

**SELF-REPORTED PREVALENCE, TYPE, SEVERITY AND
MANAGEMENT OF MUSCULOSKELETAL INJURIES AMONG
HIGH SCHOOL RUGBY PLAYERS IN THE NELSON MANDELA
BAY METROPOLE.**

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DECLARATION

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April 2019

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ABSTRACT

Background: The number of rugby players and match activities has increased and heightened the risk of injuries since the introduction of Rugby's professional status by the International Board of Rugby in 1995. Several types of cohort studies were done on the epidemiology of rugby injuries, including studies in the adolescent population, as the adolescent player aspires to play professionally. Fewer studies involved a self-reported questionnaire.

Aim of study: This study aimed to determine the self-reported prevalence, type and severity of rugby-related musculoskeletal injuries, as well as the treatment of the relevant injuries, if any, as reported by high school rugby players attending top rugby schools in the Nelson Mandela Bay Metropole (NMBM), Eastern Cape situated in South Africa, using a specifically designed questionnaire.

Methods: A self-reported questionnaire to determine the prevalence, type, severity and management of adolescent rugby injuries in the NMBM was developed in this study. The questionnaire was administered to adolescent rugby players at top rugby schools in the NMBM area. The questionnaire was completed electronically via SurveyMonkey® or in paper format to collect information related to the prevalence, type, severity and management of injuries in the adolescent rugby player was collected.

Results: A detailed self-reported questionnaire was developed using previous questionnaires. Focus was placed on the clarification of terms so that adolescents would understand what was being asked. Findings regarding the prevalence of injuries among this group found that head and face injuries, including concussions, shoulder and knee injuries were mostly reported. Similar findings have been found in other national and international studies. Most of the injuries were described as soft tissue-injuries and were predominant muscular injuries. Overall, most of the

injuries were described as mild. The respondents indicated physiotherapy as the treatment option most utilised, whereas other studies identified first aiders, medication and other medical treatment as the chief management options. However, the response of 41.9% could not be considered representative of the chosen population and the results have to be viewed with caution.

Conclusion: The prevalence of injuries among high school rugby players attending top rugby schools in the NMBM area of South Africa was found to be on par with other studies. A specifically-developed self-reported questionnaire describing the prevalence, type, severity and management of injuries in the adolescent rugby player can provide easy and significant information to be used in the development of preventative, curative and rehabilitative strategies and programmes among similar populations. Clarifying of the terminology used in the questionnaire with the help of a trained medical person during the rugby season could provide more reliable and clear answers and could minimise possible bias. Better accessibility to the questionnaire could improve the response rate to make the collected data more representative. Further reliability and validation of similar questionnaires is however required.

ABSTRAK

Agtergrond: Die risiko op beserings het verhoog met die toename in rugbyspelergetalle en rugbywedstryde vandat die Internasionale Rugbyraad rugby as 'n professionele sport in 1995 verklaar het. Verskeie kohort studies is al gedoen om die epidemiologie van rugbybeserings te ondersoek, insluitende by die populasie van adolessent rugbyspelers, aangesien sommige adolessent spelers daarna streef om professioneel te speel. Studies, wat van 'n self-gerapporteerde vraelys gebruik maak, is in die minderheid.

Doelwit: Hierdie studie het gepoog om die voorkoms, tipe, graad van ernstigheid en hantering van rugbybeserings, soos self-gerapporteer deur die adolessent rugbyspelers van Nelson Mandela Baai Metropool (NMBM) in die Oos-Kaap, Suid Afrika, deur middel van 'n spesifieke ontwerpte vraelys te bepaal,

Metode: 'n Self-gerapporteerde vraelys om die voorkoms, tipe, graad van ernstigheid en die hantering van beserings in die adolessent rugbyspeler van NMBM te bepaal, is ontwikkel. Die vraelys is aan die adolessent rugbyspelers van die top rugbyskole in NMBM beskikbaar gestel. Hierdie vraelys is elektronies op SurveyMonkey® of op gedrukte media voltooi om sodoende data wat die voorkoms, tipe, graad van ernstigheid en hantering van beserings in die adolessent rugbyspelers aandui, te versamel.

Resultate: 'n Gedetailleerde self-gerapporteerde vraelys is ontwikkel nadat vorige vraelyste ontleed is. Sorg is gedra dat die adolossente die terme in gebruik maklik sou verstaan. Die prevalensie van beserings in hierdie groep het hoofsaaklik kop- en gesigbeserings, insluitende konkussies, behels, asook skouer- en kniebeserings. Ander nasionale en internasionale studies het dieselfde resultate gelewer.

Die meeste van die beserings is as sagteweefselbeserings beskryf, waarvan spierbeserings die mees algemeenste was. Die responste het fisioterapie as die behandelingsmetode wat die meeste gebruik is, aangedui, in vergelyking met ander studies wat noodhulpwerkers, medisyne en ander behandelingsmodaliteite aandui. Die terugvoer van 41.9% in hierdie studie kan egter nie as verteenwoordigend van die gekose populasie beskou word nie en die resultate moet dus omsigtig beskou word

Gevolgtrekking: Die prevalensie van beserings in die hoërskool rugbyspelers van die top rugbyskole in NMBM was soortgelyk aan dié van ander studies. 'n Spesifiek ontwikkelde self-gerapporteerde vraelys wat die voorkoms, tipe, graad van ernstigheid en hantering van beserings in die adolessent rugbyspeler bepaal, kan heelwat inligting op 'n redelik maklike manier insamel om sodoende programme te kan ontwikkel wat fokus op die voorkoming, behandeling en rehabilitasie van beserings in soortgelyke populasies. 'n Medies opgeleide persoon kan van hulp wees om die woordgebruik en terminologie in die vraelys aan die spelers gedurende die rugbyseisoen meer duidelik te maak en sodoende meer betroubare antwoorde in te samel wat wanvoorstellings deur die adolessente kan verminder. 'n Meer verteenwoordigende respons kan verkry word indien die vraelys meer toeganklik gemaak kan word vir die spelers. Die betroubaarheid en geldigheid van soortgelyke vraelyste moet egter aandag geniet.

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CHAPTER 1

INTRODUCTION

The following chapter provides a brief introduction to the current thesis.

1.1 Background and study rationale

Rugby gained popularity worldwide especially since the introduction of its professional status by World Rugby (formerly known as the International Board of Rugby) in 1995 (Carter, 2015). As rugby is characterised by high impact activities such as scrummaging, rucking, mauling and tackling, as well as high intensity running, sprinting and static exertion (Rice & The Council on Sports Medicine and Fitness, 2008), it naturally increases the risk to sustain injuries. Several studies done on the epidemiology of rugby injuries concluded that the injury rate has increased since the introduction of the professionalism of rugby (Brooks, Fuller, Kemp, & Reddin, 2005; Kaplan, Goodwillie, Strauss, & Rosen, 2008). Several studies have however also specifically indicated that injuries among adolescent rugby players who aspire to play professional rugby, are widely prevalent (Brown, Verhagen, Viljoen, Readhead, Van Mechalen, Hendricks, & Lambert, 2012; Gabbett, 2008; McIntosh, 2005). Certain programs and strategies are continuously developed to prevent injuries, as well as to successfully treat and rehabilitate injuries among this population (Gianotti, Quarrie, & Hume, 2008; Hendricks, & Lambert, 2010; Quarrie, Gianotti, Hopkins, & Hume, 2007b

A wide range of injuries from soft tissue injuries to fractures are reported amongst adolescent rugby players, ranging through the spectrum of mild to severe (Bleakley, O'Connor & Tully, 2011;

Chiwaridzo, Masunzambwa, Naidoo, Kaseke, Dambi, & Matare, 2015; Freitag, Kirkwood, Scharer, Ofori-Asenso, & Pollock, 2015; McIntosh, 2005; Palmer-Green, Stokes, Fuller, England, Kemp and Trewartha, 2013). Strategies to prevent, treat, protect against and rehabilitate rugby injuries during adolescence therefore need to be implemented (Quarrie et al., 2007b). However, programmes to reduce or prevent injuries can only be successfully planned if more is known about the prevalence, type and severity of injuries in the adolescent rugby player (Boksmart, 2012; Quarrie et al., 2007b). One of the methods to gain large quantities of information on the prevalence, type, severity and management of adolescent rugby injuries could be by utilising a self-reported questionnaire. A self-reported questionnaire can provide a broad spectrum of information regarding the adolescent rugby players' injuries and could highlight some concerns that would not normally be revealed in traditional injury surveillances. Very few studies that involved the use of self-reported questionnaires for information related to rugby injuries among the adolescent population were found (Chiwaridzo et al., 2015). No studies utilising self-reported questionnaires were found in the Nelson Mandela Bay Metropole (NMBM), situated in the Eastern Cape, South Africa, an area well known for its production of professional and national rugby players.

1.2 Aims of this study

This study therefore aimed to determine the type, prevalence and severity of rugby-related musculoskeletal injuries as well as the treatment of the relevant injuries, amongst high school rugby players attending top rugby schools in the NMBM using a specifically developed self-reported questionnaire.

1.3 Significance of study

This study provided insight in the practical application of a self-report questionnaire developed to determine the prevalence, type, severity and management, if any, of injuries in adolescent rugby players, and as such could lead to the development of strategies to help minimise, prevent, treat and rehabilitate the injuries.

1.4 Outline of thesis

The following chapters outline the process followed to achieve this study's aim. **Chapter one** provides a brief introduction to the thesis. **Chapter two** describes a literature review. **Chapter three** discusses the methodology followed in this study. The results are plotted in **Chapter four**. Consequently, **Chapter five** discusses the results and conclusions made. **Chapter six** concludes the thesis, with specific attention to the limitations of this study and some recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The following chapter presents a literature review outlining the popularity of rugby, the nature of this sport and the risks associated with rugby. It also outlines the importance of the adolescent rugby player in this study, the incidence and prevalence of rugby injuries, as well as the type and severity of injuries sustained, specifically among these adolescent players.

The main aim of this chapter was however to scope the literature for any self-reported questionnaires that were developed for high school rugby players and which aimed to assess the type, prevalence and severity of rugby injuries they sustained, as well as the treatment they received, if any.

2.2 Popularity of rugby

Rugby gained popularity since the introduction of its professional status by World Rugby (formerly known as the International Board of Rugby) in 1995 (Carter, 2015). The official website of South Africa Rugby states that rugby, after soccer, is the most popular sport in South Africa (SARugby, 2018). The South African National rugby team often places in the top five rugby teams in the world and have been crowned world champions twice (Topend Sport, 2010). According to World Rugby, the total number of registered players increased from 2.82 million to 3.2 million in 2016 while the total number of non-registered rugby players rose from 4.91 million to 5.3 million.

Additionally, almost two million adolescents were introduced to the sport via World Rugby's "Get into Rugby" programme during that year (World Rugby, 2017). A total of 186 152 adult rugby players are currently registered in South Africa, and represent their club teams, provincial teams and the national rugby team, the latter known as the Springboks (Viljoen, 2018).

Every year youth rugby players in South Africa compete nationally in the Craven week-rugby tournament. A total of 414 players represented their provinces at the 2018 Craven Week tournament. A total of 30 players were selected after this tournament to represent South Africa against England, Wales and France (Rugby365, 2018).

2.3 The nature of rugby and the risks associated with playing this sport

Rugby is defined as a collision sport, where "athletes intentionally hit or collide with each other or with inanimate objects (including the ground) with great force" (Rice et al., 2008). Besides standing, walking, jogging, medium speed running (categorised as low intensity activity), rugby's emphasis is on high-intensity running, sprinting and static exertion like scrummaging, rucking, mauling and tackling (categorised as high intensity activity) (Roberts, Trewartha, Higget, El-Abd & Stokes, 2008). Match activities increased since the introduction of professionalism, as shown in a study by Quarrie and Hopkins (2007a). The authors found that the number of passes, tackles, rucks, tries, and ball-in-play time increased and that there were reductions in the numbers of lineouts, mauls, kicks in play, and in mean participation time per player (Quarrie, & Hopkins, 2007a). Furthermore, the introduction of professional full-time training, advancements in sports science and law changes in Rugby Union have also resulted in marked changes in players' physical characteristics and match activities, resulting in increased demands (Williams, Trewartha, Kemp, Brooks, Fuller, Taylor, Cross, Shaddick & Stokes, 2017). Over time, the team selection process and criteria has changed, where taller and heavier players are favoured

(Sedeaud, Vidalin, Tafflet, Marc & Toussaint, 2013), thus increasing the impact of contact in this sport.

The high physical demands of rugby, alongside exposure to collisions and contact, mean the inherent risk of injury whilst playing in the Rugby Union is substantial (Williams, Trewartha, Kemp, & Stokes, 2013). Current studies in Rugby Union injury epidemiology report a higher incidence of injury than any other team sports and an apparent increase in injury risk in professional and amateur games since the advent of professionalism (Brooks, et al., 2005; Kaplan, et al., 2008). A study done by Brooks and Kemp (2008) indicated a reduction in injury incidence with decreasing age and competitive level, and a significantly higher incidence of injuries during matches compared with training. The tackle was the most common mechanism of injury (Brooks et al., 2005; Hendricks & Lambert, 2010; Kaux, Julia, Delvaux, Croisier, Forthomme, Monnot, Chupin, Crieland, Le Goff, Durez, Ernst, Guns, & Laly, 2015). Quarrie and Hopkins (2007a) recorded a significant increase in tackles made per match since the introduction of professional rugby.

2.4 The adolescent rugby player

The World Health Organisation (WHO, 2013) defines adolescents as persons aged ten to 19 years. Brukner and Khan (1997) stated that tendon attachments are still not as strong as that of an adult and that their bone structure can withstand greater deflection without fracture. The joints and joint surfaces of an adolescents' body have therefore not yet reached maturity. Bones lengthen before muscle and tendons are able to stretch correspondingly before the musculotendinous complex develops the necessary strength and co-ordination to control the newly lengthened bone (Brukner and Khan, 1997). It is therefore clear that adolescent athletes are more prone to certain cartilage, apophyseal and bone injuries than adults.

Professional sport is technically defined as a sport in which athletes are engaged in a specified activity as one's main paid occupation rather than as an amateur (Oxforddictionaries, 2019). This said, the law states that it is illegal to employ children under 15 years of age or who is under the minimum school-leaving age in terms of any law (Convention C138 – Minimum age convention, 1973). However, several newspaper publications suggested that youth players are offered contracts that include accommodation and tuition bursaries. Elkin (2018) reported that as schoolboy rugby was broadcasted across several platforms in 2018, the sport receives extensive media coverage that in turn involves more corporate backing, more funding, further coverage and better talent.

There is therefore strong emphasis placed on rugby in many high schools in South Africa and great expectations are placed on rugby clashes between the different high schools (School of rugby, 2012). Some of the high school players are even officially offered contracts with French clubs (Businessstech, 2016). Regardless if these children are receiving professionally remuneration, there is a strong belief under many of the players that being selected for the U18 Craven week rugby is an important factor to help establish a possible professional career (Ellis, 2016). Thus, the adolescent rugby player is highly likely to suffer a lot of pressure to become a professional player and can in many cases be almost as competitive and demanding as would be expected at senior professional rugby level. Thus, schoolboy rugby can be paralleled with professional rugby although it is not regarded as such. Elkin (2018) also found that rugby academies are being formed within schools, external coaches are being employed and that adolescent players are being poached.

Keohane (2019) reported that some schools have 'cut ties' with other rugby focussed schools, as they did not want to play against schools where players were known to be poached and where the competition becomes biased in this obsessive sport environment. As match activities and

training time increased, and given the performance expectations on adolescent rugby players throughout the rugby season, the possibility of injuries become higher. Big emphasis is thus placed on the injury prevention, as well as the successful treatment and rehabilitation of injuries amongst young rugby players who show potential to go on and play professionally. Suggestions have therefore been made to minimise injuries and include proper pre-season conditioning, proper injury rehabilitation programs, structured return-to-play programmes, correct ball carrying, correct tackling technique and improve rules of match playing (Gianotti, et al., 2008; Hendricks & Lambert, 2010; Quarrie et al., 2007b). Rugbysmart© and Boksmart© are examples of programmes developed for use in the training of young players to minimise injuries, and focus on prevention of serious injuries such as concussion and spinal injuries. Less focus is however placed on musculoskeletal injuries, which are also important to include (Boksmart, 2012; Gianotti, et al., 2008; Quarrie et al., 2007b).

2.5 Prevalence of rugby injuries

Prevalence is the proportion of a population who have a specific characteristic at a given time (NIMH, 2017). The prevalence of injuries among adult rugby players is widely researched. According to a study done by Bathgate, Best, Craig & Jamieson (2002) an overall injury rate of 69 injuries per 1000 hours of game play was recorded (Bathgate et al., 2002). Brooks et al. (2005) reported 17 injuries per 1000 hours exposure (combined average of match injuries as well as training injuries). Brooks and Kemp (2008) reported a higher incidence of injuries in professional rugby than in other team sports. In a study by Kaux et al. (2015) 30-91 injuries per 1000 match hours were recorded.

Several studies have been conducted to determine the prevalence of adolescent rugby injuries (Brown, et al., 2012; Gabbett 2008; McIntosh, 2005). In the study by Brown et al. (2012), a

combined time-loss injury rate of 23.1 per 1000 match hours was reported. A time-loss injury rate of 6.5-10.6 per 1000 match hours was recorded in a study by McIntosh (2005). In the study by Gabbett (2008) a time-loss injury rate of 56.8 per 1000 match hours was recorded. Chiwaridzo et al. (2015) reported that 58.2% of high school rugby players sustained at least one rugby-related injury in their previous season of play.

Local research done in Gauteng, also a South African province, recorded a similar rate, nature and mechanism of injuries during a high school rugby festival as other local and international studies (Constantinou & Bentley, 2015). Wall (2011) found a high prevalence of 78.5 injuries per 1000 playing hours in U/18 South African schoolboy rugby union. In a study done by Barrett (2015) the injury rate and prevalence of injuries in rugby players of Stellenbosch University, situated in the Western Province of South Africa, was reported to be the same as in school-going rugby players, despite university players being faced with unique risk factors such as different conditioning protocols and a difference in academic pressure, in comparison to the adolescent group.

2.6 Type of rugby-related injuries

The type of injuries normally refers to the anatomical site of the injury and / or the nature of injury sustained. From an anatomical point of view Bathgate et al. (2002) reported the head to be the most commonly injured region in elite Australian rugby union players. Brooks et al. (2005) recorded mostly lower limb (60%) and upper limb (17%) injuries in the England 2003 Rugby World Cup squad. The shoulder, knee, thigh, ankle and head were indicated as the most common areas of Rugby Union injuries in a study by Brooks and Kemp (2008).

In a study done by Bleakley et al. (2011) on adolescents, mainly head and neck injuries, as well as upper and lower limb injuries was found. McIntosh (2005) found that 10-40% of paediatric injuries in his study account for head and neck injuries and that musculoskeletal injuries of the upper and lower limb were also present in equal portions. Freitag et al. (2015) also documented a relatively high incidence of concussion reported by players under 21 years old. Chiwaridzo et al. (2015) reported mostly lower limb injuries. In a South African study by Wall (2011) the knee and shoulder were the part of the body affected the most in schoolboy rugby union, contrary to a study in Scottish schools that reported the head and face as the most injured part of the body (Nicol, Pollock, Kirkwood, Parekh, & Robson, 2010). Gabbett (2008) reported the shoulder as the most affected body part in junior rugby league players.

Injuries are also classified according to the type of injuries sustained to certain anatomical structures. Gabbett (2000) indicated that predominantly muscular injuries as well as joint injuries and lacerations in a population of amateur rugby league players were found. In a study by Bathgate et al. (2002), closed soft-tissue injuries accounted for over half of all injuries sustained by elite Australian rugby union players. Brooks et al. (2005) found muscular and ligament injuries to be the most prominent type of injury among the England 2003 Rugby World squad.

Bleakley et al. (2011) recorded greater time loss due to upper limb fractures or dislocations and knee ligament injuries in adolescents, whereas Freitag et al. (2015) found that ligament injuries, fractures, lacerations, contusions, haematoma were prevalent in children and adolescents under 21 years old. McIntosh (2005) reported a relatively high incidence of musculoskeletal injuries in paediatric rugby, as well as some fractures and ligament injuries.

According to Brown et al. (2012) soft tissue injuries such as muscular and ligament injuries, as well as lacerations were found to be the most prevalent during the South African Rugby Union (SARU) youth week tournaments. Constantinou & Bentley (2015) reported most injuries in high

school rugby festivals as being soft tissue injuries. Several researchers concluded that as wide variations existed for the definition of injuries and the collection procedures by medical personnel, consensus need to be found regarding the type and prevalence of these injuries (Bleakley et al., 2011; Kirkwood, Ofori-Asenso, Parekh & Pollock, 2015).

2.7 Severity of injuries sustained

The impact and severity of rugby injuries are generally measured in time absent from practice or play. Less than one week missed from practice or play is generally considered to be a minor injury; practice or play missed for one to three weeks are considered moderate injuries; and play or practice missed for more than three weeks are considered severe injuries (Kaplan et al., 2008). Brookes et al. (2005) found that many match injuries sustained by the England 2003 Rugby World Cup squad kept them out of play for less than one week, while far less of the injuries were moderate or severe. In a study done by Kaux et al. (2015), who focussed on injuries in Rugby Union, it was found that most injuries were considered minor, with moderate and severe injuries to be quite less frequent.

Fuller, Marsalli & Molloy (2011) reported a mean severity of 22.4 days out of play during the 2008 and 2010 U/20 Junior World Championships and Junior World Rugby Trophy. According to a study done by Palmer-Green et al. (2013) the mean severity of injuries sustained in a group of 16–18-year-old rugby players from England, was 30-32 days out of play. This measured more severe in comparison to the 15-20 days England's adult rugby players were out of play. Of the 37 injuries reported in a study done in six Scottish schools (Nicol et al., 2010), 16.2% resulted in less than one week off from play. Of these 37 injuries, 18.9% resulted in 1-2 weeks off from play, whereas 45.9% resulted in 3-6 weeks off from play and 5.4% resulted in seven-twelve weeks off from play. The remaining 13.5% were reported to miss more than 12 weeks of play. In a study

done by Chiwaridzo et al. (2015), 7.7% of the injuries in high school Zimbabwean adolescent rugby players were severe with participants missing more than 28 days.

In the South African university study done by Barrett (2015), it was found that most of the injuries reported were of moderate severity. Wall (2011) reported that most of the injuries seen in South African schoolboy rugby union were slight, but that moderate and severe injuries added up to 39% of the total number of injuries.

2.8 Self-reported questionnaires

A self-reported study refers to a study in which respondents report their own behavior (Jupp, 2006). A questionnaire is a document designed with the purpose of seeking specific information of the respondents (Sansoni, 2011). Self-reported questionnaires are used to assess an extensive range of health behaviors when estimating the prevalence of health risk factors, use of preventive care, and use of mental healthcare services (Short, Goetzel, Pei, Tabrizi, Ozminkowski, Gibson, Dejoy, & Wilson, 2009). The respondents can select a response without researcher interference (Jupp, 2006).

Analysis of the data captured on self-reported prevalence, type, severity and management of the injuries, if any, of the adolescents' rugby injuries could give an indication of the typical injuries sustained in this type of sport and population. Knowledge of these injuries can help to implement better treatment and protective options, as well as implement better preventative measures to minimise injuries. It can also indicate the need to educate the adolescent rugby player about rugby injuries, since improved knowledge and perception of their own body and injuries can lead to improved management and education on where and when to seek professional assistance for rugby injuries.

Several self-reported studies on sport injury history were found in literature. A study done by Watson, Hodge & Gekis (2014) focussed on self-reported neck pain in rugby union players in Gauteng and did not involve other musculoskeletal injuries. This study utilised a four-part self-reported questionnaire to determine the prevalence of neck pain among this population. It was also expected of the players to report the grade of disability their neck pain caused them, and to offer any recommendations on how the players thought neck pain, and the concurrent “disability” could be minimised and prevented. The players were approached during training sessions and provided with an information sheet. This study’s results indicated a 12% occurrence of neck pain in rugby union players, with over half of the players experiencing neck pain in the past. This questionnaire successfully concluded that many of the players felt that there were not enough preventive measures to reduce the risk of neck pain and that the players suggested that more attention should be given to neck conditioning. Due to the descriptive nature of the study the actual cause of neck pain was not reported, and the authors suggested that such studies should include a clinician-diagnosis to minimise potential bias due to the ambiguity of these concepts.

In a study by Dissanayaka, Arambamoorthy, Aravinth, Atapattu, Bandara, De Silva et al. (2013) a self-administered questionnaire regarding the rehabilitation protocol for soft tissue injuries involving the knee amongst school level rugby players were executed in the Kandy Zone, Sri Lanka. The players were requested to complete a questionnaire regarding rehabilitation protocols for soft tissue injuries of the knee. These results were compared to international standards of knee rehabilitation protocols. Information on other type of injuries, their severity and other management options were not included in the study. This study required the research team (physiotherapists) to be available to the scholars and assist if needed. The conclusion that the implementation of knee rehabilitation protocols in the Kandy Zone, Sri Lanka, was not up to international standard was made. Furthermore, the study recommended that an internationally standard rehabilitation protocol should be adapted by the Kandy Zone School level rugby.

In a study by Gabbe, Finch, Bennell & Wajswelner (2003), a self-reported 12-month sports injury history was executed in 70 community level Australian football players. The self-reported prevalence, type and injury diagnosis of the previous year was assessed in the presence of a data collector. These results were compared with the injury surveillance records. This study drew the conclusion that recall accuracy declined as the level of detail requested increased. Where the answer required a mere yes or no, all the players could correctly recall whether they were injured during the previous year. Almost 80% were able to recall the number of injuries and body regions injured, but not the diagnosis, whereas only 61% could report the exact number, body region, and diagnosis of each injury sustained.

Chiwaridzo et al. (2015) used a self-developed questionnaire to gather data on rugby injuries in Zimbabwean adolescents. Socio-demographic information was collected, as well as detail on any rugby injuries, the area of injury, the re-occurrence of the injuries, and the severity of these injuries, player position and injury time in the game. The participants also had to indicate which of five possible health care professionals (a medical doctor, a physiotherapist, a paramedic, a qualified nurse and a nurse first aider) they had seen, if any. The data was collected over a period of four months after the rugby season ended. The questionnaires were completed in the presence of the research team. This study concluded that many of the participants sustained at least one rugby-related injury in the previous season. Lower limb injuries were the most prevalent and 7.7% of all the injuries reported were severe, as these players missed rugby activities for more than 28 days. The majority of the players that received medical treatment were treated by nurse first aiders. Although this study recruited an adequate number of participants, it only involved two high schools in one city. This sampling could have been restricted by the study setting and the results may not be a true reflection of the injuries in the league. The cross-sectional nature of the data collected and the reliance on self-report could have led to recall bias. The definition of injury

used in the study was also broad. The author concluded that further studies with larger samples would be of value.

2.9 Rugby schools in Nelson Mandela Bay Metropole (NMBM)

The NMBM is situated in the Eastern Cape Province of South Africa, which is a potential breeding ground for numerous national rugby players. Two players of the Junior Bok Squad Tour against Argentina in 2015 were from the Eastern Province (SARugby, 2015). Six of the players in the Under 20 Baby Springbok Squad represented the Eastern Province in the World Rugby Under 20-Championship held in 2016 (Sport24, 2016). Four of the 2017 Springbok rugby squad graduated from Eastern Province High Schools (SanzarRugby, 2017; SARugby, 2017a; SARugby, 2017b; Sport24, 2015; Sport24, 2017). Furthermore, several of the NMBM high schools reside on the SA Schoolsports 100 top rankings list, as published in the last week in August 2017 (Addendum C). Since the rugby players from these schools are more likely to be selected for the provincial, and consequently the national team once they are eligible to play senior rugby, this study on the prevalence, type, severity and management, if any, of their rugby injuries was relevant.

2.10 Summary

Strengths of the articles reviewed:

1. The popularity of rugby was outlined.
2. The physical nature of rugby was described.
3. The considerations regarding the adolescent rugby player was described.
4. There was a strong correlation between the articles that injuries are prevalent in both the adult and adolescent rugby population.

5. There is a strong correlation between the articles that head, upper and lower limb injuries are prevalent.
6. There is consensus that soft tissue injuries, such as muscular and ligamentous injuries, as well as lacerations prevail. Fractures were also reported.
7. Some self-reported questionnaires were utilised to determine the players' perception on their injuries.

Gaps in the literature:

1. There is a wide variation in the literature found on the prevalence rates of rugby injuries, both in the adult and adolescent population.
2. The articles reviewed showed a wide variation in the type of injuries sustained, anatomical and nature of injury, both by the adult and adolescent rugby player.
3. The literature review showed a wide variation in the severity of these injuries.
4. There is a need to standardise the definition of injuries and collection procedures to minimise the wide variation in results.
5. The self-reported questionnaires that were found focussed on injuries of only one body part.
6. Only one self-report questionnaire study in the adolescent rugby player was found that covered the broad spectrum of whole-body injuries, but the sample size was limited to only two high schools.
7. No self-reported questionnaire collecting information regarding the prevalence, type, severity and management of musculoskeletal injuries, if any, in the high school rugby players in NMBM were found.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter the research questions, aims, objectives and methodology are presented.

3.2 Research question

What was the prevalence, type, severity and management, if any, of musculoskeletal injuries as reported using a specifically-developed self-reported questionnaire among adolescent rugby players attending top rugby schools in the Nelson Mandela Bay Metropole (NMBM) area?

3.3 Aim of the study

This study is aimed at determining the prevalence, type and severity of rugby-related musculoskeletal injuries, as well as the treatment of the relevant injuries, if any, as reported by high school rugby players attending top rugby schools in the NMBM area. This was done using a specifically-developed self-reported questionnaire to determine the prevalence, type and severity of rugby-related musculoskeletal injuries, as well as the treatment of the relevant injuries (Addendum A).

3.4 Objectives

The objectives of this study were to:

- 3.4.1 Develop a self-reported questionnaire for completion by male adolescent high school rugby players (aged 13-18 years old) at top rugby schools in the NMBM area aimed at capturing the following data:
 - 3.4.1.1 The socio-demographic information of the participating high school rugby players, including their current grade, age group in which they played rugby in 2018, ethnicity, and if they received any financial assistance;
 - 3.4.1.2 The prevalence of musculoskeletal rugby-related injuries that high school rugby players sustained during the past rugby season;
 - 3.4.1.3 The type of musculoskeletal rugby-related injuries that high school rugby players sustained during the past rugby season;
 - 3.4.1.4 The severity of these musculoskeletal rugby-related injuries sustained by high school rugby players during the past rugby season; and
 - 3.4.1.5 The type of treatment received for these musculoskeletal rugby-related injuries sustained by high school rugby players during the past rugby season.
- 3.4.2 Pilot the newly-developed self-reported questionnaire among a group of high school rugby players attending the selected top rugby league schools in the NMBM area.
- 3.4.3 Conduct a survey among male adolescent high school rugby players (aged 13-18 years old) at the top rugby schools in each participating age group of the NMBM area during the 2018 rugby season using the newly-developed self-reported questionnaire to determine:

- 3.4.3.1 The socio-demographic information of the participating high school rugby players, including their current grade, age group in which they played their rugby in 2018, ethnicity, and if they received any financial assistance;
- 3.4.3.2 The prevalence of musculoskeletal rugby-related injuries sustained by high school rugby players during the past rugby season;
- 3.4.3.3 The type of musculoskeletal rugby-related injuries high school rugby players sustained during the past rugby season;
- 3.4.3.4 The severity of these musculoskeletal rugby-related injuries high school rugby players sustained during the past rugby season; and
- 3.4.3.5 The type of treatment received for these musculoskeletal rugby-related injuries high school rugby players sustained during the past rugby season.

3.5 Study setting

The Eastern Cape, one of nine provinces in South Africa, is the third most populous province in the country, behind Gauteng (13,4 million) and KwaZulu-Natal (11,1 million). In 2016, the Eastern Cape's population was estimated at 7 million people. The NMBM, comprised of 247 759 households, the third largest district municipality in the Eastern Cape (Statssa, 2016).

Several of the top NMBM rugby league schools are situated within a 50 km radius from each other. For the purposes of this study, the following top rugby league schools for each age category in NMBM were approached to form part of the study: High School Pearson, Grey High School,

High School Otto du Plessis, High School Framesby, High School Despatch and High School Die Brandwag (Addendum B).

3.6 Study population

3.6.1 Inclusion criteria:

The study population included rugby players of the top high schools in each competing age group in the NMBM, as rated on SA School Sports 100 top rankings-list, published at the end of the 2017-rugby season in August 2017(Addendum C). High school rugby in South Africa generally competes in four different age groups: U14, U15, U16 and Top XV (the latter also known as U18) (SASchoolSports, 2017). The age of the included population was therefore between 13 and 18 years old. The participants had to be either being English, Afrikaans or Xhosa proficient. This study included adolescent male high school rugby players only. Only players that practised and/or played rugby in the 2018-season were included, to obtain fresh data and to avoid recall bias.

3.6.2 Exclusion criteria:

Players that sustained serious injuries, such as brain injuries and spinal injuries resulting in disability and non-rugby-related injuries that lead them to withdrawal from play were excluded from this study, as this study was focussed on players that returned to sport and players who have sustained rugby-related musculoskeletal injuries that were treatable. Severe injury data had to be collected from other sources, and involved other ethical considerations, that did not form part of this study's purposes.

Given that the adolescents' perception and sense of language are not yet developed, and that Gabbe et al. (2003) reported a decline in obtaining reliable information the higher the level of detail that was requested, it was attempted to generate a general, simplified self-reported

questionnaire. Thus, questions regarding neural type injuries were included as well to avoid confusion in the adolescents over why certain injuries is included on the questionnaire and other not.

Players that sustained injuries in other activities apart from rugby formed part of this study but were reported as such and any information from them on rugby injuries were excluded from this study as it could have influenced the specific rugby injury data. Further responses from players that reported injuries sustained in other activities apart from rugby were eliminated in the beginning of the questionnaire.

3.7 Study design

A cross-sectional (survey) study design was used and included two phases. Phase one concentrated on the development of the questionnaire, and Phase two concentrated on the conduction of the survey.

3.8 Sample size

The first two teams of each age group, of each of the top three schools in the afore-mentioned rankings, were invited to take part in this study, giving a total of 360 rugby players. For the purposes of this study, all 360 players were included and invited to participate in this study.

3.9 Study duration

The study was conducted over the 2018 rugby season. The questionnaire for this study was developed over a period of six months, from March – August 2018. The self-reported

questionnaire was piloted in the week of 27 August – 4 September 2018. No problems were identified in the pilot study and the players were allowed to complete the questionnaire from 4 September 2018 until 30 September 2018 for the final survey.

3.10 Sample recruitment procedure

Approval to conduct this study was obtained from the Health Research Ethics committee (HREC) and given the project number 1818 / HREC Reference number S17/10/234 (Addendum D).

The Department of Education (Eastern Cape) granted permission to conduct the study (Addendum E). The principal of each school was contacted and they all preferred to communicate via e-mail and telephone. Some of these principals gave their sport head the proxy to make any decisions about this study. The participating principals or sport heads signed a consent form in agreement to the study. The participating principals and sport heads, preferred to introduce the study to the students themselves and to hand out all the consent forms, as applicable, to the players and parents themselves (Addendum F). The participating principals and sport heads then had to give the website link to the participating players containing the anonymous and voluntary questionnaire once they received the signed consent forms.

3.11 Research team

The research team for this study consisted of the principle investigator, CL, the administrative assistant, SdV, and the supervisors, LM and LC.

3.12 Study procedure

3.12.1 Phase one: development of questionnaire

The questionnaire was uploaded onto SurveyMonkey® and a link to the website was given to the rugby players once they agreed to participate in the study and all relevant informed consent forms were returned (Addendum F). The introductory page of the questionnaire contained a description of what this study is all about and the basic assent questions were asked in order to ensure voluntary participation (Addendum A).

The questionnaire was designed to automatically close should the assent questions reveal any confusion or unwillingness of the player to complete the questionnaire.

The following questions asked demographic information regarding the age group they competed in in 2018, their ethnicity, their school grade and whether they received any financial assistance. The next questions focussed on specific musculoskeletal injuries sustained during the 2018 high school rugby season, while practising or playing rugby and excluded all other injuries sustained while not playing rugby.

The questionnaire then followed a logical flow as per the anatomical body sites involved, ranging from the head to the feet. If a student answered positively on an injury sustained to a certain body site, then the electronic survey automatically opened new questions regarding this anatomical site in terms of: a) the type of injury (in other words ligament injury / fracture / bruises / wounds that need stitches etc.); b) the severity of the injury (duration out of play), and c) the type of treatment received (e.g. physiotherapy treatment / chiropractic treatment / general practitioner / specialist treatment etc.). When multiple or re-injury to the same anatomical site was reported, the questionnaire gave the player an opportunity to tick and complete more boxes referring to the

same anatomical site. This gave comprehensive detail regarding injuries of this site. The draft questionnaire was made available in English, Afrikaans and Xhosa.

After all the necessary consent forms were signed, a pilot study was conducted with five players at one of the high schools. The pilot study gave feedback regarding the ease of answering the questionnaire, the ease of accessing the questionnaire online, changes that needed to be made to the questionnaire, suggestions to improve the questionnaire and if there were any spelling errors.

The suggestions were collated after one week and no faults or problems were reported. The consenting players that brought the signed consent forms and completed the questionnaire in the pilot study were rewarded via their sports head or principal with a health bar for their time spent, once the researcher picked up the consent forms from the sports head or principal.

3.12.2 Phase two: Survey

Using the questionnaire, the rest of the consenting participants were asked to complete the online survey before 30 September 2018. The sport head or principal of each team was reminded every week via e-mail and telephonic conversation with the school secretary to remind the participating players to complete the online questionnaire using the link provided.

Participants could complete the survey during their own time (at home or at school) and, should they have wished to, they had the right to withdraw without an explanation and not complete the survey. The survey was closed by the end of September 2018. This was due to concerns of the principals or sports heads that the students were starting important academic examinations and that this study could not shift their focus away from the examinations. Consenting participants were rewarded with a health bar, e.g. with a granola bar or seeded bar, for their time spent

completing the online questionnaire. This was given to them via their principal or sports head once the researcher went to pick up the signed consent forms.

3.13 Data extraction and management

Each response on SurveyMonkey® was printed and filed in a locked, access-controlled cabinet in the principle investigator's office in Port Elizabeth. No identification could be tagged to any of the responses.

Microsoft Excel (MS EXCEL) spreadsheets containing all the responses received regarding the demographic information, as well as the prevalence, type, severity and management, if any, of the rugby-related musculoskeletal injuries were drawn from SurveyMonkey®.

3.14 Statistical analysis

A response rate of 80% of the invited players was required to consider the results representative information. The data was collected from SurveyMonkey® and the printed questionnaires and was analysed and reported descriptively. The self-perceived prevalence, type, severity and management amongst the high school rugby players attending the top three rugby league schools in the NMBM area were calculated. Statistical analysis was applied where applicable to interpret the results.

3.15 Ethical considerations

3.15.1 Consent:

Once permission from the ethics committee (HREC) and the Department of Education (Eastern Cape) was granted, the principal investigator required the signed permission from the principals at the selected schools that they consent to allowing the high school rugby players participate. Some of the principals gave their sports head the proxy to take decisions regarding this study. All the principals or sports heads could communicate in the language most understood by them (Afrikaans, English or Xhosa).

All the invited rugby players were informed via their principal or sports head about the study and all those who showed interest in participating in the study were given information letters and informed consent forms which their parents or guardians had to complete should they have agreed to participate in the study (players under 18 years old). Thereafter each participating player had to complete an assent form themselves. The aim of the study was clearly explained on the assent forms as well as on the first page of the questionnaire. All included players had to be fluent in English, Afrikaans or Xhosa. Players older than 18 years were given an informed consent form to complete themselves. Informed and written consent was obtained for collection of data, storage of data and data analysing procedures.

3.15.2 Assent:

The introductory page of the questionnaire contained a description of this study and the basic assent questions were asked in order to ensure voluntary participation. The questionnaire was designed to automatically close should the assent questions reveal any confusion or unwillingness of the player to complete the questionnaire (Addendum A).

3.15.3 Reliability:

Reliability measures whether the instrument consistently measures what it is supposed to measure (Polit & Hungler, 1995). It is concerned about the degree of consistency of the instrument and it is the main criteria for assessing the quality and adequacy.

3.15.4 Confidentiality and anonymity:

The data recorded did not have any subject identification attached to it. Instead, a study record and a reference number was allocated to each subject. The study record with its reference number and respective subject name correlation was stored in a separate encrypted file. The participants were addressed as “number 1”, number 2”, number 3” and so forth. No names were mentioned. All subjects were treated the same, irrespective of entry into the study or not. Confidentiality was always maintained throughout the study and all decisions were in the subjects’ best interest.

It was clearly explained how and where the information would be processed and documented. The researcher signed a confidentiality agreement to ensure privacy and confidentiality and the participants were informed of this.

3.15.5 Risk/ benefit ratio:

There were no identified risks involved in participating in this study. The participants were not exposed to any physical measures. The benefits of the information obtained from this study allowed for deeper insight and consideration of the self-reported type, prevalence and severity of injuries in the NMBM high school rugby players and the management thereof. This could lead to the development of improved patient management and improved preventative and protection measures.

3.16 Conclusion

This chapter described the research question as well as the aims and objectives of this study. It also described the methodology followed in order to conduct this study. The instrument used for data collection, the rationale for the targeted population as well as the sampling procedure was discussed. Analysis of the data was also explained. Ethical considerations for the protection of underage players' rights were discussed, such as their guardians' consent, as well as their own consent and assent. The risk/benefit ratio, confidentiality, anonymity and reliability of the research instrument were also discussed.

CHAPTER 4

RESULTS

The following chapter will present the results of this study.

4.1 Sample size and description

Of the six high schools invited to participate in the study, only three high schools, High School Die Brandwag, Grey High School and High School Otto du Plessis agreed to participate in the study and provided official permission. These participating schools are situated within a 50 km radius of each other (Addendum B). The original sample population of 360 rugby players in the NMBM thus decreased to 210 players that were allowed by their principals and sports heads to participate in this study. These consenting schools' principals and sports heads signed a consent form to let the players participate. The consent forms for the parents of the players, as well as the player's assent forms (players under 18 years old) were then distributed to the participating schools and administered to the potential 210 players at the three participating high schools.

Out of these 210 rugby players invited to participate in this study, 42 English and five Afrikaans responses were received on SurveyMonkey®. Forty-seven signed consent forms from the participating parents of the rugby players as well as 47 assent forms from the consenting players were collected.

The website link for the consenting players to complete the questionnaire on SurveyMonkey® were then supplied via the principals and sport heads by the end of August 2018, for completion in four weeks.

The principal of one school decided to supply printed questionnaires to their consenting players and had them fill it in by hand should they wish to be part of the study, rather than to supply the website link. This was done because some of this school's players did not readily have access to internet services to answer the questionnaire.

All 41 responses, filled in by hand, from this school were accepted and all 41 consent forms, both from the player's parent and player himself, were signed, and assent was provided as indicated. Thus, the results of this study were based on a total of 88 responses – 47 SurveyMonkey responses and 41 written responses.

Of the 88 responses received only 71 responses were acceptable as 17 were deemed unsuitable for use in this study. Data on rugby injuries were collected only from the players that gave full assent/consent on the questionnaire's first page. One participant indicated in the first assent question that he did not understand what this study is all about, so his questionnaire automatically closed. One participant indicated in the second assent question that he did not want to complete the questionnaire, so he was excluded from the study. One participant indicated in the third assent question that he did not understand that he could withdraw from the study at any time, so he was also excluded from the study. The remaining 14 respondents gave their assent to complete the questionnaire but did not complete the questionnaires. Their data was therefore not recorded.

Consequently, the 88 responses out of the possible 210 responses that was received was not representative of the population targeted for the study.

The results of the admissible and completed 71 responses are provided below.

4.2 Socio-demographic information

In table 4.1, the socio-demographic information (grade, age group, ethnicity and whether or not the scholar received a bursary) of the 71 study participants is provided.

Table 4.1: Socio-demographic information of the participating adolescent rugby players

	GRADE					AGE GROUPS				ETHNICITY			BURSARY	
	8	9	10	11	12	u14	u15	u16	u18	White	Black	Coloured	No	Yes
Number	10	14	33	7	7	10	14	33	14	46	8	17	59	12
%	14.1	19.7	46.5	9.9	9.9	14.1	19.7	46.5	19.72	64.8	11.3	23.9	83.1	16.9
TOTAL	71					71				71			71	

4.2.1 Grade

Participants from each grade (Grade 8 to 12) were included in this study. Most of the participants were in Grade ten (n=33; 46.5%) (Table 4.1).

4.2.2 Age groups

Participants were categorised under the following age groups U14, U15, U16 and U18. No participants for the U17 age groups were represented in this study. The U16 age category had the most participants (n=33; 46.5%), (Table 4.1).

4.2.3 Ethnicity

Majority of the study participants were white (n=46; 64.8%). Eight of the players reported that they were black (11.3%), while 17 reported that they were coloured (23.9%) (Table 4.1).

4.2.4 Financial assistance received to study

Twelve of the 71 players reported that they make use of a bursary (16.9%) and 59 reported that they do not (83.1%) (Table 4.1).

4.3 Prevalence of injuries

Of the 71 accepted questionnaires, a total of nine (12.7%) participants indicated that they suffered from a pre-existing condition or other injuries caused by incidents apart from rugby, so they could not give reliable information on injuries sustained through practising rugby only. Of the 71 respondents, 25 (35.2%) indicated that they did not sustain any injuries in 2018 whilst practising rugby. The remaining 37 respondents reported that they were injured whilst practising rugby during the 2018 rugby season (52.1%) (Table 4.2).

Table 4.2: Prevalence of injuries in the participating adolescent rugby players

	PLAYERS WITH INJURIES NOT RUGBY-RELATED	PLAYERS NOT INJURED IN 2018	PLAYERS INJURED IN 2018	TOTAL
Number	9	25	37	71
%	12.7%	35.2%	52.1%	100%

A total of 89 rugby-related injuries were reported by the 71 respondents. The rugby-related injury rate for the participating players that completed the questionnaire in full, excluding the nine players that reported injuries sustained apart from rugby, is reported as being 1.44 per player for the season.

4.4 Prevalence of injury area

A total of 15 out of these 89 injuries occurred to the head and face (16.9%), two were described as neck injuries (2.3%), 12 were described as being shoulder or upper arm injuries (13.5%), seven were sustained to the elbow or forearm (7.9%), nine involved the wrist or hand (10.1%) and seven injuries involving the back or chest were reported (7.9%). A further eight injuries to the buttock, hip and groin area were reported (8.99%), six injuries to the thigh were reported (6.7%), 12 injuries involved the knee (13.5%), three injuries was reportedly sustained to the calve and shin area (3.4%) and the remaining injuries reported were eight ankle injuries (9%), (Table 4.3).

Table 4.3: Prevalence of injury area in the participating adolescent rugby players

		Head / Face	Neck	Shoulder / Upper arm	Elbow / Forearm	Wrist / Hand	Back / Chest	Buttock / Hip / Groin	Thigh	Knee	Shin / calve	Ankle	TOTAL (No)
PREVALENCE		15	2	12	7	9	7	8	6	12	3	8	89
TYPE	Concussion	9											9
	Direct Eye	1											1
	Wound	2											2
	Fracture	3			1	3					2		9
	Muscle		2	6	3	4	6	7	1	5		2	36
	Neural			2					2	1			5
	Bruise			1				1	2		1		5
	Ligament			3	2	1			1	2		5	14
	Bursitis				1					1			2
	Dislocation					1				1			2
	Disc						1						1
	Cartilage									2			2
Other											1	1	
SEVERITY	Mild	3	2	7	4	5	1	5	4	4	1	3	39
	Moderate	9		5		1	4	2	1	5	2	3	32
	Severe	3			3	3	2	1	1	3		2	18
MANAGEMENT	General practitioner	7		2	1	2	2	4		3		1	22
	Physiotherapist	1	2	5	3	6	5	5	4	10	2	4	47
	Specialist	3			1	2				2		1	9
	No treatment	3		3		1			2	2	1		12
	Over-the-counter medicine	2		3	1		1			2			9
	Chiropractor							1				1	2
	Other	2			1		1					3	7

4.4.1 Head and or face injuries

Of the 15 injuries described, nine were head or face injuries were reportedly a blow to the head or face that caused dizziness and or concussion (60%). One was described as a direct injury to the eye (6.7%), two was reported to be a wound that needed stitches (13.33%) and three was reported to be a fracture (20%). Three out of head or neck injuries were classified as being severe (20%), nine as being moderate severe (60%) and three as being mild in nature (20%).

Treatment for head and or face injuries included general practitioner involvement (38.9%), specialist involvement (16.7%), and some reported receiving no treatment at all (16.7%). One reported involvement by a physiotherapist (5.6%), two made use of over-the-counter medicine (11.1%), and two reported other means of treatment (11.1%). Paramedic treatment and ice were reported amongst the other treatments.

4.4.2 Neck injuries

Both neck injuries reported were muscular in nature (100%) and both injuries were described as mild (100%). These injuries were treated with physiotherapy (100%).

4.4.3 Shoulder and upper arm injuries

Half of the 12 shoulder injuries reported were muscular in nature (50%), three as being ligamentous in nature (25%), two as being neural in nature (16.7%) and one as a bruise (8.3%).

Five injuries were described by the respondents as being moderate (41.7%) and the other seven as being mild (58.4%).

Physiotherapy was used to treat five of these injuries (38.5%), over-the-counter medicine was used to help treat three of these injuries (23.1%) while three of these injuries were not treated at all (23.1%). Two of these injuries were treated by a general practitioner (15.4%).

4.4.4 Elbow and forearm injuries

Three of the elbow injuries that were reported were described as muscular in nature (42.9%), two as ligamentous (28.6%), one as a bursitis (14.3%) and one respondent reported a fracture (14.3%).

Four of the seven elbow injuries were classified as mild (57.1%) and three as severe (42.9%).

Physiotherapy was utilised to treat three of these injuries (42.8%), one made use of a specialist (14.3%) and one made use of over-the-counter medication to treat the injury (14.3%). Treatment of one of these injuries involved a general practitioner (14.3%) and one respondent reported other means of treatment (14.3%).

4.4.5 Wrist and/or hand injuries

Four out of the nine wrist or hand injuries reported were muscular in nature (44.4%) and three fractures were reported (33.3%). One injury was described as ligamentous in nature (11.1%) and one as a dislocation (11.1%).

Five of these wrist or hand injuries reported were described as mild (55.6%), three as being severe (33.3%) and one as being moderate (11.1%).

Physiotherapy was the main means of treatment for six injuries (54.6%), two respondents had seen a specialist (18.2%), two injuries were managed by a general practitioner (18.2%) and one received no treatment at all (9.1%).

4.4.6 Back and/or chest injuries

Six of the seven back or chest injuries that were reported were described as muscular in nature (85.7%). One disc injury was reported (14.3%).

Four of these injuries were described as moderate (57.1%), two as severe (28.6%) and one as mild (14.3%).

Physiotherapy was utilised for five of these seven injuries reported (55.6%), two injuries was treated by a general practitioner (22.2%), one player also made use of over-the-counter medicine (11.1%) and one involved other means of treatment not listed in the questionnaire (11.1%). The other treatment received was described as paramedic treatment.

4.4.7 Buttock and or hip and or groin injuries

Seven out of eight participants reported muscular injuries (87.5%) while one injury was described as a bruise (12.5%).

Five of these injuries were categorised as being mild in nature (62.5%), two as being moderately severe (25%) and one as being severe (12.5%).

Physiotherapy was utilised in five of the ten treatments involved (50%), four involved general practitioner treatment (40%) while one injury also involved treatment by a chiropractor (10%).

4.4.8 Thigh injuries

Two of the thigh injuries that were reported were described as bruises (33.3%) and two more injuries as being neural in nature (33.3%). One of the thigh injuries were described as ligamentous (16.7%) and one as muscular in nature (16.7%).

Four of these injuries were described as mild (66.7%), one as severe (6.7%) and one as moderate (16.7%). Physiotherapy was utilised as treatment in four of these cases (66.7%), while two injuries received no treatment (33.3%).

4.4.9 Knee injuries

Of the 12 knee injuries reported, 5 were described as muscular in nature (41.7%). Two of the knee injuries were described as cartilaginous (16.7%), two were described as ligamentous (16.7%) and one as being a bursitis (8.3%). One injury was described as a dislocation (8.3%) and one was reported to be neural in nature (8.3%).

Five of these injuries were considered moderately severe in nature (41.7%), four were considered as mild (33.3%) and three were reported as severe (25%).

Physiotherapy was utilised in ten cases of these 19 knee treatments involved (52.6), a general practitioner was involved in three treatments (15.8%) and two received no treatment at all (10.5%).

One was treated by a specialist (10.5%) and over-the-counter medicine was reportedly used to help treat one case of injury (10.5%).

4.4.10 Calve and or shin injuries

Two of the three calve and or shin injuries that were reported were described as muscular in nature (66.7%) while one was described as a bruise (33.3%).

Two of these reported injuries were described as moderately severe (66.7%) while one was described as mildly severe (33.3%).

Two of the treatments mentioned involved physiotherapy (66.7%) and one involved no treatment at all (33.3%).

4.4.11 Ankle injuries

Ligamentous injuries contributed to five of the eight ankle injuries reported (62.5%), two respondents reported muscular injuries (25%) while one respondent reported an injury other than the options listed in the questionnaire (12.5%).

Three of the injuries were described as moderately severe (37.5%), three were described as mild (37.5%) and two were described as severe (25%).

Physiotherapy was utilised in four of the ten treatments involved (40%), three treatments involved other treatments than listed in the questionnaire (30%), a specialist was utilised to help treat one case (10%), one received treatment from a general practitioner (10%) and one of the respondents also made use of a chiropractor (10%).

4.5 Overall type of injuries sustained by the adolescent rugby players of NMBM in the 2018-season

A total of nine concussions (10.1%), one direct eye injury (1.1%), two wounds that needed stitches (2.3%), seven fractures (8.9%) and 38 muscular (42.7%) injuries were reported. Five neural (5.6%), five bruises (5.6%), 14 ligamentous (15.7%) and two bursitis (2.3%) injuries were reported. Two injuries were described as dislocations (2.3), one injury was a disc injury (1.1%), two were described as being cartilaginous (2.3%) and one injury other than those that were listed in the questionnaire was reported (1.1%). The other injury that was reported was described as a growth plate injury. See Chart 4.1.

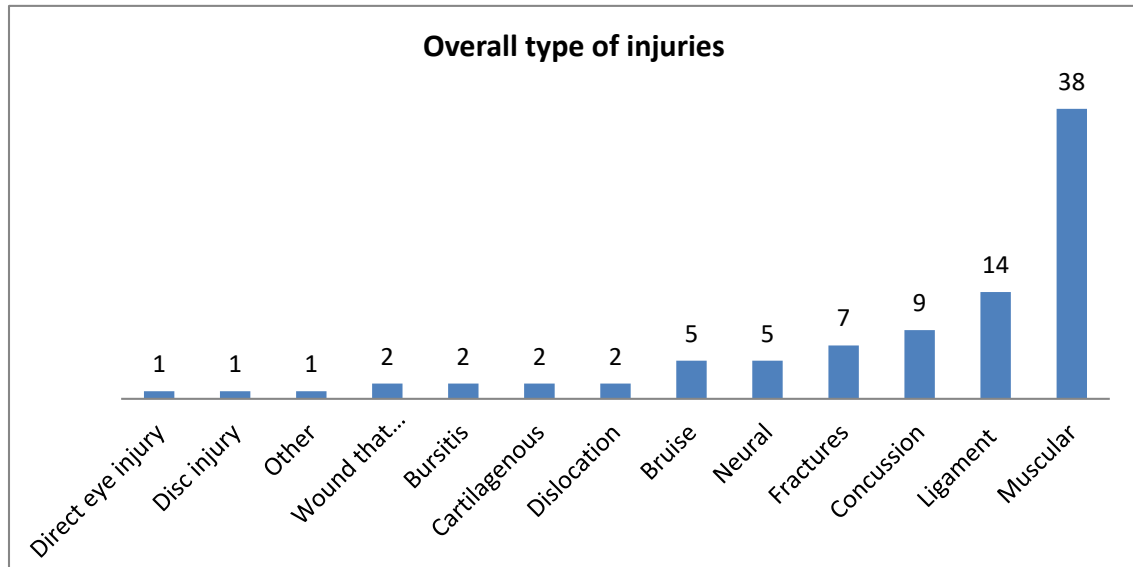


Chart 4.1: The overall type of injuries sustained by the adolescent rugby player of NMBM in 2018

4.6 Overall severity of injuries sustained by the adolescent rugby players of NMBM in the 2018-season

Eighteen (20.2) of the overall injuries sustained by adolescent rugby players in the NMBM in 2018 were reported as being severe, while 32 (36%) were reported as being moderate. The remaining 39 (43.8) of injuries were described as mild. See Chart 4.2.

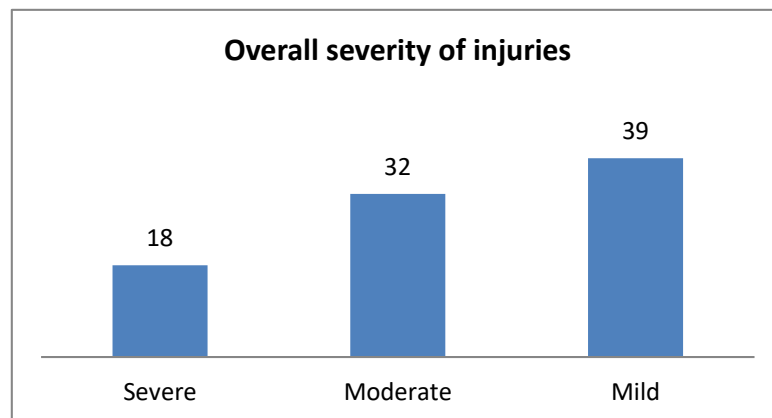


Chart 4.2: The overall severity of injuries sustained by the adolescent rugby player in NMBM in 2018

4.7 Overall management of injuries sustained by the adolescent rugby players of NMBM in the 2018-season

Twenty-two (20.4%) of the injuries involved treatment by a general practitioner. Nine (8.3%) involved specialist treatment, Physiotherapy interventions were recorded for 47 (43.5%) reports. Nine (8.3%) involved over-the-counter medicine. Whereas 12 (11.1%) descriptions of non-treatment were reported. Other (6.48%) and chiropractic treatment (1.9%) were utilised in some of the injuries. See Chart 4.3.

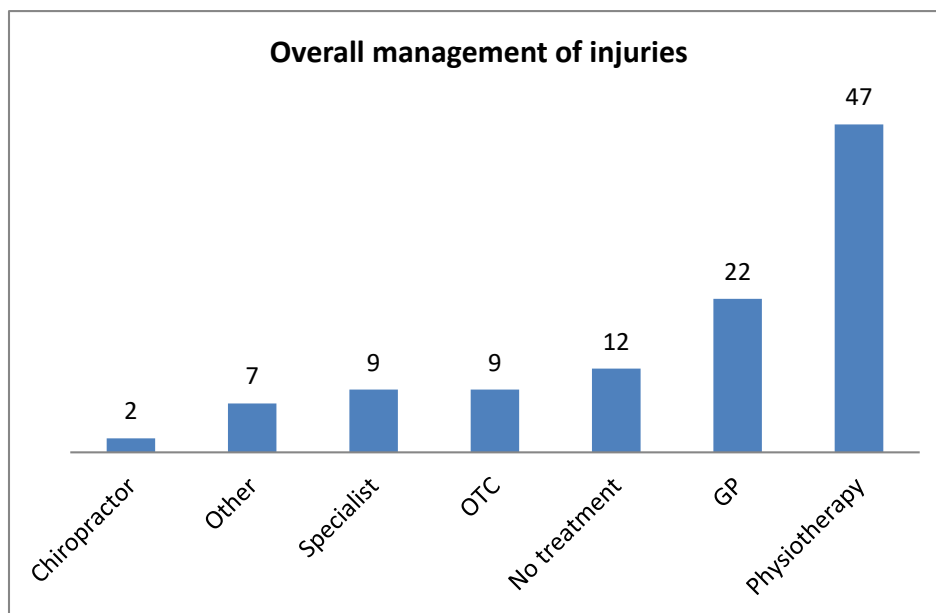


Chart 4.3: The overall management of injuries of the adolescent rugby player in NMBM in 2018

CHAPTER 5

DISCUSSION

The following chapter will discuss the results.

5.1 Introduction

This study aimed to determine the self-reported prevalence, type and severity of rugby-related musculoskeletal injuries, as well as the treatment of the relevant injuries, if any, as reported by high school rugby players attending top rugby schools in the Nelson Mandela Bay Metropole (NMBM), Eastern Cape situated in South Africa, using a specifically designed questionnaire.

This questionnaire was developed for male, adolescent high school rugby players (aged 13-18 years old) at the top rugby schools in each competing age group of the NMBM area during the 2018 rugby season. The questionnaire gathered the socio-demographic information of the players such as their current grade, age group in which they played rugby in 2018, ethnicity, and if they received any financial assistance. It further collected the self-reported information on the prevalence of musculoskeletal rugby-related injuries, the type of musculoskeletal rugby-related injuries, the severity of these musculoskeletal rugby-related injuries and the treatment received for these musculoskeletal rugby-related injuries in high school rugby players that were sustained during the past rugby season.

5.2 Studies on adolescent rugby injuries

This is the first self-reported study, to the author's knowledge, used for establishing the prevalence and type of rugby injuries among adolescent rugby players attending high schools in the NMBM area of South Africa. Several studies into the epidemiology of musculoskeletal rugby injuries amongst South African adolescents have been conducted, especially in youth tournaments such as the national Craven Week tournament and other high school festivals. However, the data collected on these rugby injuries were usually collected and documented by medical and trained personnel in several types of cohort studies and did not solely involve self-reported adolescent rugby injuries (Brown et al., 2012; Burger, Lambert, Viljoen, Brown, Readhead & Hendricks, 2014; Constantinou, & Bentley, 2015; Wall, 2011). In addition, earlier studies conducted at the tournaments might have provided false injury rates as the tournaments evaluated generally involve very high match activities in a short time frame and the injury rate could not have been applicable to other adolescent rugby players that did not compete in these top tournaments.

Some self-reported studies on rugby injuries were found in the literature, where one study involved injuries amongst the Australian community of football players (Gabbe et al., 2003) and another study involved Zimbabwean high school rugby players (Chiwariidzo et al., 2015). These self-report questionnaires were found to give information regarding the prevalence, type, severity and management, if any, of rugby injuries in the adolescent player. Unfortunately, the conclusions drawn could have been limited by recall accuracy and a limited study sample. This study therefore aimed to include as many of the top adolescent rugby players in the NMBM as possible and attempted to minimise recall accuracy by collecting the necessary information immediately after the end of the rugby season.

5.3 Discussion on the development and execution of the self-reported questionnaire of injuries in the adolescent rugby player of NMBM

Three of the original six schools that were invited to participate in this study declined due to the busy schedule the players had at the end of the 2018 rugby season, as this time marked the start of year-end examinations and included some school tours in the September holiday season. This resulted in the narrowing of the sample size from a potential 360 players to 210 players attending the remaining three high schools in the NMBM area. The questionnaire used in this study was developed by the author to collect self-reported data on the prevalence, type, severity and management, if any, of the adolescent rugby player attending high schools in the NMBM area of South Africa during the 2018 rugby season. The questionnaire was specifically designed to consist of simplified terminology and explanatory words, with reference to the prevalence of injuries, the type and severity of these injuries, and management, if any. The questionnaire was supplied electronically to the participating players with a link to SurveyMonkey®, as it was thought that the players would find it easier and less time-consuming to answer if they could tick boxes applicable to them, thereby improving the response rate. The participating players could answer the questionnaire in their own time, requiring the minimum time from daily life activities such as their academics and sport, which is particularly important to consider when doing a study on adolescents.

Forty-two English and five Afrikaans responses were received on SurveyMonkey® within the four-week time-frame allocated for data collection directly after the rugby season of 2018. The principal of one of the three participating schools decided to supply printed questionnaires to the eligible players and had them complete it in writing should they wish to be part of the study, rather than supply the website link. This was done because some of the school's players did not readily have access to internet services to answer the questionnaire. From this school, 41 out of 90

questionnaires sent out were received and accepted, and all consent forms, both from the player's parent and player himself, were signed and assent was provided.

It is of interest that the printed questionnaire produced a response rate of 45.6%, whereas only 39.2% (47 out of 120) responded to the electronic questionnaire. A study by Nulty (2008) showed that the response rates to online surveys of teaching and courses are always much lower than those obtained when using on-paper surveys. Sax, Gilmartin & Bryant (2003) concluded that an online survey is a methodological alternative to a paper questionnaire, but not necessarily a more fruitful one, as had been seen in the NMBM-study. The response rate of 41.9% is much lower than the gold standard of 80% to make this sample representative of the study population. In a pharmaceutical study by Fincham (2008) it is reported that response rates approximating 60% for most research should be the goal for researchers, but for surveys that intended to represent all schools and colleges, a response rate of more than 80% is expected. The reason for the low response rate could be attributed to the study being totally voluntary and that the players could complete it in their free time, at any place, without any influence by the researcher. The low response rate could also have been due to some players not having internet access, as they may not have had sufficient data or airtime available to fill in the questionnaire in their own capacity. Another factor resulting in the low response rate could have been attributed to the consenting players' busy schedule due to high school activities that limited the time-frame in which the questionnaire could have been completed.

The only workable time for this questionnaire to be completed was within the four weeks after the 2018 rugby season ended and before some of the players had to attend school tours and write their academic examinations. For this reason, recall accuracy could have decreased with the time lapse following the rugby season. The limited data-collection time frame could also have influenced the response rate. The principals and sports heads preferred to directly communicate

and remind the players to make sure that all consent forms were signed and brought back to school for the researcher to collect. Several reminders were sent via e-mail and telephone to the principals and sport heads in the four-week frame. In total, 88 out of a possible 210 consent forms, from the players' parents and the players themselves, were collected. It is not clear to what extent the players were motivated and reminded by the principals and sport heads about the study as the researcher did not have direct contact with the players. Thus, it is unclear if more players could have been motivated to participate in this study. In the future it could yield more responses should the researcher make a physical appointment with the players during or after rugby practice time, at the end of the season, and make use of the schools' computer facilities and internet access, if available, to provide convenient access to the questionnaire. The questionnaire could otherwise also be supplied as a hardcopy should it be more practical for the players to complete it this way.

According to SurveyMonkey®, it took the participating adolescent rugby player an average of three minutes to complete the English version of this questionnaire, four minutes to complete the Afrikaans version and the average time needed to complete the printed questionnaire is not known. As the physical printing and hand out of the paper questionnaires happened unexpectedly, there was no plan to measure the time it took the adolescent rugby players to complete the written questionnaire. A better response was received on the hand-completed questionnaires, so it is possible that the completion of this type of questionnaire was not timeous. The relatively short time that was required to complete the questionnaire in combination with the suggestion that the researcher must be physical present during the season and at the time of completion of the questionnaire, could have facilitated the process and increased the response rate, rather than the adolescent rugby players just being told by their coaches or sport heads that they should remember to complete it.

Only 71 responses of these 88 consenting respondents were considered to be valid and admissible. Three respondents did not give assent to participate in the study and were thus excluded from the study: one respondent indicated that he did not understand what the study was about; one respondent indicated that he did not want to complete the questionnaire and one respondent indicated that he did not understand that he could withdraw from the study at any time should he wish to. The assent questions were simple in format and should suffice in obtaining formal assent from the participants. Failure of the questionnaire to catch the interest of the players could have resulted in a lower response rate. More pictures could have been inserted in the questionnaire to catch the rugby players' attention and more accent could have been placed on the reward of a snack bar should they complete the questionnaire, thereby increasing the response rate.

The dubiety of the terminology for the adolescents that were still developing their skill of language and perception of themselves and their injuries, could have attributed to some incomplete and confusingly answered questionnaires. Although the questionnaire attempted to use easy and simple words to describe the injuries, it became obvious that only tertiary medical trained personnel could confirm certain injury diagnoses and as such should be part of the surveillance of adolescent rugby injuries.

5.4 Self-reported socio-economic status

The participants were to supply their socio-demographic information such as age, grade and ethnicity to ensure that the self-reported questionnaire reached the target population. Predominantly, most of the valid and admissible responses were questionnaires filled in by players in Grade ten, and who competed in the U16-age group. Most of these respondents indicated that they were Caucasian. There is however not full consensus in literature on age-related injuries and

injury severity. A study done by Brown et al. (2012) during the 2011-SARU-youth week tournament indicated that the absolute number of injuries per match increased with age. Another study by Burger et al. (2014) during the 2012 South-African youth week tournament indicated that the U13-age group sustained significantly more time-loss injuries due to tackle-type injuries than the U18-age group. A high school rugby study done by Chiwaridzo et al. (2015) indicated that both senior and junior players were equally affected by injuries.

For this study, the high school age categories were not compared to each other. The number of participants per age group should be similar to make comparisons, and it was difficult to obtain this, given that participation was voluntary. The results were thus not presented per age-group and age-specific comparisons could not be made. It is not possible to draw a link between the predominantly white players that completed the questionnaire or the predominant players that did not make use of a bursary and the epidemiology of the injuries that occurred, because the ethnicity and financial-related information of the full sample population is unknown. The information collected on whether the rugby players received any financial assistance to play rugby was deemed important to determine if fewer injuries occurred and are reported in rugby players that have better access to the whole spectrum of training, rehabilitation, medical assistance and conditioning initiatives. However, this study could not draw a linear conclusion between these parameters as the response rate was too low to be representative of the selected population. Consequently, only information on the general socio-economic status of the top high school participating players was gathered and the relationship between the players' age-group, grade, ethnicity, financial assistance received with the prevalence, type, severity and management of their injuries could not be determined.

In the future it could be worthwhile to investigate the relationship between the socio-economic status of the players and the prevalence, type, severity and management of their rugby injuries.

However, this is another subject that would have to include other parameters as well and did not form part of this study. It would have been interesting to see how the data was presented per school, but there was no way to accurately trace the participants to a certain school, as the questionnaires were completed anonymously by use of SurveyMonkey®. In retrospect there could have been a code linked to identify the different schools without making the identity of the participant known, but this was unfortunately not done in this study.

5.5 Self-reported prevalence

5.5.1 Self-reported prevalence of injuries as represented by all participants

The prevalence of rugby injuries in the adolescent group was expressed as a percentage of injured players to the whole group of valid and admissible responses. Nine respondents (12.7%) of the 71 valid and fully completed questionnaires indicated that they either had an existing condition or sustained an injury while not playing rugby. Therefore, for the use of this study their injury data was not included as part of the 89 rugby-related injuries reported as this study focussed on injuries sustained in the 2018-rugby season while practising and playing rugby. Twenty-five participants (35.2%) reported in this study that they sustained no injuries in the 2018-rugby season, while the remaining 37 participants (52.1%) indicated that they were injured while practising rugby in the 2018-season. These figure correlates well with the result found in a study by Chiwaridzo et al. (2015) where 58.2% of the participants reported at least one rugby related injury in the previous year's rugby season. However, a different injury rate was reported by Freitag et al. (2015) concluding that 28% of all child and adolescent rugby players are likely to sustain an injury during a season. In a study done at Johannesburg high school festivals the injury rate of the players was demonstrated as ranging from 15 – 17% (Constantinou & Bentley, 2015). A study done in 2011 during the South Africa Rugby Union youth week tournaments reported 185 injured

players out of a total of 1804, resulting in a prevalence of 10.3% (Brown et al., 2012). This draws the conclusion that wide variation exists in the prevalence of adolescent rugby injuries.

5.5.2 Self-reported total of injuries reported by injured participants

The number of injuries reported by these injured players was calculated by the number of rugby-related injuries compared to the number of valid responses that were not affected by other injuries or conditions apart from rugby. The remaining 62 participants reported a total of 89 injuries. Thus, the injury rate was 1.4 per player, per season when the players with injuries that were sustained in activities apart from rugby, are excluded. In the study by Chiwaridzo et al. (2015) a total of 561 injuries between 275 players was reported, given an injury rate of two injuries per player for the 2014 season. Wall (2011) indicated that there were 118 injuries in 194 school boy union rugby players, reporting an injury rate of 0.6 injuries per player. In a study in English youth rugby union by Palmer-Green et al. (2013) the injury rate was 0.4–0.6 injuries per player per season. These underline the presence of injuries in the adolescent rugby player population and to minimise, prevent and successfully manage the injuries, it clearly indicates that injury surveillance is of continuous importance.

These statistics could indicate that some players sustained more than one injury, or that they could have sustained a second injury. In this study, ten out of the 89 injuries that were reported in the 62 valid and fully completed questionnaires were labelled as re-injuries (11.2%). In the study by Chiwaridzo et al. (2015), 36.7% of the reported injuries were documented as re-injuries. Wall (2011) reported a re-injury rate of 31.4%. The NMBM study indicated a different percentage than these studies where the difference could be attributed to both recall bias in this self-reported type of study instrument, as well as dubiety in the terminology of this self-reported questionnaire.

There is a possibility that the players that were injured were prone to complete the questionnaire, as they could relate to the subject matter. Moreover, there is a possibility that the players could feel that they did not want to disclose information regarding their injuries as it could affect their position on the team should their coach prefer not to select injured players. Although, it was attempted to reduce any uncertainty regarding anonymity by collecting the signed assent forms apart from the completed questionnaires, the fact that the players and their parents had to sign assent/consent forms with their names on it could have led to uncertainty that their information would have remained confidential.

5.6 Self-reported type of adolescent rugby injuries.

5.6.1 Self-reported type of adolescent rugby injuries as categorised by anatomical area

Although the adolescent rugby players reported injuries from all over the body, they reported that the head and face (16.9%), as well the shoulder (13.5%) and knee (13.5%) were the areas that were the mostly injured. These figures matched the literature available as certain studies found head and face injuries, including concussions, were the most prevalent amongst adolescent rugby players (Bleakley et al., 2011; Freitag et al., 2015; McIntosh 2005; Nicol et al., 2010), while some adolescent studies documented injuries to the lower limbs and shoulder (Chiwariidzo et al., 2015; Gabbett, 2008; Wall, 2011) as largely prevalent. These studies' findings correlate well with studies done in the adult rugby player population, as Bathgate et al. (2002) reported mostly head injuries, while Brooks et al. (2005) and Brookes and Kemp (2008) reported upper limb and lower limb injuries to be the most prevalent, the latter documenting head injuries as prevalent as well. These results point out that rugby has the potential to cause injuries all over the body, where head and face injuries could be considered as potential high-risk areas.

5.6.2 Self-reported type of adolescent rugby injuries as categorised by nature of injury

In this study, concussion-type injuries (10.1%) were the most prevalent type of injury to the head and face area. This finding is similar to the results obtained in an adolescent study by Freitag et al. (2015) where concussions represented 2.2% to 24.6% of the reported injuries. A similar finding was also documented by Constantinou & Bentley (2015) in high school rugby festivals where concussions represented 6% of the injuries. This prevalence of concussion-type injuries in adolescents corresponded with the prevalence of concussion-type of rugby injuries in adults, as shown in the study by Bathgate et al. (2002) where 4.9% of the injuries were concussions, and in the study by Kaux et al. (2015), a 3% to 10% concussion prevalence were recorded. Concussion-type injuries are classified as potential serious type of injuries, as it could lead to brain damage and potential death. Boksmart (2012) and Rugbysmart (2008) are examples of structured programmes that were developed to decrease the risks of such serious injuries (Quarrie et al, 2007b).

The adolescent rugby players of NMBM reported that most of their injuries were muscular in nature (42.7%). This is higher than the results found in youth rugby players by Burger et al. (2014), which reported 15% muscular types of injuries. Palmer-Green et al. (2013) also indicated a prevalence of 18% to 23% in muscular type of injuries. Bathgate et al. (2002) reported a corresponding 20% prevalence of muscular injuries in adults. Ligamentous injuries (15.7%) were also dominant and this finding was less than the findings in the study by Palmer-Green et al. (2013) where the prevalence of ligament injuries ranged between 38% and 52%. In an adult study done by Bathgate et al. (2002) ligament injuries accounted for 26% of the injuries. This study's results differ from the results in the studies mentioned, but there is a consensus that soft-tissue injuries prevail in rugby.

Given the combination of this type of study, namely self-report, and the adolescent population setting, terminology could have caused misinterpretations regarding the exact type of injury the players suffered. An example is the player who referred to his back injury as a disc type of injury and other players who reported muscle spasm. It would have been technically incorrect if a disc injury was just suggested and not confirmed by an MRI or surgery. On the other hand, some of the players could also have sustained a disc injury but was diagnosed and treated according to the symptoms of muscle spasm, and this type of injury was then reported as a muscular type of injury and not as a disc type of injury.

The broad description of a bruise type of injury could for example also be confused with a muscular type or ligament type of injury and could have been reported as one or the other, depending on the adolescent rugby player's referred framework. In addition, neural injuries were described as a type of injury where lameness, decreased sensation and numbness occurred, meaning that there was a problem with the nerve conduction. Some of the players reported a neural type of injury (5.6%), but then indicated that they could immediately go on to play, which gave the impression that they actually sustained a hard shot to a body part, causing a momentarily sensation of numbness and weakness and not actually a nerve conduction problem.

This wide interpretation of terminology was therefore seen as a problem in many studies as well as in the current study and could be addressed by including medical personnel to assist in the clarity and definition of the type of injuries and diagnoses. Nicol et al. (2010) suggested that the lack of consensus and consistency over the definition of an injury in rugby or sport generally means that study definitions can vary from 'any physical complaint', to an injury that requires 'temporary replacement', to one requiring some level of medical attention, to other 'time-loss' definitions requiring for example seven days' absence from the sport. Several researchers concluded that as wide variations existed with the definition of injuries and the collection

procedures by medical personnel, consensus need to be found regarding the type and prevalence of these injuries (Bleakley et al., 2011; Kirkwood et al., 2015).

5.7 Self-reported severity of adolescent rugby injuries

Most of the injuries sustained by the adolescent rugby players in NMBM were reported to be mild in nature (43.8%). Moderate to severe injuries accounted for 36% of the injuries, while a smaller portion of these players sustained severe injuries that kept them out of the game of rugby for more than three weeks (20.2%). A study by Wall (2011) supports this finding as injuries that were defined as being slight and were mostly dominant (48%). Chiwaridzo et al. (2015) indicated that the majority of their players sustained mild injuries (67%) that correlate well with this study's findings.

In a study done by Nicol et al. (2010) only 16.2% of the injuries were recorded as mild, while Palmer-Green et al. (2013) reported a mean severity of 30–32 days of absence from play. These findings are different from the findings in the NMBM study but could have been the result of the higher intensity levels of play when those studies were done, as well as the voluntary nature of this self-reported study.

5.8 Self-reported management, if any, of the adolescent rugby injuries

The adolescent rugby players of NMBM indicated that physiotherapy was predominantly used to treat their injuries (43.5%) and that they had also been treated by general practitioners (20.4%). It is important to note that treatment may not have been mutually exclusive, for example both physiotherapy and a general practitioner could have been involved in the treatment of a specific injury. Chiwaridzo et al. (2015) recorded that nurse first aiders were used in 69.9% of injuries

treated, with the players in his study only utilising physiotherapy for 6% of their injuries. Constantinou & Bentley (2015) indicated that the most common form of management was basic first aid, following the RICE principle (rest, ice, compression and elevation), which was followed by referral for soft tissue therapy using physiotherapy and medication.

Little information was found in the other studies on the proportional management of the adolescent rugby players' injuries, except that they were usually assisted by a team including sport physicians, physiotherapists and other. One player indicated that he was treated by a chiropractor for a growth plate injury. It was difficult to confirm whether this happened or not and consequently to conclude if it was the correct way to manage this injury. This study underlines the difficulty in collecting reliable data from a self-report questionnaire on injuries in the adolescent rugby player and it is evident that no linear conclusions between the injury type, severity and management could be safely drawn.

5.9 Information that could add value to the current self-reported questionnaire of the adolescent rugby player

This study did not elaborate on the positions/roles the players played, the time in the match when they were injured and the specific mechanisms of the player's injuries, as the aim of this study were purely to collect self-reported information on the prevalence, type, severity and management, if any, amongst adolescent rugby players in NMBM, by use of a simple easy-to-complete questionnaire. However, expansion of this questionnaire to collect and apply this information as well could lead to improved strategies to minimise, prevent and treat the adolescent rugby players' injuries.

This study indicated that it can be problematic to obtain reliable information from the adolescent rugby player via a self-reported questionnaire, as also indicated in a study by Gabbe et al. (2003), where the collected information became less reliable the higher the level of detail of their injuries was required.

CHAPTER 6

CONCLUSION

6.1 Introduction

This study was aimed at determining the type, prevalence and severity of rugby-related musculoskeletal injuries as well as the treatment of the relevant injuries, among high school rugby players attending top rugby schools in the NMBM through the development of a self-reported questionnaire. It was attempted to minimise recall bias by using easy-to-understand terminology in an anonymous self-reported questionnaire in as many high school rugby players as possible, immediately following the 2018 rugby season.

6.2 Conclusion

The self-reported results of this questionnaire indicated that head and face injuries (including concussion), and shoulder and knee injuries were mostly prevalent, ranging from 16.9% to 13.5%). The injuries reported in this questionnaire tend to be predominantly soft tissue injuries (muscular and ligamentous injuries adding up to 49.4% of the injuries) and were reported to be mild in nature (43.8% of the injuries). Many of these reported injuries (43.5%) were treated by physiotherapy. These findings were similar to the findings in other national and international studies, except that the other studies highlighted the use of other medical professionals in addition to physiotherapy. The response rate of 41.9% in this NMBM-study was considered to be too low to be representative of the chosen population.

6.3 Limitations

Although a self-reported questionnaire is supposed to collect a vast amount of information fairly easily, the response rate in this study was not good enough to be representative of the chosen population, underlining the difficult task to develop and implement the use of a self-reported questionnaire, especially in the adolescent population.

The low response rate on the self-reported questionnaire could have been attributed by a combination of the adolescent rugby players' busy schedules as well as by the voluntary nature of the self-reported study. Potential restricted electronic access to the self-reported questionnaire could also have been contributed to the low response rate.

The adolescents' referring frameworks and the fact that adolescents are still developing their language skills and perceptions of themselves and their bodies could have led to dubiety in terminology. This finding correlates with other studies that found a wide variation in injury definitions and indicates that the data collected on injuries is not always easily interpreted.

6.4 Recommendations

A better response to the self-reported questionnaire could be negotiated if a specific environment was set up to collect the required data. A meeting between the researcher and rugby players during the last rugby practice, where the players could answer the quick-to-complete questionnaire at the schools' computer facility, using the school's internet access could yield a better response rate. Alternatively, printed questionnaires could also have been supplied and completed during this meeting and then collected immediately. These measures in turn could lead to improved reliability of the self-reported questionnaire.

Dubity of the terminology could be minimised by use of a medical trained individual or team that aid in clarifying diagnoses and other terminology with the players during the rugby season and at the time of completion of the questionnaire, thereby increasing the reliability and validity of the self-reported questionnaire.

6.5 Future research

As injuries are widely reported by adolescent rugby players, and as self-reported questionnaires could supply vast amounts of data fairly easy, it should be continuously attempted to secure a reliable, easy and quick-to-complete questionnaire for use in these adolescent rugby players, ensuring easy accessibility to complete the questionnaire.

The questionnaire could be expanded to search for the relationship between the age groups, ethnicity, and the use of financial assistance, as well as the players' position, time of match-play and mechanism of injuries. However, the increasing level of detail in this type of self-reported study could cause a decrease in recall accuracy. Yet, this could be minimised with the assistance of a medically trained person during the season and by having the questionnaire completed immediately after the rugby season.

All this information can be useful to implement improved preventative, treatment and rehabilitative strategies and programmes.

REFERENCE LIST

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ADDENDA

**ADDENDUM A: QUESTIONNAIRE: SELF-REPORTED
PREVALENCE, TYPE, SEVERITY AND MANAGEMENT
OF MUSCULOSKELETAL INJURIES AMONG HIGH
SCHOOL RUGBY PLAYERS IN THE NELSON
MANDELA BAY METROPOLE, INCLUDING ASSENT
FORM ON FIRST PAGE.**

2. Do you want to fill in the questionnaire? *(the questionnaire will stop automatically if you answer no)*

- Yes
- No



Rugby Injuries High School - *Complete this questionnaire only once!*

3. Do you understand that you can withdraw at any time should you want to?

- Yes
- No



Rugby Injuries High School - *Complete this questionnaire only once!*

General

4. In what grade are you currently?

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

5. In what age group did you compete in the year 2018?

- Under 14 years old
- Under 15 years old
- Under 16 years old
- Under 18 years old and/or First XV
- Other (please specify)

6. What is your ethnicity? *(this question is purely for demographic purposes)*

- Black
- White
- Coloured
- Indian / Asian
- Other (please specify)

7. Are you making use of a bursary or any financial help in order to attend this school?

- Yes
- No



Rugby Injuries High School - Complete this questionnaire only once!

Pre-existing Conditions

8. Did you suffer from any pre-existing conditions that is *not related* to playing rugby? *(If you answer yes, this questionnaire will stop as it only focusses on rugby injuries)*

- No
- Yes

6. Did you suffer any injuries to the following areas of your body while playing rugby during the 2017/2018 high school rugby season?

Head or Face Injuries	Yes / No
Neck injuries	Yes / No
Shoulder Injuries	Yes / No
Elbow and Forearm Injuries	Yes / No
Wrist and Hand Injuries	Yes / No
Back and Chest Injuries	Yes / No
Buttock, Hip and Groin Injuries	Yes / No
Thigh Injuries	Yes / No
Knee Injuries	Yes / No
Calf and Shin Injuries	Yes / No
Ankle and Foot Injuries	Yes / No

↓ In the case of more than one injury to the same body part, the participant will be given the option of more boxes to tick and complete regarding the injuries of the same body site, in order to collect data on each injury.

Three automatic questions

will pop up if answered positively

on any of the above questions,

regarding:

What type of injury did you suffer? (giving choices to tick, for example ligament injury / muscle injury / fracture / bruises / dislocations / wounds that needed stitches)

How long did this injury kept you out of practising rugby? (giving choices to tick for example less than one week / between one and three weeks / more than three weeks)

How was your injury treated? (giving choices to tick for example as treated by general practitioner, treated by chiropractor / treated by physiotherapist and other options.

ADDENDUM B: MAP OF INVITED HIGH SCHOOLS



Map 3.1: MAP OF NMBM HIGH SCHOOLS INVITED TO PARTAKE IN STUDY

ADDENDUM C: TOP THREE RANKINGS PER AGE GROUP IN NMBM AT THE END OF RUGBY SEASON 2017

- U14: (ranked 16th) : Pearson High School
(ranked 46th) : Grey High School
(ranked 54th) : Otto du Plessis High School
- U15: (ranked 23th) : Framesby High School
(ranked 35th) : Despatch High School
(ranked 37th) : Die Brandwag High School
- U16: (ranked 22nd) : Die Brandwag High School
(ranked 28th) : Framesby High School
(ranked 29th) : Grey High School
- U18: (ranked 14th) : Grey High School
(ranked 26th) : Framesby High School
(ranked 56th) : Die Brandwag High School

(Reference: SASchoolsports, 2017)

ADDENDUM D: ETHICS APPROVAL



Health Research Ethics Committee (HREC)

[Approval Notice](#)

[New Application](#)

20/04/2018

Project ID :1818

HREC Reference #: S17/10/234

Title: SELF-REPORTED PREVALENCE, TYPE, SEVERITY AND MANAGEMENT OF MUSCULOSKELETAL INJURIES AMONG HIGH SCHOOL RUGBY PLAYERS IN THE NELSON MANDELA BAY METROPOLE

Dear Mrs Cecilia Louw,

The Response to Modifications received on 27/03/2018 08:44 was reviewed by members of Health Research Ethics Committee 2 (HREC2) via expedited review procedures on 20/04/2018 and was approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: This project has approval for 12 months from the date of this letter.

Please remember to use your Project ID [1818] on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review

Please note you can submit your progress report through the online ethics application process, available at: Links Application Form Direct Link and the application should be submitted to the HREC before the year has expired. Please see [Forms and Instructions](#) on our HREC website (www.sun.ac.za/healthresearchethics) for guidance on how to submit a progress report.

The HREC will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: <https://www.westerncape.gov.za/general-publication/health-research-approval-process>. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: [Forms and Instructions](#) on our HREC website <https://applyethics.sun.ac.za/ProjectView/Index/1818>

If you have any questions or need further assistance, please contact the HREC office at 021 938 9877.

Yours sincerely,


HREC Coordinator,

Health Research Ethics Committee 2 (HREC2).

National Health Research Ethics Council (NHREC) Registration Number:

ADDENDUM E: DEPARTMENT OF EDUCATION - EASTERN CAPE APPROVAL



STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES

Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)40 608 4773/4035/4537 • Fax: +27 (0)40 608 4574 • Website: www.ecdoe.gov.za

Enquiries: [REDACTED]

Email: [REDACTED]

Date: 11 June 2018

Mrs. Cecilia Elizabeth Louw

P.O. Box 19439

Linton Grange

6015

Dear Mrs. Louw

PERMISSION TO UNDERTAKE A MASTERS THESIS: SELF-REPORTED PREVALENCE, TYPE, SEVERITY AND MANAGEMENT OF MUSCULOSKELETAL INJURIES AMONG HIGH SCHOOL RUGBY PLAYERS IN THE NELSON MANDELA METROPOLE

1. Thank you for your application to conduct research.
2. Your application to conduct the above mentioned research from six (6) selected High Schools in Nelson Mandela Bay District under the jurisdiction of the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:
 - a. there will be no financial implications for the Department;
 - b. institutions and respondents must not be identifiable in any way from the results of the investigation;
 - c. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;
 - d. you will make all the arrangements concerning your research;
 - e. the research may not be conducted during official contact time;
 - f. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to Chief Director: Strategic Management Monitoring and Evaluation;

- g. your research will be limited to those institutions for which approval has been granted, should changes be effected written permission must be obtained from the Chief Director: Strategic Management Monitoring and Evaluation;
 - h. you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis.
 - i. you present the findings to the Research Committee and/or Senior Management of the Department when and/or where necessary.
 - j. you are requested to provide the above to the Chief Director: Strategic Management Monitoring and Evaluation upon completion of your research.
 - k. you comply with all the requirements as completed in the Terms and Conditions to conduct Research in the ECDoE document duly completed by you.
 - l. you comply with your ethical undertaking (commitment form).
 - m. You submit on a six monthly basis, from the date of permission of the research, concise reports to the Chief Director: Strategic Management Monitoring and Evaluation
3. The Department reserves a right to withdraw the permission should there not be compliance to the approval letter and contract signed in the Terms and Conditions to conduct Research in the ECDoE.
 4. The Department will publish the completed Research on its website.
 5. The Department wishes you well in your undertaking. You can contact the Director, [REDACTED] on the numbers indicated in the letterhead or email [REDACTED] should you need any assistance.

[REDACTED]

**DIRECTOR: STRATEGIC PLANNING POLICY RESEARCH & SECRETARIAT SERVICES
FOR SUPERINTENDENT-GENERAL: EDUCATION**



ADDENDUM F: CONSENT FORMS FOR PARENT OF RUGBY PLAYER & CONSENT FORM FOR RUGBY PLAYER

F(a): PARENT OF RUGBY PLAYER'S INFORMATION LEAFLET AND CONSENT FORM

SELF-REPORTED PREVALENCE, TYPE, SEVERITY AND MANAGEMENT OF MUSCULOSKELETAL INJURIES AMONG HIGH SCHOOL RUGBY PLAYERS IN THE NELSON MANDELA BAY METROPOLE.

RESEARCHER: MRS CELIZE LOUW

ADDRESS: DEPARTMENT OF PHYSIOTHERAPY
UNIVERSITY OF STELLENBOSCH
STELLENBOSCH

CONTACT NUMBER:

Your child is being invited to take part in a research project. Please read the information presented here carefully, which will explain the details of this project. Please do ask any questions about any part of this project that you do not fully understand.

The way the information is collected will be **totally anonymous** and there will be no way to link any information to the player or the player's school.

You and your child's participation are **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you or your child negatively in any way whatsoever. You are also free to withdraw your child from the study at any point, even if you do agree your child to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University**, as well as **the Department of Education (Eastern Cape)** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

This study aims to develop a valid self-report questionnaire, to determine:

- ***The type of rugby injuries,***
 - ***How many of these injuries occurred (prevalence)?***
 - ***How long it kept the player from practising rugby(severity),***
 - ***If any, what treatment the player received,***
- among the high school rugby players of the Nelson Mandela Bay Metropole during the 2018 season.*

How is this research study done?

The player has to complete an anonymous, short, basic questionnaire online (SurveyMonkey®).

Why is this research study done?

The results can indicate whether there is a need for education of the high school rugby players in the Nelson Mandela Metropole regarding rugby injuries and treatment available. The data collected can lead to further surveys regarding the prevention of injuries.

Why has your child been invited?

Your child is part of the selected group of the top three high schools' rugby players in each competing age group in the NMBM, as published in the week of 29 August – 1 September 2017. (as in the SA Schoolsports top 100 ranking). The competing age groups are the Under-14, Under-15, Under-16 and Under-18-groups.

Are there any risks involved in your child's taking part in this research?

Your child will not be exposed to any physical interventions, as he will only be requested to complete an online questionnaire on SurveyMonkey. No treatment is involved and all information will be kept strictly confidential and anonymous.

If you do not agree to take part, what alternatives do you have?

Rugby injuries can be reported to your general practitioner if you need to discuss your child's rugby injuries to someone else than the researcher.

Who will have access to your child's medical records?

All information collected will be treated as confidential and protected. If it is used in a publication or thesis, the identity of the participant will remain anonymous. Your child's name will never appear on this questionnaire. Any information revealed will never be shared to any persons of concern, not to your coach, or anyone else. Only the anonymous data on the type, prevalence and severity of the injuries, as well as the type of treatment received will be documented in this thesis, available for insight at the University of Stellenbosch.

Will you or your child be paid to take part in this study and are there any costs involved?

No, you or your child will not be paid to take part in the study. There will be no costs involved for you or your child, if your child does take part. They will however receive a healthy snack to thank them for their participation.

Is there anything else that you should know or do?

You can contact Celize Louw at tel 082 4407 327 / 041 360 1009 if you have any further queries or encounter any problems.

You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study doctor.

You will receive a copy of this information and consent form for your own records

Declaration by rugby player’s parent

By signing below, I agree to let my child,
.....take part in a research study entitled SELF-REPORTED
PREVALENCE, TYPE, SEVERITY AND MANAGEMENT OF MUSCULOSKELETAL INJURIES AMONG
HIGH SCHOOL RUGBY PLAYERS IN THE NELSON MANDELA BAY METROPOLE.

I declare that:

- *I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.*
- *I have had a chance to ask questions and all my questions have been adequately answered.*
- *I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.*
- *I may choose to leave the study at any time and will not be penalised or prejudiced in any way.*
- *I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.*

Signed at (place) on (date) 2018.

.....
Signature of rugby player’s parent

.....
Signature of witness

Declaration by investigator

I, Celize Louw, declare that:

- *I explained the information in this document to*
- *I encouraged him/her to ask questions and took adequate time to answer them.*
- *I am satisfied that he/she adequately understands all aspects of the research, as discussed above*
- *I did/did not use an interpreter. (If an interpreter is used then the interpreter must sign the declaration below.*

Signed at Port Elizabeth on 2018.

.....
Signature of investigator

.....
Signature of witness

F(b): RUGBY PLAYER INFORMATION LEAFLET AND CONSENT FORM

(NEED TO BE ACCOMPANIED BY PARENT'S CONSENT FORM)

SELF-REPORTED PREVALENCE, TYPE, SEVERITY AND MANAGEMENT OF MUSCULOSKELETAL INJURIES AMONG HIGH SCHOOL RUGBY PLAYERS IN THE NELSON MANDELA BAY METROPOLE.

RESEARCHER: MRS CELIZE LOUW

ADDRESS: DEPARTMENT OF PHYSIOTHERAPY
UNIVERSITY OF STELLENBOSCH
STELLENBOSCH

CONTACT NUMBER:

You are being invited to take part in a research project. Please read the information presented here carefully, which will explain the details of this project. Please do ask any questions about any part of this project that you do not fully understand.

The way the information is collected will be totally anonymous and there will be no way to link any information to the player or the player's school.

Your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University** as well as **the Department of Education (Eastern Cape)** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

This study aims to develop a valid self-report questionnaire, to determine:

- ***The type of rugby injuries,***
- ***How many of these injuries occurred (prevalence),***
- ***How long it kept the player from practising rugby (severity),***
- ***If any, what treatment the player received,***

among the high school rugby players of the Nelson Mandela Bay Metropole during the 2018 season.

How is this research study done?

The player has to complete an anonymous, short, basic questionnaire online (SurveyMonkey®).

Why is this research study done?

The results can indicate whether there is a need for education of the high school rugby players in the Nelson Mandela Metropole regarding rugby injuries and treatment available. The data collected can lead to further surveys regarding the prevention of injuries.

Why have you been invited to participate?

You are part of the selected group of the top three high schools' rugby players in each competing age group in the NMBM, as published in the week of 29 August – 1 September 2017. (as in the SA Schoolsports top 100 ranking). The competing age groups are the Under-14, Under-15, Under-16 and Under-18-groups.

Are there in risks involved in your taking part in this research?

No physical risks are involved. It is completely safe to complete the questionnaire, as no treatment is involved and all information will be kept strictly confidential and anonymous.

If you do not agree to take part, what alternatives do you have?

Rugby injuries can be reported to your general practitioner if you need to discuss your rugby injuries to someone else than the researcher.

Who will have access to your medical records?

All information collected will be treated as confidential and protected. If it is used in a publication or thesis, the identity of the participant will remain anonymous. Your name will never appear on this questionnaire. Any information revealed will never be shared to any persons of concern, not to your coach, or anyone else. Only the anonymous data on the type, prevalence and severity of the injuries, as well as the type of treatment received will be documented in this thesis, available for insight at the University of Stellenbosch.

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study. There will be no costs involved for you, if you do take part. You will however receive a healthy snack to thank you for your participation.

Is there anything else that you should know or do?

You can contact Celize Louw at tel 082 4407 327 / 041 360 1009 if you have any further queries or encounter any problems.

You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study doctor.

You will receive a copy of this information and consent form for your own records.

Declaration by rugby player

By signing below, I agree to take part in a research study entitled

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Signed at (place) on (date) 2018.

.....
Signature of rugby player

.....
Signature of witness

Declaration by investigator

I, Celize Louw, declare that:

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- *I encouraged him/her to ask questions and took adequate time to answer them.*
- *I am satisfied that he/she adequately understands all aspects of the research, as discussed above*
- *I did/did not use an interpreter. (If an interpreter is used then the interpreter must sign the declaration below.*

Signed at Port Elizabeth on 2018.

.....
Signature of investigator

.....
Signature of witness