# The epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal.

By

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I, Johan Adriaan Wiggill, do declare that this dissertation is representative of my own work in both conception and execution (except where acknowledgements indicate to the contrary).

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# Dedication

*I DEDICATE THIS DISSERTATION TO MY FRIENDS, FAMILY AND ESPECIALLY MY PARENTS, ABRAHAM AND ELIZE WIGGILL. I JUST WANT TO THANK YOU FOR ALL YOUR SUPPORT, ENCOURAGEMENT AND LOVE. THIS DISSERTATION WOULD NOT BE POSSIBLE WITHOUT YOU.*

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# Abstract

**Background:** Ringball is closely examined and compared to basketball and netball due to the fact that ringball is derived from those two sports (Gubby and Wellard, 2015), although the biomechanics differ from one another. This may expose players to different factors that can cause various injuries. Identifying the risk factors such as age, weight, height, warming up or not warming up before practice or competitive games etc. (Sinclair et al., 2014: 31-36; Murphy et al., 2003: 15; Russell, 2015), may help us understand, identify, prevent and manage injuries sustained during play. There are similarities of the injuries sustained between basketball and netball, however, the most common and least common injuries may be different.

**Aim and Objectives:** The aim of this study was to profile musculoskeletal injuries of ringball players in KwaZulu-Natal. The objectives of this study were: to determine the period prevalence of musculoskeletal injuries in ringball players; to profile different types of musculoskeletal injuries in terms of location and severity; to determine the mechanisms and selected risk factors (e.g. age, height, protective gear, warming up etc.) of the injuries; and to determine the manner in which participants manage their musculoskeletal injuries sustained.

**Method:** The research design was a quantitative paradigm, cross-sectional descriptive survey, using a structured questionnaire. The questionnaire was administered to 110 male and female ringball players in KwaZulu-Natal. Data from the questionnaire was statistically analysed using the IBM Statistical Package for the Social Sciences (SPSS) package (version 25) with a p-value of $\leq 0.05$ indicating statistical significance. The data was described using frequencies and percentages for categorical variables and means and standard deviations for continuous variables. In order to assess associations between risk factors and injury, a Pearson's chi square test was performed for categorical risk factors, and t-tests were performed for continuous variables.

**Results:** A target population of 110 was calculated from a total of 152 players. The target population included male and female ringball players who were 16 years and older. Of the 110 questionnaires administered, 76 ringball players completed the research questionnaire. This resulted in a response rate of 69.1%. The prevalence of at least one injury, after at least one season played, in ringball players was 80.3% (n= 61). The most commonly reported location of injuries was foot/ankle injury at 35.5% (n= 33), followed by knee injury at 29% (n= 27) and wrist injury at 8.6% (n= 8). The most common mechanism of injury that was reported was landing 15.3% (n= 9), jumping 8.5% (n= 5), goal shooting 6.8% (n= 4), defending 6.8% (n= 4), collision 6.8% (n= 4), and other mechanisms 6.8% (n= 4). The participants reported that the most common healthcare professional utilised in general was self-treatment followed by no treatment. Only after the participants' first injury, was there an indication of use of healthcare professionals such as physiotherapists, chiropractors and general practitioners. Furthermore, significant association between injury and not warming up before training (p-value of 0.013) and competitive matches (p-value of 0.044) was found.

**Discussion:** This study revealed that ringball shares many similarities to basketball and netball (for example: the most common location of injury was the foot/ankle and knee). Mckay et al., (1996), reported minor differences between their study. and this one.Mckay et al., (1996) reported that the hand was the second most commonly injured area, whereas this study reported that the knee was the second most commonly injured area. This study reported that the foot/ankle, knee and wrist were most commonly injured. The results showed that there was a lack of primary healthcare professionals at competitive matches and training sessions. Primary healthcare professionals are needed at the relevant matches and training sessions so that the players can receive adequate treatment and management/treatment protocols since most of the ringball players reported that they received no treatment or applied self-treatment. This study also highlights the fact that coaches and players should pay special attention to warming up before any competitive match and training session since not doing so before training and competitive matches was a significant finding that was associated with injury.

**Conclusion:** Over the last decade, ringball has emerged as a popular sport played across South Africa as well as internationally. The combination of the sport's uniqueness and similarities to other sport provides an interest platform for new research, particularly in terms of injuires, as highlighted in this study.

**Key words:** ringball, risk factors, period prevalence, mechanism of injury.

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# Definitions

**Prevalence:** The percentage of a population that is affected with a particular disease at a given time (Merriam-Webster Dictionary, 2019). Period prevalence in this study refers to any injury during the season of a ringball player after they played at least one season/year of ringball.

**Period prevalence:** Is the number of persons with a specific disease at one point in time divided by total number of persons in the population (Martin, 2009).

**Risk factors:** Something that increases risk or susceptibility (Merriam-Webster Dictionary, 2019).

**Biomechanics:** The mechanics of biological and especially muscular activity (as in locomotion or exercise) (Merriam-Webster Dictionary, 2019).

**Primary healthcare professionals:** Primary healthcare is a term used to describe a range of healthcare providers who work in the community. Any healthcare professional who is the first point of contact for the health system can be a primary healthcare provider (Primary healthcare explained, 2015).

**International federation:** The International Sports Federations (IFs) are non-governmental organisations that are recognised by the International Olympic Committee (IOC) as administering one or more sports at world level (International Sports Federations, 2019).

**Injury:** Physical harm or damage to someone's body caused by an accident or an attack (Cambridge Dictionary, 2020).

**Overuse injury:** An overuse injury is any type of muscle or joint injury, such as tendinitis or a stress fracture, that is caused by repetitive trauma. An overuse injury typically stems from: Training errors. Training errors can occur when you take on too much physical activity too quickly (Mayo Clinic, 2019).

**Traumatic injury:** Traumatic injury is a term which refers to physical injuries of sudden onset and severity which require immediate medical attention (UF Health, 2020).

# Abbreviations

Abbreviations that appear in this study:

BMI: Body mass index

Kg: Kilogram

Cm: Centimetre

ACL: Anterior Cruciate Ligament

SPSS: Statistical Package for the Social Science

# CHAPTER ONE
# Introduction

## 1.1 Background

Ringball or "korfball" is a traditional, non–contact, family-orientated team sport played by both males and females and is comprised of elements from netball and basketball. The game is played by passing the ball between players with the intention of scoring a goal by shooting it in the basket above, one of which which is situated on either side of the court (Gubby and Wellard, 2015).

In 1902, a Dutch primary school teacher developed the sport now known as ringball (Summerfield and White, 1989). The word in Dutch “korf”, is directly translated from the English word basket and the word korfball emerged (Van Bottenburg and Vermeiden, 2011). The reason for the creation of korfball was to encourage both male and female participants to participate in the sport at an equal level (Summerfield and White, 1989). In South Africa basketball was introduced more than 100 years ago after which the rules of the game were adapted to allow women to compete in matches.

Between the years 1907 and1916, this new sport, korfball, was played under the South African basketball union and introduced to Afrikaans schools. Korfball was then made a provincial sport which became nationally and internationally recognized. There are currently approximately 2500 players in South Africa from all nine provinces who compete against each other every year.

In 2007 the name was changed to ringball, and in 2010 the International Ringball Federation was formed which introduced ringball to the world. Ringball has been played for approximately 100 years and there is still little to no information about injuries sustained (Moments in the History of Korfball – Ringball, 2012).

In this study, ringball is closely examined and compared to basketball and netball due to the fact that ringball is derived from those two sports. Although ringball is derived from basketball and netball (Gubby and Wellard, 2015), the biomechanics differ from

one another. This may expose players to different factors that can cause various injuries. Identifying the risk factors such as age, weight, height, warming up or not warming up before practice or competitive games etc. (Murphy *et al.,* 2003: 15; Russell, 2015: Sinclair *et al.,* 2014: 31-36;), may help us understand, identify, prevent and manage injuries sustained during play. There are common similarities of the injuries sustained between basketball and netball, however, the most common and least common injuries may be different to one another.

The most common injuries reported in basketball are foot/ankle injuries and knee injuries, which make up 39.7% and 14.7% of all injuries respectively (Borowski *et al.,* 2008: 2328-2335). The most common injuries reported in netball are ankle joint injuries making up 37.5% of injuries and knee injuries making up 28.6% of injuries (Pillay and Frantz, 2012: 7-10). The least common injuries found in basketball are as follows: face/head/neck at 13.6%, hand/arm at 9.6% and the upper leg/thigh and hip at 8.4% (Borowski *et al.,* 2008: 2328-2335). The least common injuries found in netball are as follows: the leg at 7.3%, hand and wrist 6.7%, shoulder 6%, back 4.7%, thigh 3.3%, neck, head, chest 3% and elbow/ arm 3% (Pillay and Frantz, 2012: 7-10). One can see the similarities in the two sports' types, however, differences do appear between the two sports from most common to least common injuries. As a result, it is suspected that ringball may also show differences.

Ringball is not well documented and there is a dearth of knowledge of injuries sustained during play and how these injuries are managed. By documenting the risk factors and injuries sustained in terms of location, severity, mechanism of injury etc. one can help prevent further injuries from taking place and help manage the injuries which are sustained.

## 1.2 Aims and objectives of the study

The aim of this study is to profile musculoskeletal injuries of ringball players in KwaZulu-Natal.

**Objectives**

To determine the period prevalence of musculoskeletal injuries in ringball players.

To profile the different types of musculoskeletal injuries in terms of location and severity.

To determine the mechanisms and selected risk factors (e.g. age, height, protective gear, warming up etc.) of the injury.

To determine how participants manage their musculoskeletal injuries sustained.

## 1.3 Rationale for the study

There is currently no information on the injuries and management protocols catalogued for this sport. Therefore, this study will provide information on the injury profile of ringball players in South Africa and consequently help organizing bodies to provide guidelines and preventative measures to prevent, reduce and manage injuries, from an individual and organizational perspective. This may also guide practitioners such as chiropractors, physiotherapists and biokineticists in the treatment of injuries and the rehabilitation process through possible tailored injury recovery/rehabilitation protocols.

## 1.4 Flow of dissertation

Chapter One is an introduction to the study and provides information on the background and the rationale for the study. This chapter provides brief information on ringball and justifies the need for the study. The aims and objectives are included in this chapter.

Chapter Two provides the review of the current literature available. There will be an in depth analysis and discussion of the topic that is currently being investigated. This chapter used the literature of basketball and netball to acquire the relevant information needed to build a profile of injuries and other information that can be compared to the

data obtained from the research topic upon completion.

Chapter Three details the methodology of the study. This chapter provides in detail the procedure of the study and how it commenced. It provides the information of the research design, the methods that were implemented and research tools that were used to gather the relevant data for this study.

Chapter Four details the results of the study. The data is presented in forms of graphs, tables and charts. A brief description of the data that are shown in various forms is provided to better comprehend the information provided.

Chapter Five provides a discussion of the results in terms of current literature. The results of Chapter Four are compared to the literature of Chapter Two and the results are then discussed in correlation to the aims and objectives of the study.

Chapter Six provides a conclusion along with any limitations related to the study and makes recommendations for further research.

# CHAPTER TWO

# Literature review

## 2.1 Introduction

Scientific literature supports wellness and health benefits of participating in different sports. However, research shows that competitive sports predispose athletes to increased risks of musculoskeletal injuries which may be detrimental to their careers (Rechel *et al*., 2008). The prevalence of musculoskeletal injuries on ringball players is of interest in this study.

Ringball or ‘korfball', is a game of Dutch origin, which has been played for at least 100 years throughout the world. Though still a minor sport by modern standards, the game has achieved popularity in South Africa and is played in all regions of the country. Currently, the Ringball Association of South Africa has approximately 2500 members across all provinces. Provinces compete within themselves and then compete against each other at a national level.

This chapter serves to provide the reader with a brief history of ringball and an outline of relevant sports (basketball and netball) to understand the injuries related to the sport, together with a review of the literature related to the incidence and prevalence of injuries in the sport.

## 2.2 Ringball

In 1902, a Dutch primary school teacher developed the sport now known as korfball (Summerfield and White, 1989). Korfball shares similarities with basketball and netball and is classified as a team sport (Gubby and Wellard, 2015). The word korfball originated from the English word basket, which was directly translated from the Dutch word “korf” (Van Bottenburg and Vermeiden, 2011). The reason for the creation of korfball was to encourage both male and female participants to participate on a level equal to each other (Summerfield and White, 1989). In South Africa basketball was

introduced more than 100 years ago after which the rules of the game were adapted to allow women to compete in matches. Between the years 1907 and 1916, this new sport, Korfball, was played under the South African basketball union and introduced to former Afrikaans schools. Korfball was then classified as a provincial sport that became nationally and internationally recognized. There are currently approximately 2500 players in South Africa from all nine provinces that compete against each other every year. In 2007 the name was changed to ringball and in 2010 the International Ringball Federation was formed which introduced ringball to the world. Ringball has been played for approximately 100 years and there is still little to no information on the injuries sustained (Moments in the History of Korfball – Ringball, 2012).

### 2.3 Difference between ringball, basketball and netball

The differences between ringball, basketball and netball include different game rules and different court types (Errey, 2016). Ringball has nine players, netball has seven and basketball five players. In netball, the player receiving the ball, must come to an immediate stop and stay on the same foot on which he/she landed and play the ball without moving the foot on which he/she landed (Play simple netball, 2016). The gameplay of basketball is a continuous flow of running and walking while dribbling the ball in motion (Breakthrough basketball, 2016). In ringball, when receiving the ball, one is allowed to take an extra two to three steps before stopping, reducing the sudden force on the knee, foot and ankle. These differences can be important to the variety of injuries sustained due to changes in the flow of motion. In general, no contact between ringball players is allowed during a match.

Blocking of the ball is allowed in netball if the space between the attacker and defender is more than three feet and the defender is not touching the ball. This applies to goal shooting and attacking. When scoring a goal, the goal shooter is required to be in the goal area or circle (Active, 2015). The shooter's knees should be flexed and shooting elbow must be flexed above the shoulder. The hand must be extended to stabilize the ball which is thrown above the shoulder to the goal net.

In ringball, blocking during gameplay is the same as netball but there is a difference when shooting for a goal. When a shooter wants to shoot for a goal he/she must be

outside the goal area or half circle. The elbow must be slightly flexed below the shoulder and the forearm and hand facing laterally upwards towards the head, holding the ball. The shooter throws the ball with a fast radial and ulna deviation with the thumb facing upwards toward the head that can allow for rotation of the ball. The ball must leave the goal shooter's hand below the shoulder and must enter the goal net from above.

In basketball, any player can score points by throwing the ball through the hoop whether they are inside or outside of the half circle. The further away from the hoop the player is when he/she releases the ball, the greater the number of points that can be scored (Breakthrough basketball, 2016). When standing before jumping to throw the ball to the goal net the shooting elbow is in full flexion with the forearm pronated towards the net and the ball leaves the hand with the hand in full flexion (Breakthrough basketball, 2016; Play simple netball, 2016).

Different biomechanical movements are required of the players to score points between the three sports and all biomechanics are subject to change again when attempting to score from different distances. The further the distance needed to shoot, the more force is needed to be applied to throw, the more strain is placed on the affected joints that can predispose the player to injury.

Differences in netball and basketball often present with different associated injuries that commonly occur. There is a great similarity of the injuries between the sports, but there is also a difference between the most common and least common injuries. The differing biomechanics used to compensate for the rules of the games lead to different management strategies and preventative protocols used to strengthen different aspects of the body to ensure that it can endure the changes in force that the body is exposed to when playing these games.

### 2.4 Injury prevalence of basketball and netball

Studies indicate there is a high prevalence of injuries in basketball and netball. By the use of the studies below one can compare and identify the similarities and differences in the injuries recorded.

Andreoli *et al.,* (2018) completed a systematic review on basketball injuries and observed 12960 injuries. Most injuries were reported to be in the lower limb of which 21.9% (n= 2832) were in the ankle and 17.8% (n= 2305) in the knee (Andreoli *et al.,* 2018). Mckay *et al.,* (1996) reported in his study (n= 9190 participants) that the knee (17.8%), ankle (30.2%) and hand (20.9%) were the most common areas injured. This shares similarities to the study conducted by Andreoli *et al.,* (2018).

Borowski, Yard, Field and Comstock, (2008) completed a descriptive epidemiological study that reported similar results (Andreoli *et al*., 2018; Mckay *et al.,* 1996). The study was done on high school basketball players in the United States (US) that reported a total of 1518 athlete sustained injuries. The injury rate was determined to be 1.94 out of 1000 players. The rate was less during practices (1.4), compared to those during competition exposures (3.27) (Borowski *et al.,* 2008: 2328-2335). The most common injuries reported were the foot/ankle at 39.7%, knee at 14.7%, face/head/neck at 13.6%, hand/arm at 9.6% and the upper leg/thigh and hip at 8.4% (Borowski *et al.,* 2008: 2328-2335).

Additionally, the similarities of injuries reported by Andreoli *et al*., (2018), Borowski *et al.,* (2008) and Mckay *et al.,* (1996) were measured from most common to least common/frequent injuries. All three of the studies reported that the foot/ankle (21.9%, 39.7% and 30.2%) and knee (17.8%, 14.7% and 17.8) were the most common sites to be injured (Andreoli *et al*., 2018; Borowski *et al.*, 2008; Mckay *et al.,* 1996).

A cross-sectional descriptive study by Pillay and Frantz, (2012) used a questionnaire investigating the prevalence, mechanism, management and severity of injuries in netball players (n= 254). Out of the 254 players, 157 (61.8%) were injured during the tournament in 2010. Throughout the season there were 301 injuries reported producing an injury rate of 1.9 per player. The majority of the injuries were found to be in the ankle joint at approximately 37.5% and knee at approximately 28.6%. Other injuries were lower leg at 7.3%, hand and wrist 6.7%, shoulder 6%, back 4.7%, thigh 3.3%, neck, head, chest 3% and elbow/ arm 3%. (Pillay and Frantz, 2 012: 68(3): 7-10).

Ferreira and Spamer, (2010) reported that the areas that were most commonly affected on female netball players were the ankle at 39.13%, knee 28.26% and lastly the cervical area at 8.69%, which shared similarities to Hampton, (2012). Hampton, (2012) completed a study on lower limb injury in netball players (n= 61) and 70% of the players reported an injury. The most common areas were the ankle (64%) and the knee (15%).

The current injury profiles mentioned above, netball (Ferreira and Spamer, 2010; Pillay and Frantz, 2012: 68(3): 7-10; Hampton, 2012) and basketball (Andreoli *et al.,* 2018; Borowski *et al.,* 2008; Mckay *et al.,* 1996), provide significant evidence of injury prevalence and share many similarities in the areas that were most commonly injured. The most common areas of injury reported in basketball and netball players were reported to be at the ankle and knee joint. Other regions that also shared similarities in injuries were the hands/arms and thighs.

Although many similarities were found between these two sports, minor differences were reported. The differences in injuries can be observed in netball and basketball by comparing the least most common areas of injury. For example: Pillay and Frantz, (2012) reported that 6% of the netball players sustained a shoulder injury and 3% of the players reported head, neck and chest injury. Borowski *et al.,* (2008) reported a slight difference in results where 2.8% and 2.5% of both male and female basketball players sustained shoulder and upper arm injury and 13.6% of the players reported face, head and neck injury.

Although evidence of injury prevalence is shown in basketball and netball, there is a lack of evidence/ knowledge in ringball. Thus, this study aims to determine the similarities, differences and severity of the injuries sustained to ensure the correct protocols are followed to prevent future injury, reoccurrence and to assist with the management plan of the injuries associated with ringball.

Basketball and netball injuries may share many similarities and minor differences in the type of injury but the severity differs between sports due to the difference in physicality, speed and continuity of motion (Sport Injury Clinic, 2014). The rules of the sport determine the speed, amount of force needed to be absorbed by the joints, the

different movements that need to be made and the physicality of the sport which will determine the type of injuries that can occur, the severity and location of the injury and the mechanism of injury. Therefore, the difference in the rules and physicality of the sport, can yield varying results in this study for ringball.

## 2.5 Selected risk factors

The risk factors that play a role in the general injuries sustained for these three sports can be divided into two groups; extrinsic and intrinsic risk factors (Massey, 2015). The extrinsic risk factors include the court surface that the games are played on, the shoe type that is worn (Sinclair *et al*., 2014: 31-36; Murphy *et al.,* 2003: 15), the speed and physicality/skill level and warm up routine before playing. Other risk factors that were generally noted were overuse injuries, exhaustion and incorrect conditioning of the body (Russell, 2015), previous injury, continuous jumping, sudden stopping (McKay *et al.,* 2001) and quick changes in direction during play (Sport injury clinic, 2014).
The intrinsic risk factors include age, weight (BMI), height, (Massey, 2015), aerobic and anaerobic fitness (McManus *et al.,* 2006).

### 2.5.1 Extrinsic risk factors

Extrinsic risk factors outline the following; court surface, shoe type, skill level, not warming up before games and practices, and previous injuries, participating in other sports, position played, protective gear, and shoe type.

#### 2.5.1.1 Court surface

There is an increased risk of injury when playing on artificial surfaces like tartan, super turf or grass (Powel, 1987). Studies have found that there is an increased risk of knee and ankle injuries when playing on artificial surfaces with the highest incidence of injuries on tartan (Árnason *et al.,* 2007; Powell, 1987). Super turf had the second highest incidence of injury as a playing surface followed by grass. The injuries on artificial turf are due to the stiffness and frictional forces of the surface that has an impact on the forces that are transmitted to the ground and therefore increases the occurrence of injuries (Inklaar,1994). This difference in forces causes overload to

various types of tissue like ligaments, bones, muscles, tendons, and cartilage, thereby increasing the risk of injury when playing on artificial surfaces (Murphy *et al.,* 2003).

#### 2.5.1.2 Footwear (shoe type)

Barrett *et al.,* (1993) examined low versus high-top shoes to prevent ankle sprains in basketball players (n=622), and found that there was no relationship between the types of shoes tested and ankle sprains. The three types of shoes tested in this study were a high-top, low-top and high-top with an inflatable chamber (Barrett *et al.,*1993). This suggested that the study may be inadequate due to the fact that there was a low injury rate in the sample and therefore may have affected the results of the study.

McKay *et al.,* (2001) conducted a study on elite and recreational basketball players (n=10 393), and showed different results to those produced by Barret *et al.,* (1993). The study showed that there was an increase of ankle injuries by more than four times when wearing air cells in the heels of the shoes when compared to a control (McKay *et al.,* 2001).

A retrospective study done on 61 senior netball participants over the period of five years reported that 61% of the participants who were injured were wearing netball specific shoes (Hampton, 2012.). Other participants were wearing other forms of shoes and 37% of the participants preferred wearing running shoes (Hampton, 2012.).

#### 2.5.1.3 Skill level

Hopper, Hopper and Elliott, (1995) conducted a study on the risk factors on female netball players (n=72) for back and lower extremity injuries. The study revealed that a higher skill level may lead to a higher probability of injury when compared to players of a lower skill level. They also found that the most common site of injury was the ankle (Hopper *et al.,* 1995). The players with a lower skill level may play at a less aggressive intensity than the higher skilled players, making the higher skill players more at risk of injury (Murphy *et al.,* 2003).

#### 2.5.1.4 Warming up before training or competitive matches

McManus *et al.,* (2006) reported that there is an increased risk of injury in netball players by not warming up before games or sport specific training by 48%. McManus *et al.,* (2006) and Verrall *et al.,* (2005) showed that there is a varied success in sport specific and generic movements in context to injury (Verrall *et al.,* 2005).

Research shows that the body prepares itself for any external or internal action that needs to be done during training and competitive matches when warming up before time (Petersen and Holmich, 2005; Verrall *et al.,* 2005; Bartlett and Warren, 2002). Warming up before doing any specific movements decreases the force on the musculotendinous junctions, increases muscle and ligament vascularity and increases joint proprioception and flexibility of ligaments (Petersen and Holmich. 2005; Verrall *et al.,* 2005; Bartlett and Warren, 2002). Other studies (McManus *et al.,* 2006; Verrall *et al.,* 2005) indicate that warming up may help with mental and sport-specific action preparation.

Additionally, Balbaugh, (2019) reported that static stretches before participating in sport, affect the strength and explosive power of the muscle negatively for up to an hour and may cause injury. However dynamic stretches have been shown to provide short term increase in flexibility and a decrease in the reflexive contractions that occur naturally in the muscle (Balbaugh, 2019).

#### 2.5.1.5 Previous injuries

Being injury free before participating in a netball season, especially in the previous season, showed that there was a 42% decrease in risk of injury compared to those players who had an injury before participating in the sport (McManus *et al.,* 2006). Structural integrity may be compromised due to the previous injury that could lead to altered joint and muscle function, muscle imbalance and altered/ impaired proprioception (Crosier *et al.,* 2002; Petersen and Holmich, 2005).

#### 2.5.1.6 Playing position

Hampton, (2012) performed a study on 61 senior netball participants on the influence of the player position on the type of lower limb injury. The positions that reported only ankle injuries were the goal keepers (83%) and goal shooters (56%). Centre and goal defence only reported knee and ankle areas. The positions that were most susceptible to injuries were goal attack (70% ankle, 20% knee) and wing attack (50% ankle, 25% knee). However, the wing defence position reported to be the safest and 54% of the participants who played this position had no injuries. The goal attack position was the only position that reported an injury at all six lower limb areas and goal keeper on three lower limb areas. (Hampton, 2012).

#### 2.5.1.7 Protective gear

Sitler *et al.,* (1994) completed a study on 1601 United States Military Academy cadet basketball players, to reduce ankle injury by applying semi rigid ankle stabilisers. The study reported that ankle injuries were remarkably reduced by the ankle stabilisers (Sitler *et al.,* 1994).

Research performed by Baker, (1990) proposed that bracing the knee to prevent injury, provided little knee joint ligament protection. Additionally, the protective bracing may cause more injuries in that area. Bracing and strapping may provide adequate stabilisation to the ankle, thumb and elbow joints as they can tolerate small amounts of movement loss without affecting joint function. Although the ankle, thumb and elbow joints can be stabilised adequately, stabilising the knee and shoulder joint are usually ineffective especially for the thoroughness of limiting joint function and for competitive sport (Baker, 1990).

### 2.5.2 Intrinsic risk factors

Intrinsic risk factors outline the following; age, weight, and height (body mass index), gender and, aerobic and anaerobic fitness.

#### 2.5.2.1 Age

A prospective cohort study by Orchard, (2001) investigated the association between age and lower limb/muscular strain injury amongst football players. The study found that age was not a risk factor for quadriceps muscle strain, however, it did pose an increased risk for calf and hamstring muscle strains. The study determined that this was due to the impact that osteoarthritic changes have on the spine, usually at L5/S1 levels. At these levels, lumbar (L-spine) and sacral (S-spine) nerve roots supply the hamstrings and calf muscles increasing the risk of injury to these muscles when compared to the quadriceps muscles that are supplied by the lumbar nerve root levels L2, L3 and L4 (Orchard, 2001).

Morgan and Oberlander's, (2001) study on major league soccer players revealed a contrasting result to that of Orchard (2001). Morgan and Oberlander, (2001) investigated if age played a part in the severity and the rates of injury sustained. These players (n= 237) were divided into three different groups consisting of the ages 25 and younger, 25 to 30 years and 30 years and older. The results of this study concluded that the age of a player did not play any significant role in the severity of injury sustained (Morgan and Oberlander, 2001).

#### 2.5.2.2 Body mass index and gender

Male athletes tend to have fewer injuries than female athletes, especially in the knee region (Murphy *et al.,* 2003; Childs, 2002). This is suggested to be due to a wide range of factors such as; hormonal, neuromuscular and anatomical factors. These factors have shown why male athletes suffer less serious knee injuries than female athletes (Murphy *et al.,* 2003; Childs, 2002). Factors that were revealed in female participants included hyper-laxity, body mass index of more than 24.7, a body mass of more than 68kg and the position of lower extremities when landing (Harner and Rhin, 2003).

Additionally, Harner and Rhin, (2003) revealed that there is more extension in the lower extremity when landing in female participants than in male participants, therefore females are at greater risk of an anterior cruciate ligament (ACL) sprain (Harner and Rhin, 2003). The risk of ACL injuries may be increased in female participants when

compared to male participants. In relation to different gender types, the type of injury, especially in the lower extremity, remains unclear (Murphy *et al.,* 2003).

#### 2.5.2.3 Aerobic and anaerobic fitness

It has been shown that in a high-intensity sport like netball, training has a significant influence in power, proprioception, joint stability, strength, fitness (aerobic and anaerobic) and agility (Steele and Chad, 1991 and Palmer *et al.,* 2000). In the study, they found those players who trained for four hours or more a week reduced the risk of injury by 39% in comparison to the players that trained for less than four hours a week (McManus *et al.,* 2006).

### 2.6 Mechanisms and severity of injuries

Ferreira and Spamer, (2010) completed a study on elite university netball players and found that the knee joint, ankle and cervical region were most commonly affected by injury (Ferreira and Spamer, 2010: 57-67). Hopper, (1986) revealed similar results amongst injured Australian netball players (n=158), which revealed that 58.2% of all injuries were in the ankle region; 13.3% in the hand; 15.2% in the knee and 13.3% in other areas of the body (Hopper, 1986: 231-239).

Steele's, (1990) study on the back and lower limb injuries of elite netball players revealed a similar pattern and showed 30.2% of injuries were at the ankle region and 15.9% were found at the calf/leg region (Steele, 1990: 88-102). There are a number of studies (Ferreira and Spamer, 2010: 57-67; Hopper. 1986: 231-239; Steele, 1990: 88-102) that reveal that the majority of injuries are at the ankle and knee region/joints and therefore, these regions are most vulnerable to injury.

Part of the study on elite university netball players by Ferreira and Spamer, (2010) investigated the mechanism of injuries, body part, and severity of the injury (table 2.1) (Ferreira and Spamer, 2010: 57-67). Ferreira and Spamer, (2010) divided the severity of injury into three sections/grades. Grade one was minor, grade two was moderately serious and grade three was serious. There were 46 injuries reported during the season. From those injuries reported 34.78% were grade one, 56.52% were grade two

and 8.69% were grade three type of injuries. Most of the players reported to have grade two injuries and the least number of players suffered grade three injuries (Ferreira and Spamer, 2010).

The most common mechanism of injury reported was incorrect landing which had a prevalence of 52.17% and injury by falling was 4.34% (Ferreira and Spamer, 2010: 57-67). Hopper, (1995) reported similar results to Ferreira and Spamer, (2010) and revealed that 73.8% landed incorrectly and 74.2% that fell or slipped were injured (Hopper, 1986). Pillay and Frantz, (2012) reported similar results to Ferreira and Spamer, (2010) and Hopper, (1986) with regard to the mechanism of injury most commonly reported. The most common reported mechanism that Pillay and Frantz, (2012) reported was the way the player landed and tripped. Another study revealed other causes of injury were contact with another player of 29%, sudden stop, slip or trip 21% and incorrect landing was 29% (Hopper *et al.,*1995). They did not report any traumatic injury in 34.78% of the cases. It was concluded that these non-traumatic injuries could be due to overuse which is defined as an injury that is non-traumatic to a certain part of the individual's body (Brunker and Khan, 2007). Mckay *et al.,* (1996) reported that landing incorrectly (15.1%), hits from a ball (18.2%) and collisions between the players (13.9%) were the most common mechanism of injury, which is similar to the studies done by Hopper *et al.,*(1995) and Ferreira and Spamer, (2010: 57-67).

Hakizimana, (2005) reported minor differences in his study on basketball players compared to the studies on the mechanism of injuries in netball players (Hopper *et al.,*1995 Pillay and Frantz, 2012; Hopper,1986). Hakizimana, (2005) reported that landing incorrectly/poorly (21.5%) was the most common mechanism of injury and defensive rebounding (18.5%) was the second most common mechanism of injury . Furthermore, Hakizimana, (2005) reported other mechanisms of injuries which are as follows: contact (12.4%), bumping into someone (11.6%), catching the ball (7.8%), turning and twisting (9.7%), falling (5.3%), pain when playing (6%), tripping (5.9%) and lateral pivot (2.8%).

Dick *et al.,* (2007) reported that the three primary mechanisms of injury in basketball players are as follows: no contact, player contact and other contacts (the ground, balls etc.) during practices and competitive matches. Most of the injuries reported were

during competitive matches (52.3%) and practices (43.6%) due to player contact. A severe injury was classified as any activity restriction for more than ten days. Dick *et al.,* (2007) reported that approximately 18% of the injuries of both competitive matches and practices, were restricted from activity for ten days or more due to the severity of injury.

**Table 2.1: Descriptive epidemiology of the injuries on a group of 25 elite university netball players. (Ferreira and Spamer, 2010: 62)**

| INJURY INCIDENCE | % |
|---|---|
| **1. SEVERITY OF INJURY:** | |
| **GRADE I** | 34.78 |
| **GRADE II** | 56.52 |
| **GRADE III** | 8.69 |
| **2. BODY PART:** | |
| **ANKLE** | 39.13 |
| **KNEE** | 28.26 |
| **CERVICAL** | 8.69 |
| **3. MECHANISM OF INJURY:** | |
| **INCORRECT LANDING** | 52.17 |
| **NO INCIDENT** | 34.78 |
| **FALL INCIDENT** | 4.34 |

Indeed, there are a variety of injuries that are sustained during sports activities, however, studies by (Ferreira and Spamer, 2010: 57-67; Hopper, 1986: 231-239; Steele, 1990: 88-102; Mckay *et al.,* 1996) have shown that there is a correlation in the most common injuries in netball. The injuries sustained when playing netball have different mechanisms of injury but are mostly similar to one another. There is also a variety of factors that one needs to consider when assessing the mechanism of injury and what leads to the injury.

## 2.7 Management of musculoskeletal injuries

The initial treatment received by netball players after they sustained an injury was based on a specific area of the body (Hopper, Elliott and Lalor,1995). According to Hopper, Elliott and Lalor, (1995) a mean of 31% of the netball players who sustained

an injury only needed to rest or apply ice, while 69% of the players received treatment composed of ice therapy that was followed by strapping, compression bandage or by splinting the region (Hopper, Elliott and Lalor,1995).
When the initial treatment was completed by the injured player, he/she received a graded exercise program along with cold therapy treatment which needed to be completed at home (Hopper, Elliott and Lalor,1995). Further treatment was given according to the body region of the player who was injured. Thirty percent of the players were advised to see a physiotherapist or a doctor. Home programs and advice were given to 54% of the players and 16% of the players were referred to the hospital (Hopper, Elliott and Lalor,1995).

Hakizimana, (2005) reported that 97.8% of basketball players received treatment for their injuries. The types of treatments available to them were physiotherapy, medical, traditional, self-treatment and no treatment used. The treatment of choice most commonly reported was self- treatment at 67.8% for the first injury and 81.4% for the second injury. Self-treatment was defined as any use of ice, strapping or anti-inflammatory medication by the player him/herself. After self-treatment, medical treatment was second at 31.7% for the first injury and 12.0% for the second injury). This was followed by physiotherapy (9.8% for first and second injury), traditional treatment (5.5% for the first injury and 9.8% for the second injury) and lastly no treatment (0.5% for the first injury and 1.1% for the second injury) (Hakizimana, 2005). Both of the studies (Hopper *et al*.,1995; Hakizimana, 2005) are similar in the treatment received from healthcare professionals, however, there are some differences. Hopper *et al.,* (1995) reported that only 30% of the netball players in their study were advised to see a doctor or physiotherapist, while Hakizimana, (2005) reported in his study that 31.7% (for the participants' first injury) and 12.0% (second injury) of the basketball players utilised medical treatment and only 9.8% utilised physiotherapy. Minor differences in netball and basketball are observed and therefore ringball can present with a difference in management and treatment protocols.

## 2.8 Summary

Ringball is a highly popular and competitive sport that is played globally. Due to the nature of the sport and the speed at which the game is played, ringball players are often predisposed to injury. Injuries between netball and basketball players have been discussed thoroughly according to the current literature, which shows many similarities and minor differences. However, with regard to ringball there is a paucity of literature amongst the injuries occurred. An understanding of the injuries experienced, the mechanisms of how they occur, the related risk factors and the management and treatment of these injuries can help healthcare providers, coaches and players with a greater understanding of how to manage and prevent these injuries.

# CHAPTER THREE

# Methodology

## 3.1 Research design

This research design is a quantitative paradigm, a cross-sectional descriptive survey, investigating musculoskeletal injuries sustained in ringball players.

## 3.2 Location of study

- The study took place before and after ringball matches where all six clubs were present at the specific clubs/venues.
- In the case where a club was not available on a matchday, a suitable date, time and place was arranged. This took place at their own clubs during a practice session.

## 3.3 Population

The population size of players who are over the age of 16 years was approximately 152 players and there were 16 ringball teams. The sample size that was required for adequate statistical power, as indicated by the statistician (Singh, 2017), was 110. The participants were recruited from the ringball players registered and playing for one of the six clubs currently in KwaZulu-Natal.

## 3.4 Permission to conduct research

Full ethical approval was granted to conduct research by the Institutional Research Ethics Committee (IREC 35/18) (Appendix K) at the Durban University of Technology. This was granted following the completion of a focus group, pilot study and gatekeeper's approval. The gatekeeper's approval consisted of permission from the president of KwaZulu-Natal Ringball Federation (Appendix L and M).

### 3.5 Sampling strategy

#### 3.5.1 Participant recruitment

The researcher contacted the president of KwaZulu-Natal Ringball Federation via e-mail to obtain permission (Appendix A) to conduct the injury profile on the participants of the respective clubs. A specific date and time suitable for the participants was established in order to administer the questionnaires. Informed consent (Appendix D) was then granted by the participants. If the participants were under the age of 18 years, the parents or legal guardians completed the parental informed consent (Appendix H). This was accompanied by the informed assent (Appendix J) for minors.

#### 3.5.2 Sample size

The KwaZulu-Natal Ringball Federation consists of six clubs. Each club has a minimum of one female team and one male team. Each team consists of nine players and substitutes (depending on the number of players within the club). There are approximately 152 players over the age of 16 years among the 16 ringball teams, as indicated by the KwaZulu-Natal Ringball Federation. Singh, (2017), suggested a sample size of a 110 participants of which a 70% response rate would ensure generalizability.

#### 3.5.3 Sample characteristics

- **Inclusion criteria**
    - All ringball players present at the club venue at that specific point in time.
    - The participants must represent one of the six ringball clubs.
    - Participants who completed and signed the letter of consent (Appendix D).
    - Participants below the age of 18 whose parents/legal guardians signed the parental consent form (Appendix H).
    - Participants who were fluent in English.
    - Participants should have at least played one season (year) of ringball to participate in this study.

- **Exclusion criteria**
    - Any participant below the age of 16 years.
    - Any participant who did not give consent due to any circumstances.
    - Participants under the age of 18 years whose parents/legal guardians did not provide consent.
    - Participants who did not complete the questionnaire.

### 3.6 Measurement tools

A self-administered questionnaire was completed by the participants. The questionnaire was adapted and contextualised from a validated questionnaire used from Archary, (2008) titled: “A profile of soccer injuries in selected league amateur indoor and outdoor soccer players in the greater Durban area”. A focus group reviewed the modified questionnaire to enhance its reliability and validity. The questionnaire was subsequently piloted before it was administered to the research participants. The results further validated the research questionnaire and relevant corrections were made where necessary.

### 3.7 Focus group

A focus group was required to validate the content of the questionnaire following provisional ethical approval from IREC. The focus group reviewed the questions within the questionnaire. These members made recommendations and modifications that were necessary and appropriate. Eight participants participated in this focus group as suggested by Salant and Dillman, (1994).

The focus group comprised of:

- The researcher.
- Supervisor and co-supervisor.
- Two ringball players.
- A master’s student who has conducted a questionnaire for his own research.
- Two additional master’s students currently conducting research.

The purpose of the focus group was to encourage the participants to analyse the research topic in order to develop new ideas for the questionnaire. This increased the relevance and validation of the research topic (Salant and Dillman, 1994).

Focus group participants were welcomed on arrival and verbal instructions were given to inform them as to what was required. They were informed that everything from the meeting would be recorded which ensured that all discussions were adequately captured. They were asked not to reveal any changes discussed during the meeting. Following this, they were required to read and sign a letter of informed consent (Appendix B), confidentiality statement (Appendix F), code of conduct (Appendix N) and a copy of the study questionnaire (Appendix I). Once all members of the focus group agreed to the terms, the researcher then read through each question of the questionnaire to initiate the discussion. All suggestions, changes and recommendations were pointed out in the questionnaire. These changes were recorded and adjusted accordingly which produced the pre-pilot study.

### 3.7.1 Changes to the focus group questionnaire (Appendix I)

The following changes were made to Appendix I:

- Added spacing between at least in the 4th line.
- Part A Question 6: Change all the “Y” from years to lower case.
- Part A Question 7: Changed sentence to “How many seasons have you played in the last five years?”
- Part B Question 4: Removed “got/received” from sentence

.Part B question 5: Corrected spelling error of “ball throw”, changed “overuse” to “overexertion”.

- Part B Question 6, 11 (new question 10): Added “Type of injury” in front injury one, two and three at the training sessions and competitive matches.
- Part B Question 7: Changed GP to general practitioner, Added “first aid” and “assistance” by field side assistance. Corrected Spelling error of sport massage.

- Part B Question 8: Added “Type of injury” in front injury one, two and three. Added “Immediately, 1-2 weeks, 2-4 weeks and more than a month” to the tables.
- Part B Question 9: Added “ pressure on muscle” next to “compression”, Changed “Dry needles” to “Dry needling”, added “Cross frictions” next to “Deep Frictions”, Added “Rehab” next to “Exercise therapy”, Added “therapy” next to “heat” and “cold”, removed “oral advice” and added “other”.
- Part B Question 10: Removed the original question.
- Part B New Question 10: Added “none, 1-2 weeks,3-4 weeks and more than a month” to the tables.
- Part B old Question 12 and 13: removed.
- Old Part C was moved to Part D and new Part C “WARM UP” was added.
- New Part D Question 1a: “Often” was added.
- New Part D Question 1b and 1.c: “Not applicable” was added.
- New Part D Question 1d: removed.
- New Part D and new Question 1d: “(e.g. netball, running, tennis shoes)”.
- New Part D and new Question 2: Same changes as for new Part D question 1.

### 3.8 Pilot testing

After the focus group reviewed the questionnaire, pilot testing commenced. This ensured that the questionnaire was tested before it is given to the research participants. These results validated the research questionnaire and corrections were made if any issues arose that were of importance to the research itself. The questionnaire (Appendix O) was then given to two ringball players who were not part of the focus group. These two participants were contacted in person. They were required to read the letter of information (Appendix B) and sign the informed consent form (Appendix D). They were then required to complete the questionnaire and correct any changes that needed to be made. It was then completed and the questionnaire was finalised for use in the research study.

### 3.8.1 Changes to the Pilot study questionnaire (Appendix O)

The following changes were made to Appendix O:

- Part B question 2 and Part D question 1.c and 2.c: Added “upper arm and forearm” to the question.

## 3.9 Study procedure

The president of KwaZulu-Natal ringball was contacted to establish the time, date and venue. Once permission was granted by the respective heads of the clubs and coaches, a letter of informed consent or assent (Appendix D, H or J) was distributed and signed by the participants or parents/ legal guardians of participants younger than 18 (Appendix H). Time was then allocated by the researcher for any additional questions posed by the players. Each player received a questionnaire (Appendix C) to complete and hand in directly after it was done. The participants’ names and other identifiable information were not placed on the questionnaires to ensure confidentiality. The informed consent (Appendix D, H or J) and letter of information (Appendix B and G) of each participant were kept in a separate box separating them from the questionnaires to further ensure confidentiality. The questionnaires were given to the participants before and after the matches and training sessions.

## 3.10 Ethical considerations

- The Institutional Research and Ethics Committee (IREC) at Durban University of Technology granted full ethical approval to conduct this research (IREC number: REC 35/18).
- The president of KwaZulu-Natal ringball gave permission to conduct the research and he emailed all the ringball clubs to comply and assist where needed.
- If the participants were 16 to 18 years old, the parents/legal guardians read and signed a letter of informed consent and information.
- All the participants read and signed an informed consent/assent form and letter of information to ensure autonomy.

- All participants who met the inclusion criteria were invited to participate in the study and no discrimination regarding gender, age or race occurred.
- All questionnaires were numbered and given to the player. No identification of the player of any sort was required on the questionnaire to ensure confidentiality.
- The data obtained will be locked away for five years in a safe in the Durban University of Technology Department. The data will only be analysed by the researcher, supervisor, co-supervisor and statistician. After the five-year period the research will be shredded and disposed of.
- The participants in this study volunteered to participate and were not coerced into participation.
- No incentive or any other reward was given to the participants who completed this study and all participants were treated the same to ensure justice.
- No participants were harmed during this study to ensure non-maleficence.

### 3.11 Data reduction and analysis

A Microsoft Excel spreadsheet was used to capture the data and then IBM SPSS version 25 was used to analyse the data. The data were described using frequencies and percentages in the case of categorical variables and with means and standard deviations in the case of continuous variables. In order to assess associations between risk factors and injury, Pearson's chi-square test was performed for categorical risk factors, and t-tests were performed for continuous variables. A p-value of less than 0.05 was used for statistical significance.

# CHAPTER FOUR

# Results

## 4.1 Introduction

The results and statistical data are presented in this chapter. This chapter includes the following information; rate of participation, the prevalence of musculoskeletal injuries, injuries sustained in terms of location and severity, mechanism of injury, management of musculoskeletal injuries, and selected risk factors that include; demographics, protective equipment, warming up before training sessions or competitive matches and footwear.

## 4.2 Rate of participation

There are six ringball clubs in KwaZulu-Natal. Data collection took place during competitive tournaments at one of the six clubs and practices at the other clubs. A sample size of 110 was calculated from a total of 152 players. The target population included male and female ringball players who were 16 years and older. Of the 110 questionnaires administered, 76 ringball players completed the research questionnaire. This resulted in a response rate of 69.1%.

## 4.3 Demographics (age, gender and ethnicity)

The demographics in this study consisted of gender, ethnicity and age. A sample of n= 76 was analysed of which 31 were males (40.8%) and 45 were females (59.2%). There were only two ethnic groups present, White and Black, where 71 of them were White (93.4%) and the 5 were Black (6.6%). The mean age recorded for males was 29.9 years with a standard deviation of 11.3 years and females was 31.9 years with a standard deviation of 12.6 years.

### 4.4 Prevalence of musculoskeletal injuries

All of the ringball players who participated in this research study played at least one season/year of ringball. The prevalence of at least one injury in ringball players was 80.3% (n= 61) and some participants reported more than one injury. The prevalence of having a second injury was 32.9% (n= 25) and a third injury was 9.2% (n= 7). Figure 4.1 shows the number of injuries sustained by the participants. A total of 19.7% reported no injuries sustained, 43.4% reported one injury, 13.2% reported two injuries, 10.5% reported three injuries, 3.9% reported four injuries and 9.2% reported more than four injuries sustained.

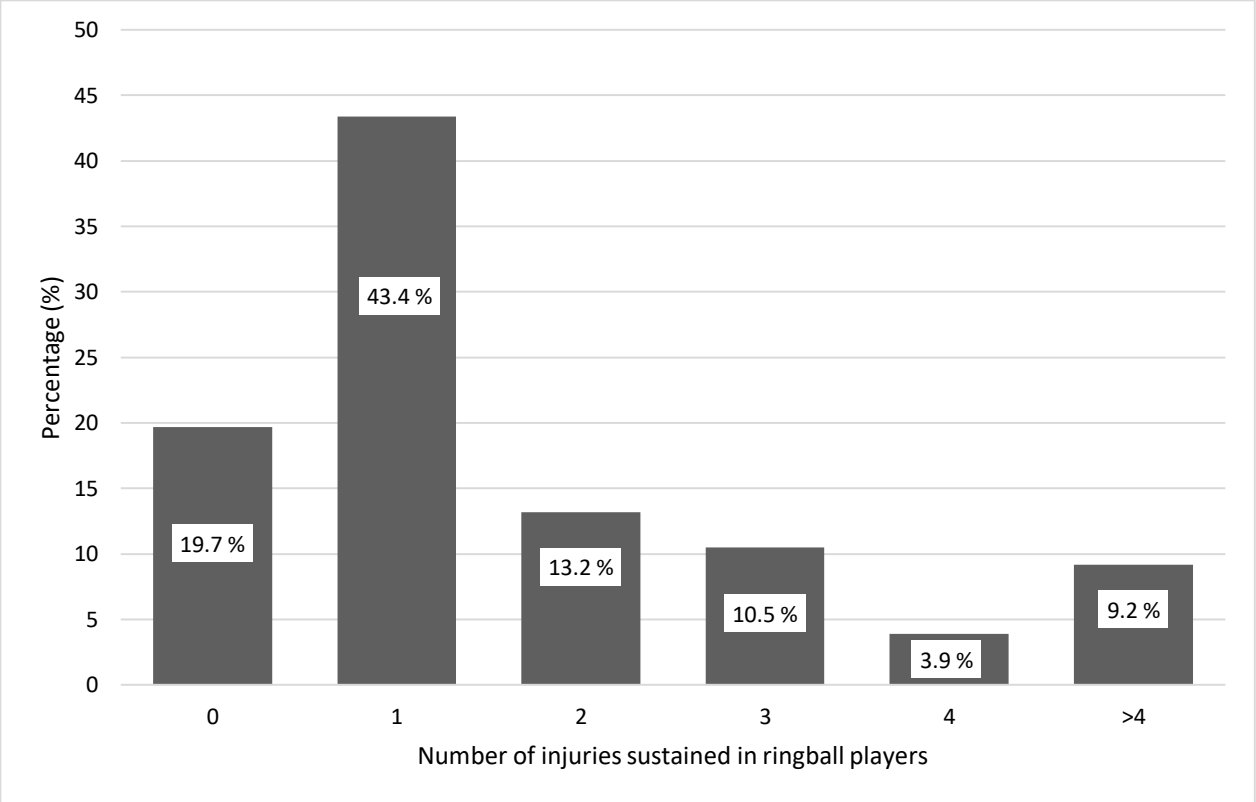


**Figure 4.1: Number of injuries sustained in ringball players**

### 4.5 Location of injuries

Out of the 93 reported injuries amongst 61 injured participants, the following locations were reported. The most common location of injuries was foot/ankle at 35.5% followed by knee at 29% and wrist 8.6%. The least common locations of injuries were head/neck, forearm and genitals at 1.1% Other locations reported are represented in Table 4.1.

**Table 4.1 Location of injuries**

| | | Responses | |
|---|---|---|---|
| | | N | Percent (%) |
| **Location** | **Foot/ankle** | 33 | 35.5% |
| | **Knee** | 27 | 29.0% |
| | **Wrist** | 8 | 8.6% |
| | **Fingers** | 6 | 6.5% |
| | **Back** | 5 | 5.4% |
| | **Shoulder** | 4 | 4.3% |
| | **Hand** | 3 | 3.2% |
| | **Elbow** | 2 | 2.2% |
| | **Thigh** | 2 | 2.2% |
| | **Head/neck** | 1 | 1.1% |
| | **Forearm** | 1 | 1.1% |
| | **Genital** | 1 | 1.1% |
| **Total** | | 93 | 100.0% |

## 4.6 Severity of injuries

Severity was measured by the number of training sessions or matches missed due to the injury sustained by the player. Table 4.2 shows the extent of the severity of the injuries by taking into account how many sessions were missed in each case. The percentages represent the number of participants who provided non-missing responses to the question. In other words, some participants may have been injured but did not answer this question on the number of sessions missed. For instance, out of 61 participants who experienced at least one injury, 59 answered the question for the number of training sessions missed. Injury one for the training sessions and competitive matches was used due to the fact that it was most commonly reported on.

The first injury is associated with more servere injuries compared to the second and third injuries. Out of 59 players who reported on the number of training sessions they have missed due to the first injury, 13.6% (n= 8) missed one session,15.3% (n= 9) missed two sessions, 6.8% (n= 4) missed 3 sessions, 6.8 (n= 4) missed 4 sessions and 22% (n= 13) missed more than four (>4) training sessions.

Interestingly, fifty-eight players reported the number of competitive matches missed due to their first injury. Out of the 58 players, 10.3% (n= 6) missed one competitive match, 15.5% (n=9) missed two matches, 12.1% (n= 7) missed three matches, 5.2% (n= 3) missed four matches and 24.1% (n= 14) missed more than four (>4) competitive matches.

**Table 4.2 Number of training sessions and competitive matches missed in the last season as a result of injury**

| Numberof sessions missed | | 0 | 1 | 2 | 3 | 4 | >4 |
|---|---|---|---|---|---|---|---|
| Training sessions missed last season as a result of first injury | Count (N) | 21 | 8 | 9 | 4 | 4 | 13 |
| | Percentage (%) | 35.6% | 13.6% | 15.3% | 6.8% | 6.8% | 22.0% |
| Training sessions missed last season as a result of second injury | Count (N) | 11 | 1 | 2 | 2 | 3 | 3 |
| | Percentage (%) | 50.0% | 4.5% | 9.1% | 9.1% | 13.6% | 13.6% |
| Training sessions missed last season as a result of third injury | Count (N) | 4 | 1 | 1 | 0 | 0 | 0 |
| | Percentage (%) | 66.7% | 16.7% | 16.7% | 0.0% | 0.0% | 0.0% |
| Competitive matches missed last season as a result of first injury | Count (N) | 19 | 6 | 9 | 7 | 3 | 14 |
| | Percentage (%) | 32.8% | 10.3% | 15.5% | 12.1% | 5.2% | 24.1% |
| Competitive matches missed last season as a result of second injury | Count (N) | 9 | 2 | 3 | 7 | 1 | 2 |
| | Percentage (%) | 37.5% | 8.3% | 12.5% | 29.2% | 4.2% | 8.3% |
| Competitive matches missed last season as a result of third injury | Count (N) | 4 | 0 | 1 | 0 | 0 | 0 |
| | Percentage (%) | 80.0% | 0.0% | 20.0% | 0.0% | 0.0% | 0.0% |

Another measurement that was used to determine severity was the number of days that were missed due to each injury. Table 4.3 shows the extent of the severity of the injuries by taking into account the number of days that were missed in each case. The number of days that the players were unavailable for training and competitive matches for their first reported injury was reported in this chapter, due to the fact that all the injured players reported on their first injury in the questionnaire.

A total of 56 participants reported the number of days they were unavailable for training, for their first reported injury. Out of the 56 participants, 23.2% (n= 13) did not miss a training session, 14.3% (n= 8) were unavailable for one to three days,16.1% (n= 9) were unavailable for four to seven days,16.1% (n= 9) were unavailable for one to two weeks, 8.9% (n= 5) were unavailable for three to four weeks and 21.4% (n= 12) were unavailable for more than one month.

There were 52 participants who reported the number of days that the players were unavailable for competitive matches for their first reported injury. Out of the 52 participants, 28.8% (n= 15) did not miss a competitive match, 7.7% (n= 4) were unavailable for one to three days, 15.4% (n= 8) were unavailable for four to seven days,19.2% (n= 10) were unavailable for one to two weeks, 7.7% (n= 4) were unavailable for three to four weeks and 21.2% (n= 11) were unavailable for more than one month.

**Table 4.3 Number of days that participants were unavailable during training sessions and competitive matches**

| | | none | 1-3 days | 4-7 days | 1-2 weeks | 3-4 weeks | > 1 month |
|---|---|---|---|---|---|---|---|
| **Number of days unavailable for training due to first injury** | Count (N) | 13 | 8 | 9 | 9 | 5 | 12 |
| | Percentage (%) | 23.2% | 14.3% | 16.1% | 16.1% | 8.9% | 21.4% |
| **Number of days unavailable for training due to second injury** | Count (N) | 9 | 0 | 2 | 6 | 3 | 2 |
| | Percentage (%) | 40.9% | 0.0% | 9.1% | 27.3% | 13.6% | 9.1% |
| **Number of days unavailable for training due to third injury** | Count (N) | 2 | 0 | 0 | 1 | 1 | 1 |
| | Percentage (%) | 40.0% | 0.0% | 0.0% | 20.0% | 20.0% | 20.0% |
| **Number of days unavailable for competitive matches due to first injury** | Count (N) | 15 | 4 | 8 | 10 | 4 | 11 |
| | Percentage (%) | 28.8% | 7.7% | 15.4% | 19.2% | 7.7% | 21.2% |
| **Number of days unavailable for competitive matches due to second injury** | Count (N) | 6 | 1 | 1 | 6 | 2 | 2 |
| | Percentage (%) | 33.3% | 5.6% | 5.6% | 33.3% | 11.1% | 11.1% |
| **Number of days unavailable for competitive matches due to third injury** | Count (N) | 2 | 0 | 0 | 1 | 1 | 1 |
| | Percentage (%) | 40.0% | 0.0% | 0.0% | 20.0% | 20.0% | 20.0% |

## 4.7 Mechanism of injury

Table 4.4 shows the mechanisms of injury for the first reported injury. The results revealed the most common mechanisms to be: incorrect landing at 15.3% (n= 9), jumping 8.5% (n= 5), goal shooting 6.8% (n= 4), defending 6.8% (n= 4), collision 6.8%

(n= 4), and other mechanisms 6.8% (n= 4). The least common mechanism of injury includes ball throw training, collision training, defending competitive at 1.7% to mention a few.

**Table 4.4: Mechanism of injury for first reported injury**

| Mechanism of injury | Count (N) | Percentage (%) |
|---|---|---|
| **Landing competitive** | 9 | 15.3% |
| **Jumping competitive** | 5 | 8.5% |
| **Collision competitive** | 4 | 6.8% |
| **Defending competitive** | 4 | 6.8% |
| **Goal shooting competitive** | 4 | 6.8% |
| **Other competitive** | 4 | 6.8% |
| **Ball throw competitive** | 3 | 5.1% |
| **Running/ short sprints competitive** | 2 | 3.4% |
| **Turning competitive** | 2 | 3.4% |
| **Defending training** | 2 | 3.4% |
| **Jumping training** | 2 | 3.4% |
| **Goal shooting competitive and training** | 2 | 3.4% |
| **Landing competitive and training** | 2 | 3.4% |
| **Running/ short sprints competitive and training** | 2 | 3.4% |
| **Running and turning competitive** | 2 | 3.4% |
| **Landing and jumping** | 2 | 3.4% |
| **Landing training** | 1 | 1.7% |
| **Defending competitive and training** | 1 | 1.7% |
| **Goal shooting training** | 1 | 1.7% |
| **Goal shooting competitive and training** | 1 | 1.7% |
| **Ball throw and goal shooting** | 1 | 1.7% |
| **Landing and running/short sprints both competitive and training** | 1 | 1.7% |
| **Ball throw training, collision training, defending competitive, goal shooting competitive, jumping training, landing training, overexertion competitive and running short sprints competitive** | 1 | 1.7% |
| **Collision competitive, jumping competitive and running/ short sprints** | 1 | 1.7% |
| **Total:** | 59 | 100% |

The results for the second reported injury (Table 4.5) also revealed the most common mechanisms to be: competitive collision, defending, jumping, and landing at 12.0% (n=3), running/short sprints 8.0% (n= 2), and turning 8.0% (n= 2). All mechanisms associated with training displayed the least sources for the second injury.

**Table 4.5: Mechanism of injury for second reported injury**

| Mechanism of injury | Count (N) | Percentage (%) |
|---|---|---|
| **Collision competitive** | 3 | 12.0% |
| **Defending competitive** | 3 | 12.0% |
| **Jumping competitive** | 3 | 12.0% |
| **Landing competitive** | 3 | 12.0% |
| **Running/ short sprints competitive** | 2 | 8.0% |
| **Turning competitive** | 2 | 8.0% |
| **Ball throw competitive** | 1 | 4.0% |
| **Defending training** | 1 | 4.0% |
| **Landing training** | 1 | 4.0% |
| **Defending competitive and training** | 1 | 4.0% |
| **Goal shooting competitive and training** | 1 | 4.0% |
| **Landing and jumping** | 1 | 4.0% |
| **Landing competitive and running/short sprints both competitive and training** | 1 | 4.0% |
| **Landing and running/short sprints both competitive and training turning competitive** | 1 | 4.0% |
| **Collision competitive, jumping competitive and running/ short sprints** | 1 | 4.0% |
| **Total** | 25 | 100% |

Contrarily, the results for the third reported injury (Table 4.6) revealed the most common mechanisms to be: jumping at 33.3% (n= 2), incorrect landing at 16.7% (n= 1), a combination of landing and jumping 16.7% (n= 1), a combination of defending and collision 16.7% (n= 1), and a combination of collision and running/short sprints 16.7% (n= 1).

**Table 4.6: Mechanism of injury for third reported injury**

| Mechanism of injury | Count (N) | Percentage (%) |
|---|---|---|
| **Jumping competitive** | 2 | 33.3% |
| **Landing competitive** | 1 | 16.7% |
| **Landing and jumping** | 1 | 16.7% |
| **Defending and collision competitive** | 1 | 16.7% |
| **Collision and running / short sprints competitive** | 1 | 16.7% |
| **Total:** | 6 | 100% |

The results revealed that the most common mechanism for injury for all three injuries are incorrect or general landing, jumping, defending, collision, running/short sprints and goal shooting.

## 4.8 Healthcare professionals utilised to manage or treat participants' musculoskeletal injuries

### 4.8.1 First reported injury

The participants reported the following for their first injury: self- treatment was most commonly reported at 35.1% (n= 20), followed by no treatment with 19.3% (n= 11). A total of 7.0% (n= 4) of the participants were treated by field side assistance or a general practitioner and 3.5% (n= 2) utilised either a biokineticist, chiropractor, physiotherapist or sport massage therapist, and only 1.8% (n= 1) used other professional treatment. However, some participants reported treatment from a combination of healthcare professionals. The most common combination was a chiropractor and self-treatment at 3.5% (n= 2) and the least common combination was general practitioner, field side assistance and physiotherapy, general practitioner and self-treatment at 1.8% (n= 1) to mention a few. This is provided in Table 4.7 below.

**Table 4.7 Healthcare professionals utilised for first reported injury**

| Healthcare Professionals utilised | count (N) | Percentage (%) |
|---|---|---|
| **Self – treatment** | 20 | 35.1% |
| **No treatment** | 11 | 19.3% |
| **General practitioner** | 4 | 7.0% |
| **Field side assistance** | 4 | 7.0% |
| **Biokineticist** | 2 | 3.5% |
| **Chiropractor** | 2 | 3.5% |
| **Physiotherapy** | 2 | 3.5% |
| **Sport massage** | 2 | 3.5% |
| **Chiropractic self-treatment** | 2 | 3.5% |
| **Other** | 1 | 1.8% |
| **General practitioner and field side assistance** | 1 | 1.8% |
| **General practitioner, field side assistance and physiotherapy** | 1 | 1.8% |
| **Chiropractic and physiotherapy** | 1 | 1.8% |
| **General practitioner and self-treatments** | 1 | 1.8% |
| **Field side assistance and other** | 1 | 1.8% |
| **Biokineticist, chiropractic and physiotherapy** | 1 | 1.8% |
| **Physiotherapy and sport massage** | 1 | 1.8% |
| **Total:** | | 100% |

### 4.8.2 Second reported Injury

The most commonly reported treatment was self-treatment by 25.0% (n= 25). A total of 10.0% (n= 2) of the participants used either a biokineticist, chiropractor, sport massage therapist or no treatment and 5.0% (n= 2) of the participants used a general practitioner, field-side assistance and physiotherapist. However, some participants reported treatment from a combination of healthcare professionals. This is illustrated in Table 4.8 below.

**Table 4.8 Healthcare professionals utilised for second reported injury**

| Healthcare Professionals utilised | count (N) | Percentage (%) |
|---|---|---|
| **Self – treatment** | 5 | 25.0% |
| **Biokineticist** | 2 | 10.0% |
| **Chiropractor** | 2 | 10.0% |
| **Sport massage** | 2 | 10.0% |
| **No treatment** | 2 | 10.0% |
| **General practitioner** | 1 | 5.0% |
| **Fieldside assistance** | 1 | 5.0% |
| **Physiotherapy** | 1 | 5.0% |
| **General practitioner and self-treatment** | 1 | 5.0% |
| **General practitioner, field-side assistance and self-treatment** | 1 | 5.0% |
| **Chiropractic and other** | 1 | 5.0% |
| **Physiotherapy and biokineticist** | 1 | 5.0% |
| **Total:** | | 100% |

### 4.8.3 Third reported injury

A quarter (25.0%) of participants reported that they utilised a physiotherapist for management of the third reported injury. The other reported healthcare professionals are a combination of the following: general practitioner and self- treatment at 25.0% (n=1), field-side assistance and physiotherapist at 25.0% (n=1) and physiotherapist and biokineticist at 25.0% (n=1).

### 4.9 Type of treatment

For the first reported injury , the most common treatment of choice as seen in Table 4.9 below was ice/cold therapy (17.0%) followed by exercise /rehabilitation therapy strapping, and ice/cold therapy with medication (5.7%). A few of the participants preferred elevation, heat therapy and massage (1.9).

**Table 4.9: Type of treatment received for the first reported injury**

| Type of treatment | count (N) | Percentage (%) |
|---|---|---|
| **Ice/cold therapy** | 9 | 17.0% |
| **Exercise therapy/ rehab** | 3 | 5.7% |
| **Strapping** | 3 | 5.7% |
| **Ice/cold therapy , medication** | 3 | 5.7% |
| **Surgery** | 2 | 3.8% |
| **Elevation, rehab, heat therapy, ice/ cold therapy, medication and strapping** | 2 | 3.8% |
| **Elevation** | 1 | 1.9% |
| **Heat therapy** | 1 | 1.9% |
| **Massage** | 1 | 1.9% |
| **Medication ( Anti-inflammatories / NSAIDS)** | 1 | 1.9% |
| **Splinting** | 1 | 1.9% |
| **Stretching** | 1 | 1.9% |
| **Exercise therapy / Rehab and strapping** | 1 | 1.9% |
| **Compression, massage , muscle stimulation** | 1 | 1.9% |
| **Heat therapy, ice/cold therapy and strapping** | 1 | 1.9% |
| **Medication and strapping** | 1 | 1.9% |
| **Massage, muscle stimulation and strapping** | 1 | 1.9% |
| **Exercise therapy, ice/cold therapy, medication and strapping** | 1 | 1.9% |
| **Ice/cold therapy, medication and strapping** | 1 | 1.9% |
| **Compression, medication, strapping and surgery** | 1 | 1.9% |
| **Dry needling and strapping** | 1 | 1.9% |
| **Ice/cold therapy and strapping** | 1 | 1.9% |
| **Compression, elevation, heat therapy, ice/ cold therapy, joint mobilization/ manipulation, medication, splinting , strapping** | 1 | 1.9% |
| **Deep frictions/ cross friction, heat therapy, ice/ cold therapy, medication, strapping** | 1 | 1.9% |
| **Elevation, heat therapy** | 1 | 1.9% |
| **Compression, dry needling, ice/cold therapy, strapping** | 1 | 1.9% |
| **Heat therapy, ice/cold therapy** | 1 | 1.9% |
| **Medication (e.g. Anti-inflammatories / NSAIDS), ice/cold therapy and strapping** | 1 | 1.9% |
| **Medication, strapping** | 1 | 1.9% |
| **Elevation, strapping** | 1 | 1.9% |
| **Ice/cold therapy, splinting, other** | 1 | 1.9% |
| **Ice/cold therapy, massage** | 1 | 1.9% |
| **Compression, heat therapy** | 1 | 1.9% |
| **Ice/cold therapy, surgery** | 1 | 1.9% |
| **Ice/ cold therapy and splinting** | 1 | 1.9% |
| **Compression and rehab** | 1 | 1.9% |
| **Heat therapy , ice/cold therapy, medication and strapping** | 1 | 1.9% |
| **Total:** | | 100% |

The type of treatment that was most commonly reported for the second injury as seen in Table 4.10 below are as follows: heat therapy (10.5%), cold therapy (10.5%) or strapping (10.5%). The other treatments averaged at 5.3% for example: surgery, combination treatment like dry needling and strapping, heat therapy, ice/cold therapy and strapping etc.

**Table 4.10: Type of treatment received for second reported injury**

| Type of treatment | count (N) | Percentage (%) |
|---|---|---|
| **Heat therapy** | 2 | 10.5% |
| **Ice/cold therapy** | 2 | 10.5% |
| **Strapping** | 2 | 10.5% |
| **Surgery** | 1 | 5.3% |
| **Heat therapy, ice/cold therapy and strapping** | 1 | 5.3% |
| **Dry needling and strapping** | 1 | 5.3% |
| **Compression, elevation, heat therapy, ice/ cold therapy, joint mobilization/ manipulation, medication, splinting , strapping** | 1 | 5.3% |
| **Heat therapy, ice/cold therapy** | 1 | 5.3% |
| **Medication (e.g. Anti-inflammatories / NSAIDS) , ice/cold therapy and strapping** | 1 | 5.3% |
| **Compression, ice/cold therapy, massage, stretching** | 1 | 5.3% |
| **Ice/cold therapy, surgery** | 1 | 5.3% |
| **Dry needling, massage** | 1 | 5.3% |
| **Elevation, rehab, heat therapy, ice/ cold therapy, medication and strapping** | 1 | 5.3% |
| **Exercise therapy, heat therapy, ice/ cold therapy and joint mobilization/ manipulation** | 1 | 5.3% |
| **Exercise therapy, heat therapy, ice/ cold therapy and joint mobilization/ manipulation , medication** | 1 | 5.3% |
| **Exercise therapy, heat therapy, ice/ cold therapy, massage , muscle stimulation and stretching** | 1 | 5.3% |
| **Total:** | | 100 |

The most common treatment of choice for the third injury listed in Table 4.11 below are as follows: splinting (20.0%), medication (e.g. Anti-inflammatories / NSAIDS) and strapping (20.0%), medication, ice/cold therapy, strapping and surgery (20.0%), exercise therapy, heat therapy and ice/cold therapy (20.0%), compression, exercise therapy, heat therapy, ice/ cold therapy, massage, muscle stimulation and stretching (20.0%).

**Table 4.11: Type of treatment received for third reported injury**

| Type of treatment | count (N) | Percentage (%) |
|---|---|---|
| **Splinting** | 1 | 20.0% |
| **Medication, strapping** | 1 | 20.0% |
| **Medication (e.g. Anti-inflammatories / NSAIDS) , ice/cold therapy, strapping and surgery** | 1 | 20.0% |
| **Exercise therapy, heat therapy and ice/cold therapy** | 1 | 20.0% |
| **Compression, exercise therapy, heat therapy, ice/ cold therapy, massage , muscle stimulation and stretching** | 1 | 20.0% |
| **Total:** | | 100% |

### 4.10 Waiting period before participants received treatment for their injuries

The reported waiting period to receive treatment for the participants' first reported injury is as follows: 46.6% reported to receive treatment immediately, 34.5% within one to three days, 8.6% after a month, 5.2% within four to seven days, 3.4% within two to four weeks, and 1.7% within one to two weeks.

The reported waiting period to receive treatment for the participants' second reported injury is as follows: 50.0% reported receiving treatment immediately, 31.8% within one to three days, 9.1% within one to two weeks, 4.5% within four to seven days, 4.5% within two to four weeks. None of the participants waited longer than a month.

The reported waiting period to receive treatment for the participants' third reported injury is as follows: 60.0% reported receiving treatment within one to three days, 20.0% reported receiving treatment immediately, 20.0% within one to two weeks**.** None of the participants waited four to seven days or longer than a month to receive treatment.

### 4.11 Selected risk factors

In order to assess associations between risk factors and injury, Pearson's chi square test was done for categorical risk factors, and t-tests were done for continuous variables. A p-value of 0.05 indicated statistical significance.

Age, gender, body mass index (BMI) and seasons playing ringball were not associated with having at least one injury.

### 4.12 Demographics

Demographics included the following: age, height, weight, gender, participating in sports other than ringball and the position played by the participant.

### 4.12.1 Age

Of those with injuries (n= 61), the mean age reported was 31.31 years with a standard deviation of 12.27. The mean age of participants without an injury was 30.27 years with a standard deviation of 2.92. A p-value was calculated at 0.765, therefore showing an insignificant relationship between age and injury.

### 4.12.2 Gender

There were 31 males and 45 female participants who participated in this research study. A total of 23 males and 38 females experienced injuries, resulting in an injury percentage of 74.2% for males and 84.4% for females. A p-value was calculated at 0.275, therefore showing an insignificant relationship between gender and injury.

### 4.12.3 Height, weight and body mass index (BMI)

The mean height recorded from participants with an injury was 172.28cm with a standard deviation of 10.20. The mean height recorded from participants without an injury was 174.93cm with a standard deviation of 8.08. A p-value was calculated at 0.352, therefore showing an insignificant relationship between height and injury.

The mean weight recorded from the participants with an injury was 72.67kg with a standard deviation of 16.58. The mean weight recorded from the participants without an injury was 80.40kg with a standard deviation of 21.31. A p-value was calculated at 0.131, therefore showing an insignificant relationship between mass and injury.

The mean body mass index (BMI) calculated for participants with an injury was 24.35 with the standard deviation of 4.22. The mean BMI for participants without an injury was 26.05 with a standard deviation of 5.48. A p-value was calculated at 0.191, therefore showing an insignificant relationship between body mass index and injury.

### 4.12.4 Participating in sport other than ringball

Twenty-nine (n= 29) participants reported playing a sport other than ringball. Twenty-seven (n= 27) of these participants reported an injury. A p-value of 0.027 was calculated, therefore showing a significant relationship between participating in other sports and injury. This shows the risk of injury is higher by participating in other sports (more than one), compared to the participants who only play ringball. This is provided in Table 4.12 below.

**Table 4.12 Participants participating in other sports**

| | | | Injury | | Total |
|---|---|---|---|---|---|
| | | | no | yes | |
| **Participation in other sports** | **yes** | Count | 2 | 27 | 29 |
| | | % within Do you participate in any other sports? | 6.9% | 93.1% | 100.0% |
| | **No** | Count | 13 | 34 | 47 |
| | | % within Do you participate in any other sports? | 27.7% | 72.3% | 100.0% |
| **Total** | | Count | 15 | 61 | 76 |
| | | % within Do you participate in any other sports? | 19.7% | 80.3% | 100.0% |

### 4.12.5 Playing position

Wing was the most common playing position (n= 19), followed by; line shooter (n= 11), line defender (n= 11), side shooter (n= 10) and centre (n= 10). The most common position associated with injury was the centre, which had a period prevalence of a 100% (n= 10). The second most common position associated with injury was side shooter with a 90% (n= 9) period prevalence. A significant association between playing position and injury could not be determined as a P-value could not be calculated due to too many groups.

## Table 4.13 Player position and injury

| | | | injury | | Total |
|---|---|---|---|---|---|
| | | | no | yes | |
| Playing position | line shooter | Count | 2 | 9 | 11 |
| | | % within Playing position | 18.2% | 81.8% | 100.0% |
| | side shooter | Count | 1 | 9 | 10 |
| | | % within Playing position | 10.0% | 90.0% | 100.0% |
| | Centre | Count | 0 | 10 | 10 |
| | | % within Playing position | 0.0% | 100.0% | 100.0% |
| | Wing | Count | 5 | 14 | 19 |
| | | % within Playing position | 26.3% | 73.7% | 100.0% |
| | line defender | Count | 3 | 8 | 11 |
| | | % within Playing position | 27.3% | 72.7% | 100.0% |
| | side defender | Count | 1 | 4 | 5 |
| | | % within Playing position | 20.0% | 80.0% | 100.0% |
| | all positions | Count | 1 | 0 | 1 |
| | | % within Playing position | 100.0% | 0.0% | 100.0% |
| | wing and line defender | Count | 0 | 2 | 2 |
| | | % within Playing position | 0.0% | 100.0% | 100.0% |
| | side shooter and line defender | Count | 0 | 1 | 1 |
| | | % within Playing position | 0.0% | 100.0% | 100.0% |
| | side shooter and line shooter | Count | 1 | 0 | 1 |
| | | % within Playing position | 100.0% | 0.0% | 100.0% |
| | wing and centre | Count | 0 | 2 | 2 |
| | | % within Playing position | 0.0% | 100.0% | 100.0% |
| | Line defender, side defender, line shooter | Count | 0 | 1 | 1 |
| | | % within Playing position | 0.0% | 100.0% | 100.0% |
| | side defender and line defender | Count | 1 | 0 | 1 |
| | | % within Playing position | 100.0% | 0.0% | 100.0% |
| | side defender, line defender, centre | Count | 0 | 1 | 1 |
| | | % within Playing position | 0.0% | 100.0% | 100.0% |
| Total | | Count | 15 | 61 | 76 |
| | | % within Playing position | 19.7% | 80.3% | 100.0% |

### 4.13 Warming up before training or competitive matches

The reported injury compared to the warming up method for training (Table 4.14) is as follows: 23 participants reported doing dynamic warm-up exercises of which 21 (91.3%) of the participants reported an injury. A total of 18 participants reported doing static warm-up exercises of which 17 (94.4%) of the participants reported to be injured. There were 35 participants who reported doing both, dynamic and static, warm-up exercises of which 23 (65.7%) of the participants were injured. A p-value of 0.013 was calculated, therefore, showing a significant relationship between the type of warm-up before training. Those who warmed up with both dynamic and static methods were less likely to get injured.

**Table 4.14 Warming up before training vs injury**

| | | | Injury | | Total |
|---|---|---|---|---|---|
| | | | No | yes | |
| **Warm- up activity/activities done** | dynamic | Count | 2 | 21 | 23 |
| | | Percentage (%) | 8.7% | 91.3% | 100.0% |
| | static | Count | 1 | 17 | 18 |
| | | Percentage (%) | 5.6% | 94.4% | 100.0% |
| | both | Count | 12 | 23 | 35 |
| | | Percentage (%) | 34.3% | 65.7% | 100.0% |
| **Total** | | Count | 15 | 61 | 76 |
| | | Percentage (%) | 19.7% | 80.3% | 100.0% |

The reported injury compared to the warming up method for competitive matches (Table 4.15) is as follows: 24 participants reported doing dynamic warm-up exercises of which 22 (91.7%) of the participants reported an injury. A total of 18 participants reported doing static warm-up exercises of which 16 (88.9%) reported an injury. There were 34 participants who reported doing both, dynamic and static, warm-up exercises of which 23 (67.6%) of the participants were injured. A p-value of 0.044 was calculated, therefore showing a significant relationship between the type of warm-up before competitive matches. Furthermore, those who warmed up with both dynamic and static methods were less likely to get injured.

**Table 4.15 Warming up before competitive matches vs injury**

| | | | injury1 | | Total |
|---|---|---|---|---|---|
| | | | No | yes | |
| **Warm up activity/activities done** | dynamic | Count | 2 | 22 | 24 |
| | | Percentage (%) | 8.3% | 91.7% | 100.0% |
| | static | Count | 2 | 16 | 18 |
| | | Percentage (%) | 11.1% | 88.9% | 100.0% |
| | Both | Count | 11 | 23 | 34 |
| | | Percentage (%) | 32.4% | 67.6% | 100.0% |
| **Total** | | Count | 15 | 61 | 76 |
| | | Percentage (%) | 19.7% | 80.3% | 100.0% |

Those participants who warmed up for longer were slightly less likely to get injured (both training and matches) but the difference was not statistically significant (p=0.114 and 0.097 respectively).

## 4.14 Protective gear

Wearing protective gear for training and competitive matches was significantly (p= <0.001) associated with being injured. This might be due to reverse causality, as those who wear protective gear do so because of an injury that has already occurred and not to prevent injury. In both cases, 100% of those who wore protective gear were injured .This is provided in Table 4.16 and Table 4.17 below.

**Table 4.16 Wearing of protective gear during training**

| | | | Injury | | Total | |
|---|---|---|---|---|---|---|
| | | | **No** | **Yes** | | **P- value** |
| **Protective gear worn during training** | **no** | **Count** | 15 | 26 | 41 | |
| | | **% within training** | 36.6% | 63.4% | 100.0% | |
| | **yes** | **Count** | 0 | 35 | 35 | |
| | | **% within training** | 0.0% | 100.0% | 100.0% | |
| **Total** | | **Count** | 15 | 61 | 76 | 0.001 |
| | | **% within training** | 19.7% | 80.3% | 100.0% | |

**Table 4.17 Wearing of protective gear during competitive matches**

| | | | Injury | | Total | |
|---|---|---|---|---|---|---|
| | | | No | Yes | | P-value |
| Protective gear worn during competitive matches | no | Count | 15 | 25 | 40 | |
| | | % within competitive match | 37.5% | 62.5% | 100.0% | |
| | yes | Count | 0 | 36 | 36 | |
| | | % within competitive match | 0.0% | 100.0% | 100.0% | |
| Total | | Count | 15 | 61 | 76 | 0.001 |
| | | % within competitive match | 19.7% | 80.3% | 100.0% | |

## 4.15 Footwear (shoe type)

Wearing appropriate footwear for training or matches was not associated with injury. A p-value of 0.477 was calculated indicating an insignificant relationship between footwear and injury.

## 4.16 Summary

There was a total of n= 76 participants in this study. The prevalence of at least one injury in ringball players was 80.3% (n= 61) and the most commonly reported locations of injuries were foot/ankle at 35.5% followed by knee at 29% and wrist 8.6%. The most common mechanisms of injury that were reported include incorrect or general landing, jumping, goal shooting and defending.

The participants reported that the most common healthcare professional utilised in general was self- treatment followed by no treatment. The participants utilise health care professionals like physiotherapists, chiropractors and general practitioners only after their first injury. Furthermore, the participants who warmed up before training or competitive matches with both static and dynamic exercises are less likely to get injured.

# CHAPTER FIVE

# DISCUSSION

## 5.1 Introduction

In this chapter, the literature review of netball and basketball is compared to the results of this study found in Chapter Four. The discussion of this study entails the following; the prevalence of injuries in ringball compared to that of basketball and netball, the selected risk factors, mechanisms of injury, the severity of injuries and treatment of injuries.

## 5.2 Prevalence of injuries in ringball compared to basketball and netball

The period prevalence of injury in this study with regard to at least one injury was 80.3% (n= 61) (figure 4.1). There were 93 reported injuries amongst 61 injured participants (Table 4.1) of which the most common location of injuries was the foot/ankle at 35.5%, followed by the knee at 29% and wrist 8.6%. The studies conducted by Borowski *et al.,* (2008), Ferreira and Spamer, (2010), Pillay and Frantz, (2012) and Andreoli *et al.,* (2018) on netball or basketball revealed similar results to this study with the most common injured areas.

Pillay and Frantz, (2012) and Ferreira and Spamer, (2010) revealed the prevalence of injuries to the foot/ankle to be 37.5% and 39.13%, respectively. Additionally, they revealed the injury prevalence of the knee to be 28.6% and 28.26%, respectively. These two studies revealed similar results to this study of the most common areas of injuries, however, there are differences in the percentages as this study showed the foot/ankle to have an injury prevalence of 35.5% and the knee of 29%. Differences in results from this study compared to the studies above may be due to a larger population size of 254 participants (Pillay and Frantz, 2012) compared to this study which had a population of 76 participants. Furthermore, Ferreira and Spamer, (2010)

only had female participants in their study, whereas this study included both male and female players, which could explain the differences in percentages.

Hampton, (2012) reported injuries in similar areas to this study as well as the studies conducted by Pillay and Frantz, (2012) and Ferreira and Spamer's, (2010). However, the studies conducted by Pillay and Frantz, (2012) and Ferreira and Spamer's, (2010) differed vastly from Hampton, (2012) with percentages. Hampton, (2012) reported that the foot/ankle (64%) and knee (15%) were mostly injured, which is vastly different from this study. The difference between the study conducted by Hampton, (2012) and this study, is that Hampton, (2012) used a five-year retrospective study that focused on lower limb injuries. It is, therefore, unclear as to what upper limb injuries these players experienced.

Netball injuries may report similarities to ringball due to the sharing of relatively similar rules that are used in both sports but there are slight differences between ringball and basketball. Mckay *et al.,* (1996) reported that the hand (20.9%) was the second most commonly injured area, whereas this study reported that the knee was the second most commonly injured area (29%). Mckay *et al.,* (1996) also reported that the ankle (30.2%) was the most commonly injured area and the knee (17.8%) was the third most commonly injured area. This differed from this study which showed the foot/ankle (35.5%) to be the most commonly injured area and the knee (29%) to be the second most commonly injured. An explanation for the differences in these results may be due to the participation number (n= 9190) from Mckay *et al.,* (1996) as this produced a much larger sample size and therefore would likely produce a more accurate collection of data.

The studies conducted by Andreoli *et al*., (2018), Borowski *et al.,* (2008) and McKay *et al.,* (1996) reported on injuries sustained in basketball, which were similar to this study with regard to the area mostly injured. However, McKay *et al.,* (1996) reported that the hand (20.9%) was the second most common injury location after the ankle. The reported prevalences were the foot/ankle (21.9%, 39.7% and 30.2% respectively) and knee (17.8%, 14.7% and 17.8 % respectively). The difference in percentages may be due to the participation size or the number of injuries reported. The above studies

had over 1500 participants (n= 1518, n= 12960 and n= 10393 respectively) which may have contributed to the difference in percentages.

## 5.3 Selected risk factors

### 5.3.1 Extrinsic risk factors

The extrinsic risk factors are discussed as follows; footwear (shoe type), warming up before training or competitive matches, playing position and protective gear.

#### 5.3.1.1 Footwear (shoe type)

This study reported a wide variance of footwear used and therefore could not show a specific relationship between footwear and injury. Additionally, Hampton, (2012) reported that 61% of the participants who were injured wore netball specific shoes and 37% wore running shoes. Due to the specificity of the study done by Hampton, (2012), there was an isolation of shoe wear and therefore had specific relationship between footwear and injury.

#### 5.3.1.2 Warming up before training or competitive matches

The results of this study concur with other studies as McManus *et al.,* (2006) reported that there was an 48% increased risk of injury in netball players who did not warm up before games or sport specific training. Petersen and Halmich, (2005), Verrall *et al.,* (2005) and Bartlett and Warren, (2002) reported that the body prepares itself for any external and internal action when warming up before training and competitive matches.

Additionally, Balbaugh's, (2019) results were in contrast to this study. Balbaugh reported that static stretches before participating in sport may affect the muscle negatively for up to an hour and may cause injury. However dynamic stretches have shown that they increase the flexibility of the muscles and decrease the reflexive contractions that occur naturally in the muscle that may cause a decrease in injury (Balbaugh, 2019). The contrasting results may be due to the difference in the target

population. Balbaugh's, (2019) study was conducted on an athletic population and not specifically for netball, basketball or ringball.

#### 5.3.1.3 Playing position

A significant association between playing position and injury could not be determined as a p-value could not be calculated due to too many groups. However, 61 out of 76 participants reported injuries.

The results reported in this study differed from Hampton, (2012) who reported on player position and associated injury, where this study could not associate area of injury relative to player position due to too many groups. However, Hampton, (2012) reported that the positions that were most susceptible to injuries were goal attack (70% ankle, 20% knee) and wing attack (50% ankle, 25% knee). Wing defence was the safest of all the positions with low reported injury percentages which suggested that the attacking positions were more susceptible to injuries than the defensive positions. The goal attack position was the only position that reported an injury at all six lower limb positions and goalkeeper reported three lower limb injuries (Hampton, 2012).

Hampton, (2012) suggested that the attacking positions were most susceptible to injuries and this study showed similarities to them, as both of the studies had the goal attacking position (netball position goal-attack which can be compared to the line shooter or side shooter) and wing as the position that was mostly susceptible to injuries and the defender as least susceptible to injuries. There are suggested similarities but the study conducted by Hampton, (2012), was based on lower limb injuries in the netball population, whereas this study was based on a general injury profile of the entire musculoskeletal system which in turn could yield different results.

This study could not associate player position to player injury due to too many groups that were present and therefore a common association to injuries could not be made. Hampton, (2012) made a player to injury association of just lower limb injuries and not the entire musculoskeletal system.

#### 5.3.1.4 Protective gear

This study reported that wearing protective gear was associated with the participants who already had an injury and not the cause or prevention of injury, therefore it cannot be compared to Sitler *et al.,* (1994) or Baker, (1990), who reported otherwise.

Sitler *et al.,* (1994) reported in their study conducted on United States Military Academy cadet basketball players, that ankle injuries were remarkably reduced by the ankle stabilisers. However, Baker, (1990) proposed that bracing the knee to prevent injury, provided little knee joint ligament protection and additionally, the protective bracing may cause more injuries in that area. The ankle, thumb and elbow joints can be stabilised adequately, but stabilising the knee and shoulder joint are usually ineffective especially for the thoroughness of limiting joint function and for competitive sport (Baker, 1990).

### 5.3.2. Intrinsic risk factors

#### 5.3.2.1 Age

This current study agreed with Morgan and Oberlander, (2001) that age did not play any significant role in the injury. However, the study conducted by Orchard, (2001) disagreed with this current study. Orchard's, (2001) study found that age did not play any significant role in quadriceps muscle strain but increased the risk for calf and hamstring muscle strain.

Morgan and Oberlander's (2001), study presented with the same general results, however, the study was conducted on soccer players. If a different demographic or study population (netball/ basketball) were used, a different result may have been reported.

Orchard's, (2001) study may present with different results to this current study, however, Orchard's study was based on muscle strains specifically the quadriceps, hamstrings and calf muscles and not general musculoskeletal injuries which can explain the reason why there was a difference in results reported.

#### 5.3.2.2 Body mass index and gender

This study revealed that there was an insignificant relationship between height, weight, gender and body mass index and injury.

According to Murphy *et al.,* (2003) and Childs, (2002), male athletes tend to have fewer injuries than female athletes and suggested that there are different factors such as hormonal, neuromuscular and anatomical factors that could explain why this is the case. A body mass index of >24.7 and body mass of more than 68kg were identified as risk factors for injury in females. The body mass index of this study (24.3) is similar or close to the body mass index (24.7) of Harner and Rhin, (2003).

This study revealed that the mean weight/ body mass was 76.67kg which is different to the results obtained from Harner and Rhin's, (2003) study that revealed a body mass of more than 68kg was a risk for injury in females. Harner and Rhin, (2003), found a relationship between injury, body mass index and gender, which, in contrast to this study, showed an insignificant relationship between body mass index and gender. The results may be different due to the fact that this study is based on ringball players and that the study that Harner and Rhin, (2003) conducted was on the general athlete population.

### 5.4 Mechanism of injuries

Pillay and Frantz, (2012), Hopper *et al.,* (1995) and Mckay *et al.,* (1996) reported similar results to this study. The studies reported that landing incorrectly was one of the most common mechanisms of injuries. In addition, Hopper *et al.,* (1995) and Mckay *et al.,* (1996) reported that contact with another player (collision) was also one of the commonly reported mechanisms of injury. The similarities of injuries can be explained by the general gameplay that involves repetitive jumping, landing and sudden sprints in basketball, netball and ringball.

Hakizimana, (2005) reported minor differences in his study compared to this one. Landing incorrectly/poorly (21.5%) was the most common mechanism of injury and defensive rebounding (18.5%) was the second most common mechanism of injury reported. The results of this study showed incorrect landing (15.3%) to be the most

common and jumping (8.5%) to be the second most common mechanism of injury. Basketball can be a more physical game in the court compared to netball and ringball, which provides a possible explanation as to why some of the results may differ, particularly defensive rebounding.

### 5.5 Severity of injuries

Severity was measured by the number of training sessions or matches missed due to the injury sustained by the player and the number of days that were missed through each injury. The number of matches and training sessions was only a guideline of the severity of the injury as the true severity of injury was classified according to the number of days the participants were restricted from activity/ training/competitive matches. More than 14 days (two weeks) activity restriction was classified as a severe injury in this study.

This study reported the severity of the first injury revealed by the participant. A total of 8.9% were unavailable for training for three to four weeks, 21.4% were unavailable for more than one month, 7.7% were unavailable for competitive matches for three to four weeks and 21.2% were unavailable for more than one month.

Dick *et al.,* (2007) reported that 18% of the participants were restricted from activity for more than ten days of both competitive matches and practices. There is a substantial difference between the numbers of activity restriction in this study compared to Dick *et al.,* (2007). The recorded severity of injuries in this study is greater than the findings from Dick *et al.,* (2007), however, a possible explanation for this difference may be due to the study period and amount of injuries reported. Dick *et al.,* (2007) performed his study over a 16-year period whilst this study was conducted over a three to four-month period. Dick *et al.,* (2007) had more than 4211 injuries from more than 45 000 competitive matches and 7833 injuries from more than 140 000 training sessions and this study only had 93 reported injuries amongst 61 injured participants. A longer study period and more injuries that are reported may suggest different results and could be the reason why the results of Dick *et al.,'s* (2007) conducted study may be different.

### 5.6 Type of treatments and healthcare professionals utilised

The most common treatment/management therapy utilised by the participants in this study was ice/cold therapy followed by exercise /rehabilitation therapy, strapping, ice/cold therapy with medication (e.g. Anti-inflammatories / NSAIDS) and heat therapy. This study reported similarities to Hopper, Elliot and Lalor, (1995) and Hakizimana, (2005) in the common treatment utilised. Hopper, Elliot and Lalor, (1995) and Hakizimana, (2005) reported that ice therapy and strapping are commonly used. Hakizimana, (2005) also reported that the most commonly reported treatment was self-treatment which corresponds to this study where self-treatment was mostly reported as treatment of choice.

However, Hopper, Elliott and Lalor, (1995) reported that 30% of the players were advised to see a physiotherapist or a doctor. This study reported (for injury one) that only 7% of the players utilised a doctor and 3.5% a physiotherapist, biokineticist, chiropractor or sport massage therapist which showed a difference to the study Hopper, Elliot and Lalor, (1995) conducted.

This study may report similarities to the studies conducted by Hopper, Elliot and Lalor, (1995) and Hakizimana, (2005), but differences are presented by the percentages showed above. The different results may be due to the absence of the first contact health professionals at the respective competitive matches or training sessions. If healthcare professionals were present at the competitive matches and training sessions the ringball players would had more access to better post-injury care.

## 5.7 Summary

This study revealed that ringball shares many similarities to basketball and netball (for example: the most common location of injury was; the foot/ankle and knee) and minor differences for example: Mckay *et al.,* (1996) reported that the hand was the second most commonly injured area, whereas this study reported that the knee was the second most commonly injured area in relation to the topics discussed above. Ringball had a lack of literature in general musculoskeletal injuries and how this sport was managed. Therefore, this study recorded valuable information of ringball players such as the most common locations injured, which were the foot/ankle (35.5%), knee (29%) and wrist (8.6%). Furthermore, there was significant association between injury and not warming up before training (p-value of 0.013) and competitive matches (p-value of 0.044) was found.

There is a need for primary health care professionals at the competitive matches and training sessions so that the players can receive adequate treatment needed. The two most reported treatments were self-treatment (35.1%), followed by no treatment (19.3%). More research needs to be conducted on ringball which will give a more accurate analysis of what is needed to treat and prevent the general injuries sustained.

# CHAPTER SIX

# Conclusions, Limitations and Recommendations

## 6.1 Introduction

This chapter will detail the conclusions of this study that are produced from the results and discussion of Chapters Four and Five on the epidemiology of musculoskeletal injuries in ringball players of KwaZulu-Natal. The outline of the key findings of this study will be presented along with the strengths and limitations. There are recommendations outlined for future research studies on ringball to achieve a better understanding of the musculoskeletal injuries in this sport.

## 6.2 Key findings

- A prevalence of at least one injury in ringball players was 80.3%. The prevalence of having a second injury was 32.9% and a third was 9.2%.
- The most common locations injured were the foot/ankle (35.5%), knee (29%) and wrist (8.6%).
- The severity of injuries was measured by the number of training sessions or matches missed and the number of days that were missed (this was for the first reported injury since it was the most reported injury out of all three). The more training sessions, matches and days missed due to injury, indicates a higher severity of injury.
    - Training sessions missed: 13.6% of the players missed one session,15.3% missed two sessions, 6.8% missed 3 sessions, 6.8% missed 4 sessions and 22% missed more than four training sessions.
    - Competitive matches missed: 10.3% missed one competitive match, 15.5% missed two matches, 12.1% missed three matches, 5.2% missed four matches and 24.1% missed more than four competitive matches.
    - Number of days missed from training: 23.2% did not miss a training session, 14.3% were unavailable for one to three days,16.1% were unavailable for

four to seven days,16.1% were unavailable for one to two weeks, 8.9% were unavailable for three to four weeks and 21.4% were unavailable for more than one month.

- Number of days missed from competitive matches: 28.8% did not miss a competitive match, 7.7% were unavailable for one to three days, 15.4% were unavailable for four to seven days,19.2% were unavailable for one to two weeks, 7.7% were unavailable for three to four weeks and 21.2% were unavailable for more than one month.

- The main mechanism of injury for injury one was incorrect landing at 15.3%, jumping 8.5%, goal shooting 6.8%, defending 6.8%, collision 6.8% and other mechanisms 6.8%.
- 35.1% of the participants reported self-treatment for injury one and 25.0% for injury two, meaning that they did not receive management or treatment from healthcare professionals.
- 17.0% reported that they used ice/cold therapy for injury one.
- A significant association between injury and not warming up before training (p-value of 0.013) and competitive matches (p-value of 0.044) was found.

### 6.3 The Strengths of this study

This is the first study done on the epidemiology of musculoskeletal injuries in ringball players according to our knowledge. The strengths of this study are as follows:

- The first study in South Africa to capture the period prevalence of musculoskeletal injuries in ringball.
- The first study in South Africa to capture the location and severity of injury.
- The first study in South Africa to capture the selected risk factors and mechanism of injuries.
- The first study in South Africa to capture the management of the musculoskeletal injuries sustained in ringball players

## 6.4 Limitations of this study

- This study only included male and female participants over the age of 16.
- Participants had to play at least one year/season of ringball to participate in this study.
- The questionnaire had to be administered before training sessions or competitive matches during the ringball season that started in the middle of February and ended at the end of May.
- Did not compare body composition and gender to injury.

## 6.5 Recommendations for future studies on ringball

- A larger population size should be included in future studies of the epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal or a study on the ringball players of all provinces nationally in South Africa.
- Future studies should include all ages of both male and female players to see if other risk factors can be identified and to enlarge the population size.
- Studies done in the future can investigate the court surfaces and consequent incidences of injuries sustained.
- More attention could be paid in future studies on the knowledge that the ringball players have of healthcare professionals and the role they play in injuries and what treatment protocol was most effective for their injuries.
- Analyse body composition and gender to see if there could be a correlation between the two.

## 6.6 Conclusion

Ringball is a popular sport played across South Africa as well as internationally, therefore the need for research pertaining to injuries in ringball was necessary. This study revealed that ringball shares many similarities and minor differences with netball and basketball as a sport. This study reported that the foot/ankle, knee and wrist were most commonly injured. The results showed that there was a lack of primary health care professionals at competitive matches and training sessions. Primary health care professionals are needed at the relevant matches and training sessions so that the

players can receive adequate treatment and management/treatment protocols since most of the ringball players reported that they received no treatment or applied self-treatment. This study highlights that coaches and players should pay special attention to warming up before competitive matches and training sessions, since not warming up before training and competitive matches was found to be a significant risk factor for injury.

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# Appendices

## Appendix A

### GATEKEEPER's PERMISSION

[ /05/2018]

Mr. Ockie van Schalkwyk

**Request for Permission to Conduct Research**

Dear Mr. van Schalkwyk

My name is Johan Wiggill, a Chiropractic Masters student at the Durban University of Technology. The research I wish to conduct for my Masters dissertation involves the epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal.

I am hereby seeking your consent to conduct my research at the respective clubs.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Institutional Research Ethics Committee (IREC).

If you require any further information, please do not hesitate to contact me via my cellphone number: 0636592154 or email: Johanadriaan728@gmail.com. Thank you for your time and consideration in this matter.

Yours sincerely,

Johan Wiggill
Durban University of Technology

_____

Signature: KwaZulu-Natal President

## Appendix B

**LETTER OF INFORMATION – RESEARCH PARTICIPANT**

Dear Sir or Madam
Welcome to my research study.

**TITLE OF RESEARCH study:**

**The epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal.**

**NAME OF SUPERVISOR:**

Prof JD Pillay [PhD Physiology]

**NAME OF CO-SUPERVISOR:**

Dr BN Mkhwanazi [PhD Physiology]

**NAME OF RESEARCH STUDENT:**

Johan Wiggill [B. Tech Chiropractic]

**Brief introduction and purpose of the study:**

Ringball is a sport that is approximately a 100 years old and there is still not a lot of information on this sport. By doing this study it will increase the knowledge of health care professionals and the players self of what type of injuries most commonly occur. This will help the health care professionals in managing, treating, rehabilitation and to introduce injury prevention strategies.

**Outline of the Procedures:**

Each player will receive a Letter of information and Consent or letter of Information and Assent (if younger than 18 years of age and a informed consent from a legal guardian is required) and questionnaire to complete. Directly after completing the questionnaire you should hand it in to the researcher. Your name or other identifiable information will not be placed on the questionnaires to ensure confidentiality. This questionnaire should take approximately 15 minutes to complete. Please answer all the questions at the best of your ability and honestly.

**Risks/ Costs:**

There are no costs or risks taking place in this research project.

**Benefits:**

- This will increase the knowledge of all health care professionals by pointing out the most common injuries.
- Will help guide and increase proficiency in the management, treatment and rehabilitation.
- To improve methods of preventing a injury and give relevant information on prevention strategies.

**Commitment to the study:**

You may withdraw at any point in time with no consequences from this study for any reason.

**Remuneration:**

There will be no remuneration offered.

**Costs of the Study**:

There are no costs involving this research study.

**Confidentiality**:

Your information will be kept confidential and will be stored at Durban University of Technology's Chiropractic department in a safe for five years. Thereafter it will be destroyed by a shredding machine.

**Research-related Injury:**

You will not be injured during this research study.

**Persons to Contact in the Event of Any Problems or Queries:**

Please contact the researcher (Johan Wiggill: 063659215), my supervisor (Prof JD Pillay: 031-373239), Co-supervisor (Dr BN Mkhwanazi: 031-3732400) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support, Prof Napier on 031 373 2326 or carinn@dut.ac.za

## Appendix C

### QUESTIONNAIRE FOR RESEARCH PARTICIPANT

**Code**
**All questions are strictly confidential. Please be as truthful as possible and tick one box per question unless otherwise indicated.**

**IF YOU HAVE NOT PLAYED AT LEAST ONE SEASON OF RINGBALL AND ARE UNDER THE AGE OF 16 PLEASE DO NOT FILL IN.**

**PART A. IDENTIFICATION**

1. Age (years): _____

2. Gender: Male: ☐ Female: ☐

3. Ethnicity: Black: ☐ White: ☐ Coloured: ☐ Indian: ☐ Other: ☐

4. Height (in cm): _____

5. Weight (in Kg): _____

6. How long have you played Ringball for?

1-2 years: ☐ 2-3 years: ☐ 3-4 years: ☐ >4 years: ☐

7. How many seasons have you played in the last five years? _____

8. Playing position: _____

9. Do you participate in any other sports? Yes: ☐ No: ☐

10. If yes, please specify: _____

**PART B. HISTORY OF INJURY**

1.Do you have any pre-existing medical condition? (e.g. Anemia, Diabetes, Osteoporosis, hypertension)

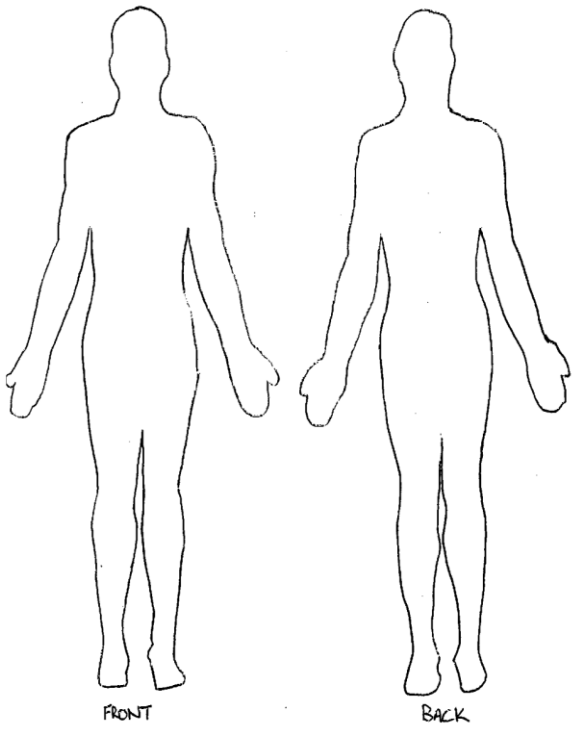
_____

_____

2. Which of the following injuries did you sustain (One or more answers are possible):

Wrist: ☐ Hand: ☐ Elbow: ☐ Shoulder: ☐ Head/Neck/Facial: ☐
Upper arm: ☐ Forearm: ☐ Knee/ Thigh: ☐ Chest: ☐
Abdomen: ☐ Genital: ☐ Foot/Ankle: ☐ Back: ☐

3. Based on question two, which body parts sustained injury? (Indicate on the illustration)




**4. How many injuries have you sustained during training or competitive session(s) playing ringball?**

| | | | | | |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | > 4 |

**5. Please tick in the box below if you had any of these mechanisms of injuries, based on your three most severe injuries.**

| **Mechanism of injury** | **Training / competitive** | | **Injury: 1/2/3** | | |
|---|---|---|---|---|---|
| | **Training** | **competitive** | **1** | **2** | **3** |
| **Ball throw** | | | | | |
| **Collision** | | | | | |
| **Defending** | | | | | |
| **Goal shooting** | | | | | |
| **Jumping** | | | | | |
| **Landing** | | | | | |
| **Overexertion** | | | | | |
| **Running/ short sprints** | | | | | |
| **Turning** | | | | | |
| **Other** | | | | | |

**6. How many training sessions and competitive matches did you miss last season as a result of the injury? (Please tick in correct blocks)**

**Type of injury (Injury One): _____**

*Training sessions:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

*Competitive matches:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

**Type of injury (Injury Two): _____**

*Training sessions:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

*Competitive matches:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

**Type of injury (Injury Three): _____**

*Training sessions:*

| | | | | | |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | > 4 |

*Competitive matches:*

| | | | | | |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | > 4 |

**7. What kind of treatment did you receive following injuries? (Please tick in correct blocks and one or more answers are possible).**

| **Treatment** | | **Injuries 1/2/3** | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| Biokineticist | | | | |
| Chiropractic | | | | |
| General practitioner | | | | |
| Field side assistance (first aid) | | | | |
| Physiotherapy | | | | |
| Self-treatment | | | | |
| Sport massage | | | | |
| Other | | | | |
| None | | | | |

**8. How long after the injury did you receive treatment?**

**Type of injury (Injury One): _____**

| | | | | | |
|---|---|---|---|---|---|
| Immediately | 1-3 days | 4-7 days | 1-2weeks | 2-4weeks | More than a month |

**Type of injury (Injury Two): _____**

| | | | | | |
|---|---|---|---|---|---|
| Immediately | 1-3 days | 4-7 days | 1-2weeks | 2-4weeks | More than a month |

**Type of injury (Injury Three): _____**

| | | | | | |
|---|---|---|---|---|---|
| Immediately | 1-3 days | 4-7 days | 1-2 weeks | 2-4weeks | More than a month |

**9. What kind of treatment or advice did you receive following injury? (Tick in the correct blocks and one or more answers are possible).**

| **Treatment:** | | **Injuries 1/2/3:** | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| Compression (pressure on muscle) | | | | |
| Dry needling | | | | |
| Deep frictions/ Cross friction | | | | |
| Elevation | | | | |
| Exercise therapy / Rehab | | | | |
| Heat therapy | | | | |
| Ice/cold therapy | | | | |
| Joint mobilization/ Manipulation | | | | |
| Massage | | | | |
| Medication (e.g. Anti-inflammatories / NSAIDS) | | | | |
| Muscle stimulation | | | | |
| Splinting | | | | |
| Strapping | | | | |
| Stretching | | | | |
| Surgery | | | | |
| Other | | | | |

**10. How long have you been unavailable for training or competitive matches because of injury?**

**Training sessions**

**Type of injury (Injury One): _____**

| | | | | | |
|---|---|---|---|---|---|
| none | 1-3 days | 4-7 days | 1-2 weeks | 3-4 weeks | More than a month |

**Type of injury (Injury Two): _____**

| | | | | | |
|---|---|---|---|---|---|
| none | 1-3 days | 4-7 days | 1-2 weeks | 3-4 weeks | More than a month |

**Type of injury (Injury Three): _____**

| | | | | | |
|---|---|---|---|---|---|
| none | 1-3 days | 4-7 days | 1-2 weeks | 3-4 weeks | More than a month |

**Competitive matches**

**Type of injury (Injury One): _____**

| | | | | | |
|---|---|---|---|---|---|
| none | 1-3 days | 4-7 days | 1-2 weeks | 3-4 weeks | More than a month |

**Type of injury (Injury Two): _____**

| | | | | | |
|---|---|---|---|---|---|
| none | 1-3 days | 4-7 days | 1-2 weeks | 3-4 weeks | More than a month |

**Type of injury (Injury Three): _____**

| | | | | | |
|---|---|---|---|---|---|
| none | 1-3 days | 4-7 days | 1-2 weeks | 3-4 weeks | More than a month |

**PART C. WARM UP**

***Training session***

**1.a) Do you warm up before a training session?**

Yes: ☐ No: ☐ often: ☐ Sometimes: ☐

**1.b) If other than No, what type of warm up activity/activities do you engage in?**

Dynamic (e.g. active movements, walk, jog) : ☐ Static (e.g. standing/stretching): ☐

**1.c) For how long (in minutes) do you warm up**? **_____**

***Competitive matches***

**2.a) Do you warm up before a competitive match?**

Yes: ☐ No: ☐ often: ☐ Sometimes: ☐

**2.b) If other than No, what type of warm up activity/activities do you engage in?**

Dynamic (e.g. active movements, walk, jog) : ☐ Static (e.g. standing/stretching): ☐

**2.c) For how long ( in minutes) do you warm up**? _____

**PART D. PROTECTIVE EQUIPMENT**

***Training session***

**1.a) Do you wear any protective gear (braces/ strapping, etc.)?**

Yes: ☐ No: ☐ often: ☐ Sometimes: ☐

**b) If yes, often or sometimes, why are you using protective gear?**

To prevent injury: ☐ Because of a previous injury: ☐

Recent injury: ☐ I was told to: ☐

For no reason: ☐ Not applicable ☐

**c) If yes, often or sometimes, where have you worn the protective gear?**

Wrist: ☐ Hand: ☐ Elbow: ☐ Shoulder: ☐ Head/Neck/Facial: ☐
Upper arm: ☐ Forearm: ☐ Knee/ Thigh: ☐ Chest: ☐ Abdomen: ☐
Genital: ☐ Foot/Ankle: ☐ Back: ☐

Not applicable ☐

**d) What footwear do you wear when playing ringball (e.g. netball, running, tennis shoes)?**

_____

**e) Do you think it is appropriate?** Yes: ☐ No: ☐

***Competitive matches***

**2.a) Do you wear any protective gear (braces/ strapping, etc.)?**

Yes: ☐ No: ☐ often: ☐ Sometimes: ☐

**b) If yes, often and sometimes, why are you using protective gear?**

To prevent a injury: ☐ Because of an previous injury: ☐

Recent injury: ☐ I was told to: ☐

For no reason: ☐ Not applicable ☐

**c) If yes, often and sometimes, where do you wear the protective?**

Wrist: ☐ Hand: ☐ Elbow: ☐ Shoulder: ☐ Head/Neck/Facial: ☐ Knee/ Thigh: ☐

Upper arm: ☐ Forearm: ☐ Chest: ☐ Abdomen: ☐ Genital: ☐ Foot/Ankle: ☐

Back: ☐ Not applicable ☐

**d) What footwear do you wear when playing ringball (e.g. netball, running, tennis shoes)?**

_____

**e) Do you think it is appropriate?** Yes: ☐ No: ☐

**IF ANY OF THE PARTICIPANTS WISH TO GET THE RESULTS OF THIS RESEARCH, PLEASE BRING THIS TO THE RESEARCHERS ATTENTION AND IT WILL BE MADE AVAILABLE TO YOU.**

## Appendix D

### Letter of consent

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Johan Wiggill, about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number: **REC 35/18**,
- I have also received, read and understood the above written information regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be collected and put together into a study report in a way that prevents me from being identified by my name.
- In view of what is needed for the research, I agree that the data collected during this study can be put together in a computerized system by the researcher.
- I may, at any stage, without judgement or harm, withdraw my consent and participation in the study.
- I have had enough opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that any important new findings that happen during the course of this research which may be about my participation will be made available to me.

| _____ | _____ | _____ | _____ |
|---|---|---|---|
| Full Name of Participant | Date | Time | Signature |

I, Johan Wiggill, herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

| _____ | _____ | _____ |
|---|---|---|
| Full Name of Researcher | Date | Signature |
| _____ | _____ | _____ |
| Full Name of Witness | Date | Signature |

## Appendix E

**LETTER OF INFORMATION- FOCUS GROUP**

Dear Sir or Madam
Welcome to my focus group.

**TITLE OF RESEARCH study:**

**The epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal.**

**NAME OF SUPERVISOR:**

Prof JD Pillay [PhD Physiology]

**NAME OF CO-SUPERVISOR:**

Dr BN Mkhwanazi [PhD Physiology]

**NAME OF RESEARCH STUDENT:**

Johan Wiggill [B. Tech Chiropractic]

**Brief introduction and purpose of the study:**

Ringball is a sport that is approximately a 100 years old and there is still not a lot of information on this sport. By doing this study it will increase the knowledge of health care professionals and the player's self of what type of injuries most commonly occur. This will help the health care professionals in managing, treating, rehabilitation and to introduce injury prevention strategies.

**Outline of the Procedures:**

The purpose of the focus group is to validate the questionnaire by assessing and discussing the pre-focus group questionnaire. A time, venue and date will be arranged by the researcher telephonically or via email with all members of the focus group. Each participant will be required to sign a confidentially letter and a code of conduct form before commencement of the focus group discussion. The focus group will be regulated and recorded by the researcher. If there are any changes or suggestions proposed by a participant, those will be investigated by the group and voted on. Only with a unanimous vote will change be made to the questionnaire. A list of changes that are implemented will be used to adjust the questionnaire.

**Risks/ Costs:**

There are no cost or risk taking place in this research project.

**Benefits:**

- This will increase the knowledge of all health care professionals by pointing out the most common injuries.
- Will help guide and increase proficiency in the management, treatment and rehabilitation.
- To improve methods of preventing an injury and give relevant information on prevention strategies.

**Commitment to the study:**

You may withdraw at any point in time with no consequences from this study for any reason.

**Remuneration:**

There will be no remuneration offered.

**Costs of the Study**:

There are no costs involving this research study.

**Confidentiality**:

Your information will be kept confidential and will be store at Durban University of Technology's Chiropractic department in a safe for five years. Thereafter it will be destroyed by a shredding machine.

**Research-related Injury:**

You will not be injured during this focus group.

**Persons to Contact in the Event of Any Problems or Queries:**

Please contact the researcher (Johan Wiggill: 063659215), my supervisor (Prof JD Pillay: 031-373239), Co-supervisor (Dr BN Mkhwanazi: 031-3732400) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support, Prof Napier on 031 373 2326 or e-mail carinn@dut.ac.za

## Appendix F

### Letter of consent / Confidentiality statement of focus group

**Statement of Agreement to Participate in the Research Study:**

- I hereby confirm that I have been informed by the researcher, **Johan Wiggill**, about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number: **REC 35/18**,
- I have also received, read and understood the above written information regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be collected and put together into a study report in a way that prevents me from being identified by my name
- In view of what is needed for the research, I agree that the data collected during this study can be put together in a computerized system by the researcher.
- I may, at any stage, without judgement or harm, withdraw my consent and participation in the study.
- I have had enough opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that any important new findings that happen during the course of this research which may be about my participation will be made available to me.

**Circle the appropriate answer:**

1- Have you read the participant information sheet? YES NO

2- Have you had the opportunity to ask questions regarding this study? YES NO

3- Have you received satisfactory answers to your questions? YES NO

4- Have you had the opportunity to discuss this study? YES NO

5- Have you received enough information about this study? YES NO

6- Who have you spoken to regarding this study? _____

7- Do you understand the implications of your involvement in this study? YES NO

8- Do you understand that you are free to withdraw from this study at any time, without giving a reason for withdrawing, and without affecting your future health? YES NO

9- Do you agree to voluntarily participate in this study? YES NO

**If you answered NO to any of the above, please obtain the necessary information from the researcher and / or supervisor before signing.**

**Thank You!**

Focus group member: _____ Signature: _____

Researcher's name: _____ Signature: _____

## Appendix G

**PARENT/LEGAL GUARDIAN LETTER OF INFORMATION**

Dear Parent or Legal Guardian.

I'm a Chiropractic master's student at Durban University of Technology and I'm currently doing my dissertation. May I ask your permission for your son/daughter to participate in my research today?

**TITLE OF RESEARCH study:**

**The epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal.**

**NAME OF SUPERVISOR:**

Prof JD Pillay [PhD Physiology]

**NAME OF CO-SUPERVISOR:**

Dr BN Mkhwanazi [PhD Physiology]

**NAME OF RESEARCH STUDENT:**

Johan Wiggill [B. Tech Chiropractic]

**Brief introduction and purpose of the study:**

Ringball is a sport that is approximately a 100 years old and there is still not a lot of information on this sport. By doing this study it will increase the knowledge of health care professionals and the player's self of what type of injuries most commonly occur. This will help the health care professionals in managing, treating, rehabilitation and to introduce injury prevention strategies.

**Outline of the Procedures:**

Your child will receive a Letter of information, Informed consent form and a questionnaire to complete. Directly after completing the questionnaire your child should hand it in to the researcher. His/her name or other identifiable information will not be placed on the questionnaire to ensure confidentiality. This questionnaire should take approximately 15 minutes to complete. They are required to answer all the questions at the best of their ability and honesty. The inclusion and exclusion criteria for this study are:

- **Inclusion criteria**
  - All ringball players present at the club venue at that specific point in time.
  - The participants must be a player of one of the six ringball clubs
  - The individual players must give their consent and sign a Letter of consent and information letter for the research that needs to be conducted.
  - Participants below the age of 18 must have parental consent.
  - Participants must understand and be able to speak English.

- **Exclusion Criteria**
    - Any participant that is below the age of 16 years.
    - Any participant that cannot give consent due to any circumstances.

**Risks/ Costs:**

There are no cost or risk taking place in this research project.

**Benefits:**

- This will increase the knowledge of all health care professionals by pointing out the most common injuries.
- Will help guide and increase proficiency in the management, treatment and rehabilitation.
- To improve methods of preventing a injury and give relevant information on prevention strategies.

**Commitment to the study:**

Your child may withdraw at any point in time with no consequences from this study for any reason.

**Remuneration:**

There will be no remuneration offered.

**Costs of the Study**:

There are no costs involving this research study.

**Confidentiality**:

Your child's information will be kept confidential and will be store at Durban University of Technology's Chiropractic department in a safe for five years. Thereafter it will be destroyed by a shredding machine.

**Research-related Injury:**

No one will be injured during this research study.

**Persons to Contact in the Event of Any Problems or Queries:**

Please contact the researcher (Johan Wiggill: 063659215), my supervisor (Prof JD Pillay: 031-373239), Co-supervisor (Dr BN Mkhwanazi: 031-3732400) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support, Prof Napier on 031 373 2326 or carinn@dut.ac.za

## Appendix H

### Letter of consent/ Legal guardian consent

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Johan Wiggill, about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number: **REC 35/18**,
- I have also received, read and understood the above written information (Parent/Guardian Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my Childs sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and Childs participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to allow my child to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my Childs participation will be made available to me.

_____ _____ _____ _____

Full Name of legal Guardian\ Parent Date Time Signature

I, Johan Wiggill, herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____ _____ _____

Full Name of Researcher Date Signature

_____ _____ _____

Full Name of Witness Date Signature

## Appendix I

### QUESTIONNAIRE FOR FOCUS GROUP

**Code** ☐

**All questions are strictly confidential. Please be as truthful as possible and tick one box per question unless otherwise indicated.**

**IF YOU HAVE NOT PLAYED ATLEAST ONE SEASON OF RINGBALL AND ARE UNDER THE AGE OF 16 PLEASE DO NOT FILL IN.**

**PART A. IDENTIFICATION**

1. Age (years): _____

2. Gender: Male: ☐ Female: ☐

3. Ethnicity: Black: ☐ White: ☐ Coloured: ☐ Indian: ☐ Other: ☐

4. Height (in cm): _____

5. Weight (in Kg): _____

6. How long have you played Ringball for?

1-2 years: ☐ 2-3 Years: ☐ 3-4 Years: ☐

>4 years: ☐

7. How many seasons have you played for?

| 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|

8. Playing position: _____

9. Do you participate in any other sports? Yes: ☐ No: ☐

10. If yes, please specify: _____

**PART B. HISTORY OF INJURY**

1. Do you have any pre-existing medical condition? (e.g. Anemia, Diabetes, Osteoporosis, hypertension)

_____

_____

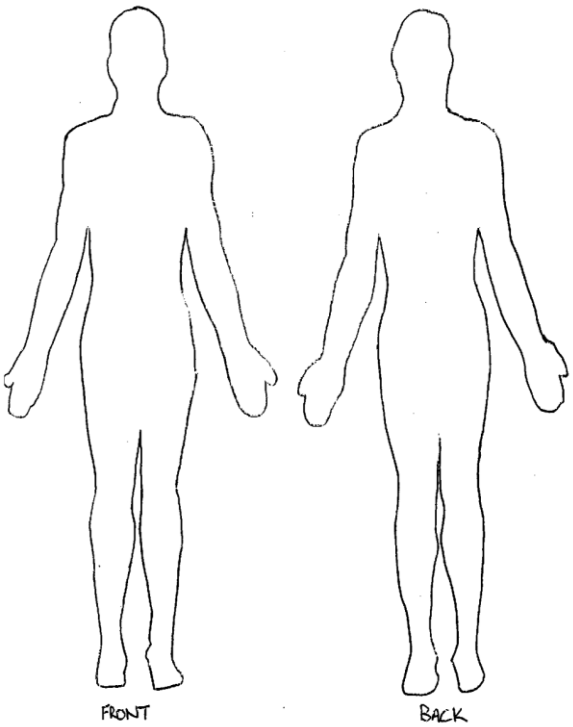
2. Which of the following injuries did you sustain (One or more answers are possible):

Wrist: ☐ Hand: ☐ Elbow: ☐ Shoulder: ☐ Head/Neck/Facial: ☐

Knee/ Thigh: ☐ Chest: ☐ Abdomen: ☐ Genital: ☐

Foot/Ankle: ☐ Back: ☐

3. Based on question two, which body parts sustained injury? (Indicate on the illustration)




**4. How many injuries have you got/received/sustained during training or competitive session(s) playing ringball ?**

| | | | | | |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | > 4 |

**5. Please tick in the box below if you had any of these mechanisms of injuries, based on your three most severe injuries.**

| **Mechanism of injury** | **Training / competitive** | | **Injury: 1/2/3** | | |
|---|---|---|---|---|---|
| | **Training** | **competitive** | **1** | **2** | **3** |
| **Ball through** | | | | | |
| **Collision** | | | | | |
| **Defending** | | | | | |
| **Goal shooting** | | | | | |
| **Jumping** | | | | | |
| **Landing** | | | | | |
| **Overuse** | | | | | |
| **Running/ short sprints** | | | | | |
| **Turning** | | | | | |
| **Other** | | | | | |

**6. How many training sessions and competitive matches did you miss last season as a result of the injury? (Please tick in correct blocks)**

**Injury One:**

*Training sessions:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

*Competitive matches:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

**Injury Two:**

*Training sessions:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

*Competitive matches:*

| 0 | 1 | 2 | 3 | 4 | > 4 |
|---|---|---|---|---|---|

**Injury Three:**

*Training sessions:*

| | | | | | |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | > 4 |

*Competitive matches:*

| | | | | | |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | > 4 |

**7. What kind of treatment did you receive following injuries? (Please tick in correct blocks and one or more answers are possible).**

| **Treatment** | | **Injuries 1/2/3** | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| Biokineticist | | | | |
| Chiropractic | | | | |
| GP | | | | |
| Field side | | | | |
| Physiotherapy | | | | |
| Self-treatment | | | | |
| Sport message | | | | |
| Other | | | | |
| None | | | | |

**8. How long since the injury have you gone for treatment?**

**Injury One:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**Injury Two:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**Injury Three:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**9. What kind of treatment or advice did you receive following injury? (Tick in the correct blocks and one or more answers are possible).**

| **Treatment:** | | **Injuries 1/2/3:** | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| Compression | | | | |
| Dry needles | | | | |
| Deep frictions | | | | |
| Electro-modalities (e.g ultrasound, TENS) | | | | |
| Elevation | | | | |
| Exercise therapy | | | | |
| Heat | | | | |
| Ice/cold | | | | |
| Injectables (e.g. Voltaren, steroids) | | | | |
| Joint mobilization/ Manipulation | | | | |
| Massage | | | | |
| Medication (e.g. Anti-inflammatories/NSAIDS) | | | | |
| Muscle stimulation | | | | |
| Oral advice | | | | |
| Splinting | | | | |
| Strapping | | | | |
| Stretching | | | | |
| Surgery | | | | |

**10. What advice did you receive?**

**Injury One:**

| | | |
|---|---|---|
| Rest/<br>No sport activity | Limited sport activity: | Full sport activity: |

**Injury Two:**

| | | |
|---|---|---|
| Rest/<br>No sport activity: | Limited sport activity: | Full sport activity: |

**Injury Three:**

| | | |
|---|---|---|
| Rest/ No sport activity: | Limited sport activity: | Full sport activity: |

**11. How long have you been unavailable for training or competitive matches because of injury?**

**Training sessions**

**First injury:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**Second injury:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**Third injury:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**Competitive matches**

**First injury:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**Second injury:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**Third injury:**

| | | |
|---|---|---|
| 1-3 days | 4-7 days | > 7 days |

**12. Did you get facilities to access health care services on site?**

| | | | | |
|---|---|---|---|---|
| Always (100%) | Very often (75%) | Often (50%) | Sometimes (25%) | Never (0%) |

**13. Which health care services can you access after the game?**

| **Treatment** | |
|---|---|
| Biokineticist | |
| Chiropractic | |
| GP | |
| Field side | |
| Physiotherapy | |
| Self-treatment | |
| Sport message | |
| Other | |
| None | |

**PART C. PROTECTIVE EQUIPMENT**

***Training session***

**1.a) Do you wear any protective gear (braces/ strapping, etc.) ?**

Yes: ☐ No: ☐ Sometimes: ☐

**b) If yes to question 1.a, why are you using protective gear?**

To prevent injury: ☐ Because of an previous injury: ☐

Recent injury: ☐ I was told to: ☐

For no reason: ☐

**c) If yes or sometimes to question 1.a, where do you wear the protective?**

Wrist: ☐ Hand: ☐ Elbow: ☐ Shoulder: ☐ Head/Neck/Facial: ☐

Knee/ Thigh: ☐ Chest: ☐ Abdomen: ☐ Genital: ☐

Foot/Ankle: ☐ Back: ☐

**d) How often do you use the protective gear?**

| Always (100%): | Very often (75%): | Often (50%): | Sometimes (25%): | Never (0%): |
|---|---|---|---|---|

**e) What footwear do you wear when playing ringball?** _____

**f) Do you think it is appropriate?** Yes: ☐ No: ☐

***Competitive matches***

***2.a) Do you wear any protective gear (braces/ strapping, etc.)?***

Yes: ☐ No: ☐ Sometimes: ☐

**b) If yes to question 2.a, why are you using protective gear?**

To prevent a injury: ☐ Because of an previous injury: ☐

Recent injury: ☐ I was told to: ☐

For no reason: ☐

**c) If yes or sometimes, where do you wear the protective?**

Wrist: ☐ Hand: ☐ Elbow: ☐ Shoulder: ☐ Head/Neck/Facial: ☐

Knee/ Thigh: ☐ Chest: ☐ Abdomen: ☐ Genital: ☐

Foot/Ankle: ☐ Back: ☐

**d) How often do you use the protective gear?**

| Always (100%): | Very often (75%): | Often (50%): | Sometimes (25%): | Never (0%): |
|---|---|---|---|---|

**e) What footwear do you wear when playing ringball?** _____

**f) Do you think it is appropriate?** Yes: ☐ No: ☐

**IF ANY OF THE PARTICIPANTS WISH TO GET THE RESULTS OF THIS RESEARCH, PLEASE BRING THIS TO THE RESEARCHERS ATTENTION AND IT WILL BE MADE AVAILABLE TO YOU.**

## Appendix J

### Letter of Assent

Statement of Agreement to Participate in the Research Study:

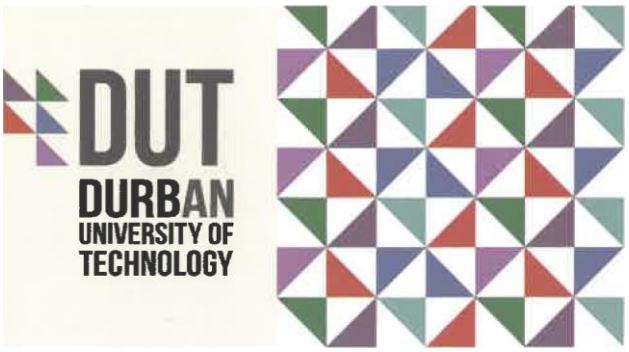
- I hereby confirm that I have been informed by the researcher, Johan Wiggill, about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number: **REC 35/18** ,
- I have also received, read and understood the above written information regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be collected and put together into a study report in a way that prevents me from being identified by my name
- In view of what is needed for the research, I agree that the data collected during this study can be put together in a computerized system by the researcher.
- I may, at any stage, without judgement or harm, withdraw my consent and participation in the study.
- I have had enough opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that any important new findings that happen during the course of this research which may be about my participation will be made available to me.

| _____ | _____ | _____ | _____ |
|---|---|---|---|
| Full Name of Participant | Date | Time | Signature |

I, Johan Wiggill, herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

| _____ | _____ | _____ |
|---|---|---|
| Full Name of Researcher | Date | Signature |
| _____ | _____ | _____ |
| Full Name of Witness | Date | Signature |
| _____ | _____ | _____ |
| Full Name of Legal Guardian | Date | Signature |

## Appendix K




Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate l, Steve Biko Campus
Durban University of Technology

P O Box 1 334, Durban, South Africa, 400 1

•re]: 03 1 373 2375 Email: Javíshad@dutac.za
http://www.dut.ac.za/research/institutional research ethics

www.dut.ac.za

I I December 2018
IREC Reference Number: REC 35/18

Mr J A Wiggill
15 Regina Avenue
Umbilo
Durban

Dear Mr Wiggill

The epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal.

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the 'REC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

[redacted]

Professor J K Adam
Chairperson: IREC

## Appendix L

### GATEKEEPER's PERMISSION

[04/06/2018]

Mr. Ockie van Schalkwyk

**Request for Permission to Conduct Research**

Dear Mr. van Schalkwyk

My name is Johan Wiggill, a Chiropractic Masters student at the Durban University of Technology. The research I wish to conduct for my Masters dissertation involves the epidemiology of musculoskeletal injuries of ringball players in KwaZulu-Natal.

I am hereby seeking your consent to conduct my research at the respective clubs.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Institutional Research Ethics Committee (IREC).

If you require any further information, please do not hesitate to contact me via my cell phone number: 0636592154 or email: Johanadriaan728@gmail.com. Thank you for your time and consideration in this matter.

Yours sincerely,

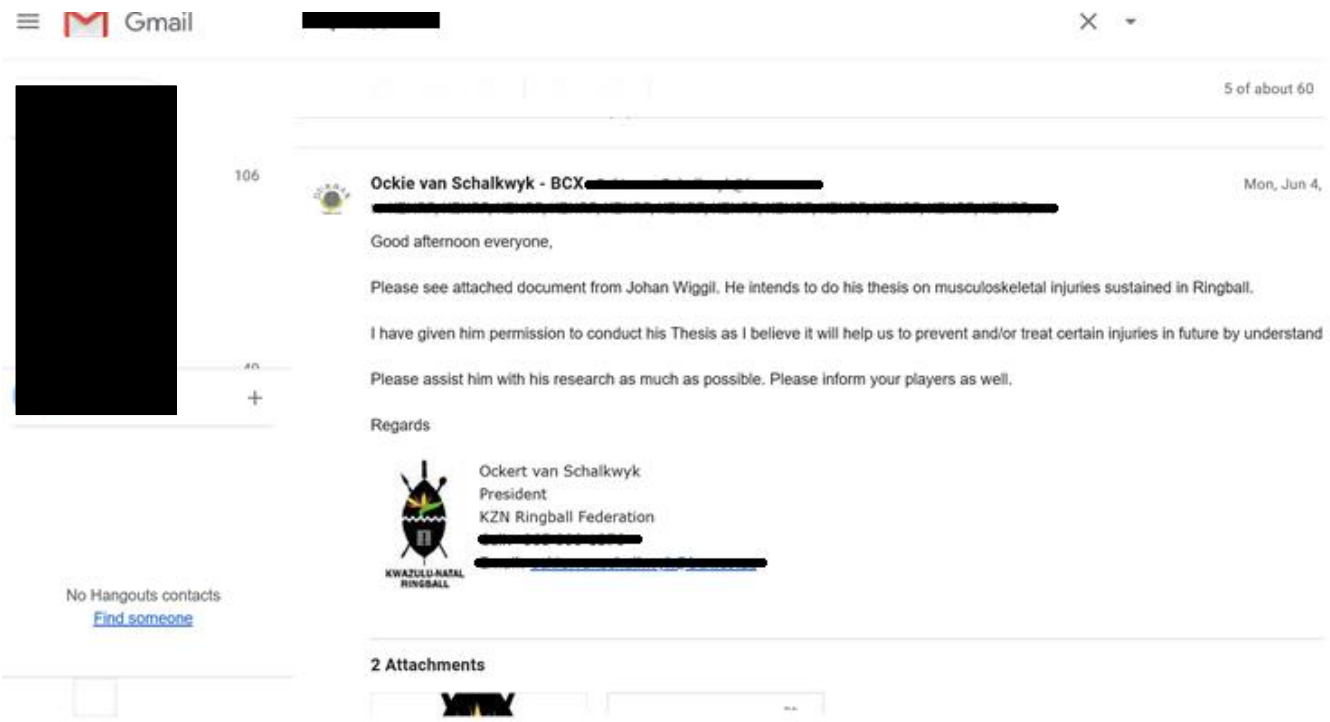
Johan Wiggill
Durban University of Technology

[redacted]

Signature: KwaZulu-Natal President

## Appendix M

## EMAIL FROM RINGBALL PRESIDENT PERMISSION TO CONDUCT RESEARCH AT CLUBS



Gmail [redacted]

5 of about 60

[redacted]

106

**Ockie van Schalkwyk - BCX**[redacted] Mon, Jun 4,

[redacted]

Good afternoon everyone,

Please see attached document from Johan Wiggil. He intends to do his thesis on musculoskeletal injuries sustained in Ringball.

I have given him permission to conduct his Thesis as I believe it will help us to prevent and/or treat certain injuries in future by understand

Please assist him with his research as much as possible. Please inform your players as well.

Regards

Ockert van Schalkwyk
President
KZN Ringball Federation
[redacted]

KWAZULU-NATAL RINGBALL

No Hangouts contacts
Find someone

**2 Attachments**

## Appendix N

### CODE OF CONDUCT FOCUS GROUP

**<u>IMPORTANT NOTICE</u>: THIS FORM IS TO BE READ AND FILLED IN BY EVERY MEMBER PARTICIPATING IN THE FOCUS GROUP, BEFORE THE FOCUS GROUP MEETING CONVENES.**

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.

2. None of the information shall be communicated to any other individual or organization outside of this specific focus group as to the decisions of this focus group.

3. The information from this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

| Member Represents | Members Name | Signature | Contact Details |
|---|---|---|---|
| Supervisor | | | |
| Co- supervisor | | | |
| Researcher | | | |
| Masters student currently conducting questionnaire research | | | |
| Participant: | | | |
| Participant: | | | |
| Participant: | | | |
| Participant: | | | |