intuitively)			
Drug	Permitted	Prohibited in competition	Prohibited at all times
Ibuprofen			
Inhaled salbutamol			
Prednisone			
Insulin			
Hydrochlorothiazide			
Verapamil			
Pseudoephedrine			
Tetrahydrocannabinol			
Oxycodone			
Methylphenidate			
Nandrolone			
Ciprofloxacin			
Tamoxifen			

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Phase 2

If you are interested in participating in phase 2 of this study, an in-depth interview, please provide a suitable email address below.

Please note that the provided email address will not be linked to your survey responses which will remain kept completely anonymous.

It will only be used to obtain consent and schedule a virtual meeting to conduct the interview

Name	Email

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2 For further queries please feel free to get in touch with us using the following contact details:

	Name	Contact Number	Email Address
Supervisor	Rubina Shaikh	011 717 2578	Rubina.Shaikh@wits.ac.za
Master's Student	Nerine du Plessis	071 400 9923	1662927@students.wits.ac.za

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Department of Pharmacy and Pharmacology

Faculty of Health Sciences | 7 York Road Parktown, 2193 | Johannesburg | South Africa | Tel: +27 11 717 2552

Participation Information Sheet

Research Topic: Exploring the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and Medication Use in Sports

Good day,

The researcher would like to invite you to participate in this research study. Before deciding to participate in this study, please take the time to read and understand the particulars of this study. Feel free to ask any questions if anything is unclear or if you would like more information with regards to the above topic.

WHO AM I AND WHAT IS THIS STUDY ABOUT?

I am Nerine du Plessis, I am currently doing a Master of Pharmacy degree at the University of Witwatersrand, Johannesburg. The aim of this study is to explore the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and Medication Use in Sport. Participation in the survey will be voluntary. Refusal to participate will not result in one incurring a penalty or loss of any kind.

WHAT WILL TAKING PART IN THIS STUDY INVOLVE?

On clicking on the link implied consent is given for the researcher to use and publish all responses obtained, all responses will be kept anonymous throughout the study. Participants will be asked to complete a survey that should not exceed 20 minutes.

If you as the participant agrees and provides the relevant contact information the researcher will contact you to participate in the second phase of this study, where a follow up in depth interview will be conducted. All contact information provided will be de-linked from the

survey responses prior to analysis to maintain the participants confidentiality and keep all survey responses anonymous.

WHAT ARE THE RISKS OF PARTICIPATING IN THIS STUDY?

There are no risks for participating in this study.

WHAT ARE THE ETHICAL CONSIDERATIONS?

Throughout the study, ethical considerations will be very important to the researcher. Because this study involves human participation, approval from the WITS Research Ethics Committee has been sought by the researcher. The principal function of this committee is to safeguard the rights and dignity of all human rights who participate in research projects as well as the integrity of the research. If you have any concerns with how the study will be conducted, please contact the following individuals:

Wits HREC contact	Committee Chairperson	Committee Secretariat:
Name:	Clement Penny	Zanele Ndlovu Rhulani Mukansi
Tel:	011 717 2301	011 717 2301 011 717 1234
Email:	Clement.Penny@wits.ac.za	Zanele.Ndlovu@wits.ac.za Rhulani.Mukansi@wits.ac.za

Privacy and confidentiality will be maintained throughout the study meaning that all names and any identifiable information will not be included in the write-up. All responses captured will be sorted in a folder on a computer that is password protected. Only the researcher and the supervisors will have access to this information.

Any contact information that is provided linked to the second phase of this study will not be linked to your survey responses which will remain anonymous.

WHAT ARE THE BENEFITS OF PARTICIPATING IN THIS STUDY?

There are no direct benefits to participating in this study, it will however assist in the current understanding of sports pharmacy and supplement use.

For any further information regarding this study, please contact the research team:

	Researcher	Supervisor
Name:	Nerine du Plessis	Rubina Shaikh
Tel:	071 400 9923	011 717 2369
Email:	1662927@students.wits.ac.za	Rubina.shaikh@wits.ac.za

Thank you for taking the time to consider participating.

Kind Regards,

Nerine du Plessis

M. Pharm

1662927



Department of Pharmacy and Pharmacology

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Participation Information Sheet

Research Topic: Exploring the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and medication Use in Sport

Good day,

The researcher would like to invite you to participate in this research study. Before deciding to participate in this study, please take the time to read and understand the particulars of this study. Feel free to ask any questions if anything is unclear or if you would like more information with regards to the above topic.

WHO AM I AND WHAT IS THIS STUDY ABOUT?

I am Nerine du Plessis, I am currently doing a Master of Pharmacy degree at the University of Witwatersrand, Johannesburg. The aim of this study is to explore the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and Medication Use in Sport. Participation in the interview will be entirely voluntary. Refusal to participate will not result in one incurring a penalty or loss of any kind.

WHAT WILL TAKING PART IN THIS STUDY INVOLVE?

If participants agree to partake in this study, they will be requested to undertake an online interview with the researcher. The interview should not last longer than 45 minutes, in which the researcher will ask the participant questions related to the research topic. The interview will be recorded and transcribed into Microsoft word to ensure accuracy with regards to responses.

WHAT ARE THE RISKS OF PARTICIPATING IN THIS STUDY?

There are no other risks for participating in this study.

WHAT ARE THE ETHICAL CONSIDERATIONS?

Throughout the study, ethical considerations will be very important to the researcher. Because this study involves human participation, approval from the WITS Research Ethics Committee has been sought by the researcher. The principal function of this committee is to safeguard the rights and dignity of all human rights who participate in research projects as well as the integrity of the research. If you have any concerns with how the study will be conducted, please contact the following individuals:

Wits HREC contact	Committee Chairperson	Committee Secretariat:
Name:	Clement Penny	Zanele Ndlovu Rhulani Mukansi
Tel:	011 717 2301	011 717 2301 011 717 1234
Email:	Clement.Penny@wits.ac.za	Zanele.Ndlovu@wits.ac.za Rhulani.Mukansi@wits.ac.za

Privacy and confidentiality will be maintained throughout the study meaning that all names and any identifiable information will not be included in the write-up. All recordings and responses captured will be sorted in a folder on a computer that is password protected. Only the researcher and the supervisors will have access to this information.

WHAT ARE THE BENEFITS OF PARTICIPATING IN THIS STUDY?

There are no direct benefits to participating in this study, it will however assist in the current understanding of sports pharmacy and supplement use.

For any further information regarding this study, please contact the research team:

	Researcher	Supervisor
Name:	Nerine du Plessis	Rubina Shaikh
Tel:	071 400 9923	011 717 2369
Email:	1662927@students.wits.ac.za	Rubina.shaikh@wits.ac.za

Thank you for taking the time to consider participating.

Kind Regards,
Nerine du Plessis
M. Pharm, 1662927

Appendix 6: Interview Consent Form



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Faculty of Health Sciences | 7 York Road Parktown, 2193 | Johannesburg | South Africa | Tel: +27 11 717 2552

Participant Consent Form:

Research Topic: Exploring the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and Medication Use in Sports

I, _____, hereby confirm that I have accurately understood the information pertaining to the research that I am participating in, that has been provided by the researcher. I understand the following:

- I understand all that is required for this study.
- I will participate in this study towards the researcher's master's project.
- I confirm that I have given consent to participate freely and willingly.
- I understand that I may withdraw my consent and permission to participate at any time during the study.

Participant Signature: _____

Date: _____

For further queries please feel free to get in touch with us using the following contact details:

	Name	Contact Number	Email Address
Supervisor	Rubina Shaikh	011 717 2578	Rubina.Shaikh@wits.ac.za
Master's Student	Nerine du Plessis	071 400 9923	1662927@students.wits.ac.za



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Participant Consent Form: Audio Recording of Interviews

Research Topic: Exploring the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and Medication Use in Sports

I, _____ hereby confirm that I have read and understood the information sheet provided and I understand the following:

- I give consent to be voice recorded during the interview.
- I have given consent willingly and may withdraw from this study at any time without any negative consequences.
- I may mention if there are any answers I would not like to be recorded or used in the study.
- My responses will be kept confidential i.e. only the researcher and her supervisor will have access to my responses.
- Anonymity will be maintained in the study write up/results by the use of pseudonyms.
- I give the researcher permission to use the recordings for her research project.
- I give the researcher permission to use direct quotes from the recording.

Yours faithfully,

Participant signature: _____

Date: _____

For further queries please feel free to get in touch with us using the following contact details:

	Name	Contact Number	Email Address
Supervisor	Rubina Shaikh	011 717 2578	Rubina.Shaikh@wits.ac.za
Master's Student	Nerine du Plessis	071 400 9923	1662927@students.wits.ac.za

1 Appendix 8: Interview Demographic Questions



4 Department of Pharmacy and Pharmacology

5 Faculty of Health Sciences I 7 York Road Parktown, 2193 I Johannesburg I South Africa I Tel: +27 11 717 2552

7 Pharmacist Interview Demographic Questionnaire

8 **Research Topic: Exploring the Knowledge, Attitudes, Perceptions and Practices of**
 9 **Pharmacy Personnel with regards to Doping and Medication Use in Sport**

Demographics	
Age:	
Gender	
Male	
Female	
Other (Please specify)	
Health Care Sector	
Private	
Public	
Pharmacy Sector	
Retail	
Hospital	
Highest qualification _____	
Professional affiliation	
Responsible pharmacist	
Locum pharmacist	
Clinical pharmacist	
Community service pharmacist	
Pharmacy intern	
Pharmacy assistant	
Pharmacy technician	

Duration of tenure	
Less than 5 years	
6-10 Years	
11-15 years	
16-20 years	
More than 20 years	

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Pharmacist Interview Guide

Research Topic: Exploring the Knowledge, Attitudes, Perceptions and Practices of Pharmacy Personnel with regards to Doping and Medication Use in Sport

Introduction:

Good morning/Afternoon, I am Nerine, it is lovely to meet you, I hope you are well.

Thank you for taking the time to talk with me today.

My aim for this study is to explore the knowledge, attitudes, perceptions and practices of Pharmacy Personnel with regards to Doping and Medication use in Sport. The purpose of this interview is to get a more in-depth understanding of the way that pharmacists answered the survey questions in phase one and elaborate on the answers received. Participation in this interview will require you to answer a few questions, please note that this interview is completely voluntarily, and you are free to withdraw participation at any time or refrain from answering any question you are uncomfortable with. Please note that this interview will be audio recorded and your answers transcribed to ensure accuracy, this will however remain completely confidential throughout the study and write up with access to limited to only myself and my supervisor. The interview should last roughly 45 minutes.

Please do not hesitate at any point to ask questions you may have.

The following questions will act as a guide during the interview while allowing the participant and the researcher to deviate to allow for further probing and follow-up questions and remarks where necessary.

1. What do you understand about the concept of sports pharmacy?
2. What do you know about the World Anti-Doping Agency and their mandate?
3. As a pharmacist how do you think you could contribute to achieving WADA's mandate?

4. As a pharmacist what do you think you can contribute to athlete's medical needs?
5. Which level of athlete do you think you encounter on a day-to-day basis?
6. What do you know about sports supplements?
7. How confident are you in recommending a sports supplement?
8. Are you at all concerned about the safety of the supplements available and why?
9. What is your process when an athlete approaches you with a medical need?
10. What resources do you utilise when considering athlete's needs?
11. Do you think that pharmacists are equipped to attend to athlete's medical needs and if so, why?
12. What training have you had in sports pharmacy (University as well as CPD)?
13. Do you think pharmacists are underutilised in sports and if so, why?

Conclusions:

Those are all the questions I have for you; do you have any questions for me before we finish? Thank you very much for participating in this phase of my research study, I really appreciate your contribution. Please do not hesitate to contact myself or my supervisor using the contact information on the participant information sheet for any other questions.

Thank you, and I hope you have a lovely day further.

1 *Appendix 10: Turnitin Report*

