COMMON LOWER EXTREMITY INJURIES IN FEMALE HIGH SCHOOL SOCCER PLAYERS IN JOHANNESBURG EAST DISTRICT.

Primrose Theodorah Siphesihle Mtshali

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of

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DECLARATION

I, Primrose Theodorah Siphesihle Mtshali declare that this research report is my own work. It is being submitted for the degree of Master of Science in Physiotherapy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

…….. (Signature of the candidate)

…….day of……. (Month), 2007

ABSTRACT

Background and purpose of research

As the number of females participating in sports has increased, so has the necessity of understanding the effect of female growth and development in participation, athletic ability and injury patterns. Soccer is one of the sports where South Africa has seen an increase of youth and adult females' participation.

Aim: To establish the prevalence of and extrinsic risk factors contributing to injuries in the lower extremity in female high school soccer players in the Johannesburg east district.

Method: A retrospective descriptive questionnaire – based study of 103 first team high school female soccer players in the Johannesburg east district was conducted. This was to determine point and one year prevalence of injuries, profile of injuries that affect female soccer players, associations between injuries and player position, age, use of equipment, frequency of play, and training duration and also to identify possible risk factors that contribute to injuries.

Results: The one year prevalence of injured players was 46.1% and point prevalence was 37.8%. Knee injuries (18.6%) and ankle injuries (17.6%) were reported for one year prevalence and for point prevalence knee injuries were 13.3% and ankle injuries 18.9%. An extended duration of skills (p=0.0001) and fitness (p=0.02) training in this population reduced the likelihood of incurring an injury and the older (p=0.01) the players, the more chances of sustaining injuries. The players who wore shin guards were less prone to shin/leg injuries (p=0.01) and the relative odds were 0.35 (CI 0.16-0.79). The midfielders had more foot and toe injuries (p = 0.05). Starting age (p=0.78), frequency of play (p=0.83) wearing of shoes (p=0.54) and stretching had no influence on injury.

Conclusion: The knee and ankle were the main locations of injury with defenders and midfielders mostly being injured. The increased duration of training for both skills and fitness and not wearing shin guards are risk factors for injury in female soccer players in high school.

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CHAPTER 1

1.0 INTRODUCTION

Following many decades of isolation from world sports due to undemocratic practices in South Africa, the South African Football Association (SAFA) was readmitted to the Confederation of African Football (CAF) and the Federation Internationale de Football Association (FIFA) in 1992. In 1993 the Women's South African national team was formed and by 1994 it had entered the qualifying stages for the first time for the Women's World Cup (www. safagoal.net). Currently there is an under 19 inter- regional tournament for women in SAFA which has increased young females participation in soccer (www. safagoal.net). Following this trend schools have started participating in female soccer in South Africa and most high schools engage in a number of matches. As the number of females participating in sports has increased, so has the necessity of understating the effect of female growth and development on participation, athletic ability and injury patterns (Hutchinson & Nasser, 2000; Powell & Barber Foss, 2000 and Hewett, 2000). Most studies however still concentrate on male soccer players (Giza et al, .2005).

Soccer is the world's most popular organized sport with 21 million females registered with Federation Internationale de Football Association- FIFA (Giza et al. 2005).). Soccer has been played in many countries of the world including South Africa for more than 100 years (www.fifa.com). The popularity of soccer in South Africa is seen in the township streets where it is a common boys' game. Recently, girls can also be seen playing soccer in the streets. Although there has been organized soccer for decades now, with leagues being played annually, these have been local and mainly for men. High schools have also been involved in tournaments but mostly for boys' teams (www. safagoal.net).

Soccer injuries involve predominantly the lower extremities including the knee and ankle joints and muscles of the lower limb (Peterson et al., 2000), since the lower extremities in most sports provide locomotive power and speed to the entire body. When all sports are considered the lower extremities are often at an overall greater risk of injury than central

(back, neck & head) and upper extremities (Hutchinson and Nasser, 2000). Soccer requires the ability to respond quickly and accurately to the changing position of the ball, team mates and opponents (Ziegler, 1994). It also requires skills of jumping, landing and lateral pivot while running. The role coaches play in skills training is important to prevent lower extremity injuries. In a review article Thacker et al., (2003) skills training and conditioning reduced the rate of knee injury in female hand ball players compared to a non intervention group.

Powell and Barber-Foss (2000), found that the majority of soccer injuries in high school girls are traumatic, caused by body contact and they occur more during matches (57.8%) than in training sessions (42.2%) Girls (26%-28%) are at higher risk of injury than boys (22.6% - 24.8%) especially in contact sports and the injury rates are different from those of boys (Powell and Barber-Foss, 2000). Females who participate in jumping and cutting sports demonstrate a four to six fold higher incidence of knee injury than males participating in the same sports (Hewett, 2000). More than 30000 serious knee injuries occur in female intercollegiate and high school athletics in the US each year (Hewett, 2000).

The overall incidence of injuries in contact sports is estimated to be 10-15 injuries per 1000 playing hours (Peterson et al., 2000). Epidemiological studies of male soccer players have identified an incidence of 10-35 injuries per 1000 game hours (Giza et al. 2005). Giza et al. (2005), report that several studies have identified female soccer players as having a higher incidence of knee and anterior cruciate ligament injuries. These injuries are the most common cause of loss of practice and game time and require appropriate prevention strategies (Thacker et al., 2003). Prevention and intervention have become the focal points for researchers and clinicians (Murphy et al., 2003). Preventative measures are based on epidemiological research to establish the extent of the injury problem, which are the incidence, severity and injury profile of the sport (Hagglund et al. 2005).

With the onset of puberty, females undergo physiologic changes under the influence of female sex hormones which affect bone mass, lean body mass, circulation and metabolism (Hutchinson & Nasser, 2000). There are three theories that explain the differences between male and female lower extremity injuries viz. a) anatomical, b) neuromuscular and c) hormonal. The anatomy of females includes a wider pelvis, femoral anteversion, genu valgus and external tibial torsion. This may affect the injury profile of the lower extremity. At puberty the boys gain muscle mass and lose body fat under the influence of androgens, while girls gain both lean mass and fat mass (Hewett, 2000 and Holschen, 2004). An average teenage girl has 20%-25% body fat, whereas the body fat of an athletic girl may be lower than 10% (Greydanus and Patel, 2002). Differences in muscle strength are not due to fibre type, but rather muscular hypertrophy and percentage muscle mass (Hewett, 2000 and Holschen, 2004). Holschen (2004) found that differences in physical and physiologic characteristics affect performance and risk of injury. In a study done by Powell & Barber-Foss, (2000) investigating the sex related injury patterns among selected high school sports, it was shown that girls have a high incidence of injuries in contact sports like soccer and basketball. It is therefore doubtful that research findings on male athletes can be applied to females without some evidence to support such generalizations.

1.1 PROBLEM STATEMENT

The female athlete remains less well understood and less well studied compared with the male athlete (Holschen, 2004). It is doubtful that research findings on male athletes can be applied to females. Differences in physical and physiologic characteristics affect performance and risk of injury (Holschen, 2004). As the population of child and adolescent athletes has grown, a corresponding increase in the number of athletic-related injuries has been seen (Hutchinson and Nasser, 2000). With anatomical and physiological differences between boys and girls, the injury rate and type might be different. As participation in youth soccer for girls has started to grow in the past few years in South Africa, no studies have been published to determine the profile of injuries in adolescent girls as was determined by a thorough literature search. Because of the limited information on injuries in female soccer players, it cannot be stated as yet, whether or not

characteristics and causes of injuries vary substantially from those previously reported for male players (Junge and Dvorak, 2004)

1.2 AIM OF STUDY

To establish the prevalence of and extrinsic risk factors contributing to injuries in the lower extremity in female high school soccer players in the Johannesburg east district.

1.2.1 Objectives of study

- To establish the point and one year prevalence of lower extremity injuries of female high school soccer players in the Johannesburg east district.
- To establish the profile of injuries that affect female high school soccer players in the Johannesburg east district.
- To identify possible extrinsic risk factors contributing to injuries in female high school soccer players in the Johannesburg east district.
- To establish whether there are associations between:
    1. age and injury,
    2. anatomical location of injuries and player position,
    3. frequency of play and injury,
    4. stretching and anatomical location of injury,
    5. training duration and injury,
    6. use of equipment and anatomical location of injury of female high school soccer players in the Johannesburg east district.

1.3 SIGNIFICANCE OF THE STUDY

The study will add to the knowledge about injuries in female adolescent school soccer players. Modifiable risk factors might be established that may assist coaches in developing appropriate training programmes. The knowledge gained might assist in developing prevention methods for coaches and health team members for female high school soccer players.

CHAPTER 2

2.0 LITERATURE REVIEW

INTRODUCTION

The literature review includes a discussion of: participation in soccer, growth and development of females, biomechanics of the lower limb, and prevalence of lower extremity injuries and profile of injuries. The profile of injuries includes location, severity, activity during when injuries occurred, mechanism of injury and management of injuries. The extrinsic risk factors contributing to injuries, namely - skill level, equipment (shoes & shin guards), exposure (training and matches), and player position are also reviewed.

The data bases used for the literature review were PubMed, Science direct, Swetwise, Ovid, and Wits Health Science Library.
Search key words used were: soccer, football, injuries, lower extremity, female, youth, adolescent, high school, stretching AND injuries

2.1 PARTICIPATION IN SOCCER

In searching the literature for articles related to soccer, it was not difficult to find European and United States of America studies. For Africa and other regions like South America and Asia, there were a limited number of studies (van Heerden, 1992; Odion 2001). When the search combined soccer and the participation of adolescents, some literature was available although it was not always clear whether they were studying male or female soccer players (Le Gall et al., 2006; Morgan and Oberlander, 2001; Junge et al., 2000). The studies reviewed in this section refer mainly to soccer studies (Lilley et al., 2001; Emery et al., 2005; Powell and Barber-Foss, 2000; Giza et al., 2005; Faude et al., 2005; Dvorak and Junge, 2000; www.srsa.gov.za, 2005).

Soccer is the most popular sport in the world, with more than 200 million participants including both sexes across all age groups (Giza et al. 2005) and about 40 million are women (Dvorak and Junge 2000). Powell and Barber-Foss (2000), from the National

Federation of State High School Associations data in the United States of America between 1988 and 1998, found an increase of about 40% in participation of girls in high school sports, soccer being one of the popular contact sport.

The South African Football Association (SAFA) now has national age groups from under – 12 upwards for both sexes (www.safagoal.net, 2001). According to the survey done by the Department of Sport and Recreation to establish sports participation patterns in South African school sports, participation is increasing and school is a common motivator for sports participation, i.e. children participate more in sports while they are still at school. Soccer is the most common sporting code played and the one most supported by South Africans (www.srsa.gov.za, 2005). According to Oliphant (2001) in www.safagoal.net, 54% of school going adolescents registered soccer as their sport of choice. The participation in school sports between ages 16 to 20 years is 51.7% across the genders and 38.9% of females are motivated by being at school to participate in soccer whilst 30.9% of males are motivated by being at school to participate in sports (www.srsa.gov.za, 2005).

Females have increased their participation in sports in general and soccer is one of the common contact sports that is played in high schools (Powell and Barber-Foss, 2000 and www.srsa.gov.za, 2005). This population also gets injuries which have not been researched to determine the type of injuries that occur in the lower extremities. As females reach adolescence, there are many anatomical and physiological changes that occur which might have an effect on the injuries that are sustained in the lower extremity.

2.2 GROWTH AND DEVELOPMENT

It is important to understand the growing musculoskeletal system in order to understand the injuries in children and adolescents. Linear growth and physical maturation are dynamic process encompassing molecular, cellular, somatic and organizational changes. Traditionally, stature is primarily used for growth assessment, but changes in body proportion and composition are essential elements of growth, especially of maturation.

The growth and development of humankind is classified into stages from birth as infancy, childhood, adolescence and adulthood. Adolescence is the phase where the child undergoes a massive change physically, physiologically and psychologically. Adolescence is also a transition period from childhood to adulthood which begins after onset of puberty during which their reproductive systems matures (Malina and Bourchard, 1991). Puberty is a dynamic period of development marked by rapid changes in size, shape and composition, all of which are sexually dimorphic (Rogol et al., 2000).

On average girls enter and complete each stage of puberty earlier than boys. The onset of puberty corresponds to a skeletal or biological age of +/- 11 years in girls and 13 years in boys. This difference in girls and boys onset of puberty affects mainly the body composition, which includes relative proportions of water, muscle, fat and bone (Rogol et al., 2000).

Growth and development is also influenced by physical activity or sports. Girls, who participate in sports like swimming, are generally taller and mature earlier compared to girls not participating in sports. Delay in growth and sexual maturation among certain group of elite female athletes, mainly gymnasts, dancers and long-distance runners may occur. Many complex interaction factors including the physical and metabolic demands of intensive athletic training and competition are cited (Rogol et al., 2000). 'Although moderate exercise has a stimulating effect on growth, intensive physical training represents a chronic stress capable of attenuating growth' (Georgopoulos et al., 1999). Even with intense search of literature, soccer studies that explore the effect of growth in female adolescent players could not be found..

Although the whole body is involved when playing soccer, the lower extremities are more involved because the skill required by the game is based on the lower extremities. Lower extremities also provide locomotive power and speed to the entire body which exposes them to extreme tensile and compressive stresses from soft tissues and ground-reaction forces. During the peak linear growth, adolescents are vulnerable to injury because of imbalance in strength and flexibility and changes in the biomechanical

properties of the bone (Sharma et al. 2003). The typical female physique is portrayed with a wider pelvis, femoral anteversion, genu valgus, and external tibial torsion which may lead to specific types of musculoskeletal injuries (Holschen 2004).The combination of growth and changes in female adolescents will alter the cutting, jumping and landing skills (Swartz et al., 2005; Quatman et al., 2006) and lead to increased risk of injuries in the lower extremity (Quatman et al., 2006).

Quatman et al., 2005 found that adolescent females when landing during a vertical jump test had higher ground reaction forces and higher loading forces compared to adolescent males which lead to poor dissipation of forces through the lower extremity specifically the knee joint. The differences in ground reaction forces during landing could be explained due to the angles of hip knee and ankle. Swartz et al., 2005 on comparing children (age 9.41±0.99) and adults (age 23.9±2.76), found that children landed with a different strategy than adults during vertical jump tests. Children had a higher knee valgus angle at initial contact and during peak vertical ground reaction forces. Children also demonstrated less hip and knee flexion angles (girls less than the boys) on initial contact from jumping compared to adults. This will increase the risk of noncontact injuries in the lower extremities. This may lead to overuse injuries as well

Overuse injuries such as stress fractures are problematic in females. Inadequate strength, flexibility, footwear, equipment and training methods all play a role in the incidence of these injuries. The tendency of female athletes to have more problems around the knee is partially due to lower levels of conditioning compared to male athletes (Hutchison and Nasser, 2000). Females have a tendency to develop patellofemoral pain due to ligament laxity, weakness of vastus medialis oblique muscle, genu valgum, increased Q angle, and excessive pronation associated with tibial torsion (Brukner and Khan, 2006 and Holschen 2004).

Roach and Maffulli (2003) in their paper reviewing childhood sports injuries, found that, with growth spurts there is a decrease in flexibility due to relative bone lengthening which, without prophylactic stretching, can predispose children and adolescents to

increased risk of injuries. Due to the nature of most sports there are lower extremity injuries. The review by Hutchinson and Nasser (2000) found that the lower extremities are at greater risk of injuries in soccer than any other parts of the body because of the nature of the sport and also that the lower extremities provide locomotive power and speed to the entire body for all contact sports.

2.3 PREVALENCE OF LOWER EXTREMITY INJURIES

Soccer is a sport where most injuries occur in the lower extremity (Junge et al. 2006, Powell and Barber-Foss 2000, Emery et al. 2006; Morgan and Oberlander, 2001), thus this review of the prevalence of injuries will focus in the lower extremity. The lower extremity includes the hip, groin, upper leg, ankle and foot (Wong & Hong, 2005; Fuller et al., 2006).

Hutchison and Nasser (2000) found that 35.8% of all children and adolescent injuries resulted from sports and recreational activities. When studying adolescent sport participation and injury in high schools, Emery et al., (2005) found the lower extremities to be involved in 78.2% of all soccer injuries. This is consistent with other studies (Faude et al, 2005; Giza et al, 2005; Murphy et al, 2003; Powell and Barber-Foss, 2000) which found the lower extremities to be the most commonly injured part of the body.

The studies that were reviewed here have varying findings, mainly because of different methodologies and definitions used. These variations create significant differences in results and conclusions (Fuller et al. 2006; Hagglund et al. 2005; Junge and Dvorak, 2000).

The recommendation in the study done by Fuller et al. (2006) is that prospective cohort designs should be followed to minimize the occurrence of errors associated with recall in retrospective studies. However cohort designs require medical personnel to record injuries.

In this literature review prospective studies are reviewed first where the incidences are reported followed by retrospective studies. Studies which compare prospective and retrospective studies to determine the differences in the number injuries in the two different methodologies are then reviewed. The operational definition for injury used in this review is, as defined by Fuller et al. (2006), as any physical complaint sustained by a player that results from a football match or football training, irrespective of the need for medical attention or time-loss from football activities.

2.3.1 Incidence of injuries

The incidence of injuries is defined as the number of new injuries in a specified period divided by the total number of players exposed to injury (Junge and Dvorak, 2000). In most studies this is calculated per 1000 hours of exposure (sum of games and training). In the systematic review done by Dvorak and Junge (2000), some studies calculated incidences per 1000 hours of football without specifying as to whether these hours were competitive games or training times. In some studies the incidence has been calculated for 1000 hours of training as well as game hours.

In studies for female professional soccer, the authors when calculating the incidence of injuries per 1000 player hours, game injury incidences were 12.63 and training injury incidences were at 1.17 per 1000 player hours (Giza et al., 2005). Sixty percent of the injuries were in the lower extremities (Giza et al., 2005). In a similar study done in the German National League 80% of injuries occurred in the lower extremities. The incidence of injuries per 1000 hours of training was 2.8 and 23.3 per 1000 match hours (Faude et al., 2005). The training injury incidence in this study was slightly high compared to the study done by Giza et al., (2005), but within the ranges of the male studies.

The ranges of incidences of injuries when compared with male adult studies where the injury incidences were between 12 to 35 injuries per 1000 hours of outdoor soccer and 1.5 to 7.6 injuries per 1000 of training (Dvorak and Junge 2000).The lower extremities

accounted for between 61% - 90% of injuries. (Junge et al. 2000, Emery and Meeuwisse, 2006, Walden et al., 2005;

The study done by Le Gall et al., 2006 on elite adolescents looked at the incidences according to age level. For under-14 incidence of injuries in matches (games) is 9.5 per 1000 hours and 4.1 per 1000 training hours. For the under-15 the incidence was 10.4 per 1000 match hours and 3.7 per 1000 training hours. For the under-16 the incidence was 14.2 per 1000 match hours and 3.8 per 1000 training hours. The incidences of injuries increased with age in matches, this may be due to the increase in frequency of play or exposure. It was not stated whether the subjects were male or female.

The incidence is higher for injuries per 1000 hours of matches than the injuries per 1000 hours of training in both female and male studies. On average, the incidence of match injuries is 4-6 times higher than the incidence of injuries that occur during training sessions (Junge and Dvorak, 2004).

2.3.2 Rate of injuries

Rate of injury is defined as the number of reported injuries divided by the number of player seasons multiplied by 100 (Powell and Barber-Foss 2000). Comparing the incidence of injuries between boys and girls in high school sports, Powell and Barber-Foss (2000), found the injury rate of girls in soccer to be 26.7 compared to boys at 23.4. The lower extremity accounted for 78.7% of the total injuries in girls compared to boys with 76.4% injuries (Powell and Barber-Foss, 2000). In another adolescent study done by Emery et al. (2006), examining sport participation and sport injury in adolescents the overall injury rate was reported at 65.7 injuries per 100 players. The authors in this paper did not report the injury rates according to gender as well as different sports codes. Although the studies (Powell and Barber-Foss, 2000 and Emery et al., 2006) are similar in terms of participation in different sports in high schools, it is difficult to compare the results due to the different presentation of results.

In a South African study to evaluate injury in junior soccer players, van Heerden (1992), expressed the incidence of injury as injuries per 100 participants and taking exposure-time into consideration, he calculated the incidence of injury as the number of 30 minute matches x 0.5 x number of players involved per match. In this study by van Heerden (1992), 10.5 injuries were reported per 100 participants or 1 injury per 20.6 player-hours. These results make it difficult to compare to other studies due to the different formulas used to calculate the incidence of injuries. The sample population (76 players) was also very small in comparison to other studies.

2.3.3 Prevalence of injuries

Prevalence is the measure of injuries in a population at a given point in time (point prevalence) and can also be measured over a period of time (period prevalence). The formula used to calculate the prevalence is the existing cases divided by population at risk over a specified period of time (Friis and Sellers, 1999)

In a 5-year retrospective study (1993 – 1998) done in female soccer players, the incidence of injury was calculated per 1000 hours of athletic exposure, i.e. training and match exposure combined (Lilley et al., 2002). This information was obtained from coaches and team managers records. In 1993 the incidence was 10.9 per 1000 hours, whereas in 1998 it was 6.7 per 1000 hours. In 1995 the incidence was at it lowest at 5.0 per 1000 hours and at it highest in 1994 at 12.2 per 1000 hours. Sixty four percent of the injuries reported were in the lower extremity. The explanation for the rise of incidence of injuries was attributed to the increase in competition and training time. The mean age of the population in this study was 17-years of age. The calculation of incidence of injury in this study makes it difficult to compare to the prospective studies where matches and training hours are combined, whereas in the other studies training and match hours are separated.

In an African study done to investigate the injury pattern of the Falcons (Nigerian national female soccer team), the authors recorded lower extremity injuries at 78% compared to other parts of the body (Odion 2001). The results in this study are only

presented using percentages which makes it difficult to compare with other studies which calculate incidence and rate of injuries.

2.3.4 Comparison of prospective and retrospective studies

Junge and Dvorak, (2000), comparing prospective and retrospective data on the same population of soccer players, found significant differences in the incidence of injuries. Incidences of injuries per 1000 hours of exposure were lower (2.03 per 1000 hours of exposure) in retrospective questionnaire data compared to 7.3 per 1000 hours of exposure of players receiving weekly follow up. The severity of symptoms i.e. whether minor, mild or severe may contribute to the reporting of injuries. The milder the symptoms or further back the injury had occurred, the more frequently it was forgotten. There was no difference between the two methodologies in the location, type and mechanism of injuries. Similar findings were found in the study done in female adolescent gymnasts comparing prospective (3.31 per 1000 hours) and retrospective (1.96 per 1000 hours) methodologies (Kolt and Kirkby, 1999). These findings when comparing the two different methods of conducting the studies are very important for the study to be conducted as it shows that incidences and rates of injuries can be determined irrespective of the method used..

In trying to reach consensus in the paper on data collection procedures in studies of soccer it was agreed that studies should be of a prospective, cohort design to minimise the occurrence of errors associated with recall bias which is a problem with retrospective study designs (Fuller et al., 2006). In this consensus paper it was agreed that the incidence of injuries should be reported as the number of injuries per 1000 player hours, separating game and training hours. Before consensus was reached there were problems in the literature in reporting the incidences of injuries.

2.4 INJURY PROFILE

The profiles of injuries include type and location of injury, activities during which injuries occurred; mechanism of injury, severity of injury and management of injuries**.**

2.4.1 Type and location of injury

Ankle /foot injuries are the most common site of injury in boys (33.3%) and girls (33.5%) in the study by Powell and Barber-Foss (2000). The hip/thigh/leg injuries in this study were at 25.8% for girls and 28% for boys. Knee injuries were 19.4% for girls and 15.1% for boys. The locations of injury in this study are combined, which makes it difficult to compare to other studies. Lilley et al., 2002 in partial agreement with the study above, reported 24% ankle injuries, 18% shin injuries, 12% knee injuries, 10% foot injuries and seven percent thigh in female adolescent soccer players.

Emery et al., (2006) agree with both the above studies in their results where the ankle (20%) is the most common injured location compared to other lower extremity locations The ankle is also cited as the most common site of injury in the lower extremity in a review of common sports injuries in children and adolescents by Hutchinson and Nasser (2000).The finding that the ankle is the commonly injured location in adolescent female soccer players is similar to male soccer studies and is followed by the knee (Le Gall et al.,2006; Peterson et al.,2000; Junge et al., 2006; Wong and Hong 2005; Emery et al., 2005)

However the knee is also described as the most common injury site followed by the ankle in the lower extremity in female professional adult soccer players (Giza et al. 2005 and Faude et al., 2005). This study is supported by Morgan and Oberlander (2001) where knee (21%) and ankle (18%) injuries are common in male soccer. The children land with different strategy compared to adults where the hip flexion is increased during a vertical jump in adults compared to children (Swartz et al., 2005). The increase in knee injuries in adult female soccer players may be due to the decrease in level of skill compared to male soccer players (Hutchinson and Nasser, 2000).

Walden et al., 2005 reported thigh injuries as the (23%) most common followed by the knee (20%) and the ankle (14%). These findings are similar to the study by Junge et al., 2004 comparing soccer and rugby injuries in adolescent players, where thigh and ankle injuries were common (17%) followed by lower leg injuries of 16%. This is due to the

nature of the sports where collision and tackling is part of the sport and contact with another player or equipment causes the injuries.

2.4.2 Activities during which the injuries occurred

Injuries in soccer happen mostly during matches rather than in training. This is similar to other adolescent and adult studies for males and females (Emery et al., 2005; Faude et al., 2005; Morgan and Oberlander, 2001; Junge et al., 2004. Most injuries in soccer are traumatic (9% - 34%) rather than overuse (Junge and Dvorak, 2004). Fifty eight percent of traumatic injuries occurred during matches and 42% during training (Faude et al., 2005). Forty two percent of the injuries occurred during training in high school girls compared to 40.7% in high school boys (Powell and Barber-Foss, 2000).

The types of injuries in females were strains (30.7%), sprains (19.1%), contusions (16.2%) and fractures (11.65). Younger soccer players were found to sustain joint sprains and contusion, whilst older players had muscle strains, ligament ruptures and meniscal tears (Junge et al., 2006; Emery et al., 2006).

A few of the recent studies done on soccer players further differentiate between new injuries and recurring injuries (Powell and Barber-Foss, 2000; Lilley et al. 2002 ; Emery et. al. 2006). Powell and Barber-Foss (2000) reported new injuries as 89.6% for female soccer players compared to 91% for males. Most re-injuries occurred in female soccer players (10.4%) compared to male soccer players (8.4%).Recurrent or reinjury is an injury occurring after an initial injury of the same type and location (Hagglund et al. 2005; Fuller et al. 2006). Lilley et al. (2002) found both ankle and shin injuries to have a high rate of recurrence at 76% and 100% respectively. Re-injuries have been attributed to inadequate healing and premature return to sport (Lilley et al., 2002). Emery et al. (2006) reported 49% of previous injuries reoccurred in the same body part.

2.4.3 Severity of injury

Fuller et al. (2006) describe injury severity as the number of days that elapse between the dates of injury to the date the players return to full participation in soccer. The severity of

injury is categorized as minor (1-7days of absence), moderate (8-28days) severe (more than 28 days) (Hagglund, 2005). All the studies reviewed by Fuller et al (2006) followed the same classification of severity of injuries when describing them.

Seventy two percent of high school girls' soccer players were of minor severity (Powell and Barber-Foss, 2000). This is supported by Le Gall et al. (2006), where 60.3% of all the injuries in different age groups were minor. Severe injuries were found to be common in the 18-25 year age group. These included fractures; ligament sprains and muscle rupture (Chomiak et al. 2000). During the 2004 Olympic Games where soccer was one of the team sports, 35% of injuries resulted in an absence of one week from soccer (Junge et al. 2006); these were minor injuries according to the definition. In the study done by Faude et al. (2005), 51% of injuries were of minor severity, 36% moderate and 13% severe. More than half (58%) of the severe injuries were located in the knee. More moderate and major injuries were reported in the under 14 players accounting for 42.4% compared to 38% (under 15) and 38.5% (under16) (Le Gall et al.; 2006)

The severity of the injury is also linked to the level of skill of players. Males' soccer players sustain more severe injuries possible due to the aggressiveness of this population (Sharma et al., 2003). Thirty two patients were admitted to King Edward VIII hospital in Durban with severe soccer injuries and all were of low level of skill or amateur players. These injuries were skeletal related injuries of the lower limb (Goga and Gongal, 2003). In their study all the injuries were traumatic and 75% of them were as a result of foul play or bad tackles. Chomiak et al., (2000) agrees with the study above as the incidence of severe injuries per 1000 hours of exposure was twice as high in low skill as in high skill groups. The high level groups incurred 22.7% severe injuries and 27.5% were incurred by players in the low level groups. This has not been determined in a female population whether adolescent or adult players.

2.4.4 Mechanism of injury

Direct contact with another player was reported in most studies as being the mechanism of injury (Emery et al. 2006). In their survey study of sport participation and injury in

Calgary high schools, 40.4% of the injuries in soccer were direct contact from the opponent and 44.9% were non-contact injuries whilst contact with something or a teammate was significantly low. This is also in agreement with other studies done in adult males (Junge et al. 2000; Junge and Dvorak, 2004; Walden et al. 2005).Traumatic injuries (52%) were caused by direct contact with another player and 48% of these injuries were without any contact (Le Gall et al. 2006). In other studies foul play is cited as the cause of traumatic injuries (Walden et al., 2005; Wong and Hong, 2005).

2.4.5 Management of injuries

Chomiak et al., (2000) in male adolescent soccer players, found that the application of a cold pack was the most common treatment. Only 7% of the participants consulted or stopped to participate due to injury. This seems to have been due to the lack of a team physician in the amateur and youth teams during matches. The treatment of minor injuries according to this study was underestimated or inadequate. Rehabilitation after an injury was inadequate and only 41% of the injured players were treated by a physiotherapist. One of the reasons given by players was the coaches' desire for players to return to competition as soon as possible.

As the treatment of injuries in adolescents is undermined due the reasons mentioned in the previous paragraph, a conclusion can be drawn that players have histories of untreated injuries. A history of injury is a risk factor for future injuries in soccer (Kucera et al., 2005)

2.5 RISK FACTORS IN SOCCER INJURIES

In general risk factors can be classified as intrinsic (person-related) as well as extrinsic (environment related) (Dvorak et al., 2000). The intrinsic risk factors are understood to be individual biological or psychological characteristics such as age, joint flexibility, functional stability, biomechanical and anatomical characteristics, previous injuries and inadequate rehabilitation. Lack of muscle flexibility is one of the most commonly postulated risk factors for the development of lower limb muscle injuries (Witvrouw et al. 2001; Witvrouw et al. 2004). Extrinsic risk factors include the amount of training, level

of competition, number of matches played, climatic factors, pitch surface, equipment (shoes, shin guards and taping) and rules of the game. Intrinsic and extrinsic risk factors partially influence each other and therefore increase the risk of injury.

2.5.1 Level of skill

Although age is an intrinsic factor, it is seen as playing a role in contributing to injury of the lower extremity in the review by Murphy et al., (2003). The conclusion of six studies showed an increase in the incidence of injury in older athletes compared to younger athletes (Murphy et al., 2003). Adolescents are at greater risk of injury than younger children and the peak injury rate is common in the older adolescents' age group (Emery, 2003). However in the review by Schmidt-Olsen et al. (1991) reports that some studies did not reach the same conclusion as they found younger athletes to be more at risk of injury. The incidence of injuries seems to suddenly increase in the 14-16 year old age groups

There are great differences among age groups and skill levels and incidences of injury. The level of skill is based on the league of the team (Peterson et al., 2000). When comparing two European regions of high and low skilled level players, Junge et al., (2000) found that the incidence of injury in low-level skill players of 14 – 16 years and 16 – 18 years was higher than in the high-level skill players of similar age groups. Peterson et al., (2000) had similar results for the same age groups. The high level 14 – 16 years age group incidence of injuries was low (Alsace: 2.2 per 1000 hours and Czech Republic: 2.5 per 1000 hours). There was a notable difference in incidence of injuries for the 14 – 16 year low-level players for Alsace region (0.9 injuries per 1000hours) and Czech Republic (4.9 injuries per 1000hours). This may be because the Czech Republic spent a greater amount of time in training (135.6 hours) and in games (32.2 hours), whereas the Alsace region spent 97.1 hours in training and 28.9 hours in games.

Emery et al., (2005) compared boys and girls soccer players for under-14, under- 16, and under -18 in an evaluation of risk factors. The under- 14 girls (7.92 per 1000hours) and

boys (7.88 per 1000hours) both had a higher incidences of injuries compared to the other age groups.
However, Emery and Meeuwisse, (2006) when comparing outdoor and indoor soccer injuries in both males and females, found that the under-14 age group had a lower rate of injury incidence, which was higher in the under - 16 and under - 18 age groups for outdoor soccer. The exposure to matches may be a reason to the lower incidence of injuries in this study, although this possibility was not explored. Murphy et al., (2003) report that some studies found that young players with low skill levels had a twofold increased incidence compared to the older high skilled level. The contradictions in these studies may be attributable to different study techniques as well as the level of exposure in different age groups. There are however great differences between different age groups and skill levels.

2.5.2 Exposure

Exposure includes all the training sessions and matches with a team. A training session is defined as a coach- directed scheduled activity carried out with the team. A match is defined as any scheduled friendly or competitive match with teams from different clubs (Walden et al 2005; Fuller et al 2006)

In the study of injuries in the UEFA Champions League during the 2001-2002 seasons, done by Walden et al. (2005), 69 matches were recorded as the average for a single player in the competition. In total 85% (225/266) of players incurred 658 injuries, which means 7.3 to 11.5 injuries per 1000 hours of exposure. During the study period 56% of the players were exposed to some national team play on at least one occasion and almost 4% of all injuries occurred when playing for their national team. This means that these players were exposed to more matches than other players.

Junge et al. (2000) in a study comparing two European regions to establish the incidence of injuries reported that the Czech Republic spent more time training and playing football than the players from the Alsace region in all age and skill levels, with the exception of the amount of training in the 14 to 16-year-old high level players. In both regions, the

number of training and game hours was higher in high-level players than in low-level players of the same age. The frequency of injuries was higher at 50% in the Czech Republic region compared to the Alsace region at 35.1%.

Studies done in the female population to determine the level of exposure in relation to injuries are limited, but one could possibly conclude that more exposure to matches and training will increase the risk of injury. The difficulty in measuring exposure in soccer studies is evident in the literature because although there is consensus in defining exposure (Walden et al., 2005; Fuller et al., 2006), the studies prior to this did not use the same methods.

2.5.3 Player position

In most studies the position of play does not have an influence on injury or the incidence of injury; however some studies found defenders to have a greater risk of injuries than other players and goalkeepers had more upper extremity injuries (Dvorak and Junge, 2000)., Midfielders (34.1%) sustained the most injuries followed by defenders (28.1%) in the study of female professional soccer players done by Giza et al. (2005). Wong and Hong, (2005) attempt to explain the risk of injury of defenders and midfielders, thus, ,the defenders prevent the opponents from scoring; therefore tackling, jumping and landing will increase the risk of injury whether there is contact or not.

LeGall et al., (2006) argue that comparing different populations to adolescent players for different positions of play may be difficult as the players may not have settled yet into definitive positional roles. They agree that the defenders sustain more injuries compared to other positions.

2.5.4 Equipment

Equipment includes leg guards and training shoes (Olsen et al., 2004). There is very little information on the wearing of shoes and shin guards with regards to preventing lower extremity injuries in any of the studies on soccer. It has been found that one of the contributing factors to sports injuries generally is the equipment (Brukner and Khan,

2006, Zuluaga et al., 1995). Failure to wear shin guards is directly linked to leg injuries and all traumatic leg injuries occurred in players who had inadequate or no shin guards (Dvorak and Junge, 2000).

'Uneven playing surfaces and inappropriate foot wear are some of the causes of injuries in soccer players' (Wong and Hong, 2005). The uneven playing surfaces may result in more loading on the ligaments and muscles. When the external loading is greater than what can be tolerated by the ligaments and muscles, injury usually follows. Shoe surface contacts were also found to be of importance in football and friction should be kept to a minimum. Incorrect footwear which can provide sufficient frictional forces will lead to slipping. Too much frictional force will produce large torques when twisting and turning, which may lead to injury (Wong and Hong, 2005).

Olsen et al. (2004) found that compulsory leg guards and training shoes reduced the incidence of injuries both in training and matches for the intervention teams. This was only part of other intervention strategies consisting of: controlled rehabilitation of lower extremity injuries, prophylactic ankle taping, information to coaches and players on disciplined play and injury risk, correction of training consisting of a specific warm up and cool down programme and correction and supervision of prophylactic measures by doctors and physiotherapists.

2.5.5 Stretching

Traditionally, it is generally accepted that stretching promotes better performances and decreases the number of injuries (Witvrouw et al., 2004). In their reviews (Thacker et al. 2004; Shrier I 2004; Herbert and Michael 2002; Weldon and Hill 2003) conflicting evidence was found whether to endorse or discontinue stretching before or after exercise to prevent injuries. This is mainly due to the quality of studies conducted and different types of stretching techniques applied in the studies. Witvrouw et al., (2004) and Thacker et al (2004), agree that part of the contradictions can be explained by a lack of understanding of the type of sporting activities in which the individual is participating. Soccer is one of the sporting activities that involve bouncing and jumping activities with

high intensity of stretching-shortening cycles that require a muscle-tendon unit that is compliant enough to store and release the high amount of elastic energy that benefits performance (Witvrouw et al., 2004). If participants of the sports have insufficiently compliant muscle-tendon units, this may lead to increased risks of injury.

There is also little evidence whether stretching pre or post participation prevents injuries, decreases muscle soreness and improves performance, but these concepts are included in injury prevention programmes (Andersen 2005). Hartig and Henderson (1999) assessed whether stretching the hamstrings in military recruits with increased risk injury at the beginning of basic training; found that the number of lower extremity overuse injuries was significantly lower in the intervention group compared to the control group. The result in this population showed 43 hamstring injuries (29%) in the control group and 25 hamstring injuries (17%) in the intervention group.

Conclusion

All the studies reviewed agree that the lower extremity is the most commonly injured in soccer players regardless of age, gender and skill level. The ankle in adolescent soccer players was the most commonly injured location followed by the knee. Only one study reported shin injuries in adolescent soccer players. Shin guards are found to be directly related to shin injuries. The factors affecting female gender were not discussed in this review as the objective was to determine the extrinsic risk factors associated with injuries in female soccer and also the study is not comparing the male and female soccer players.

The recommendation in the study done by Fuller et al. (2006) is that prospective cohort designs should be followed to minimize the occurrence of errors associated with recall in retrospective studies. However cohort designs require the medical personnel to assess and record injuries. In South Africa there is still a lack of such resources in high schools therefore this study will be conducted retrospectively to achieve the objectives.

CHAPTER 3

3.0 METHODOLOGY

3.1 STUDY DESIGN

A retrospective descriptive questionnaire- based study design was used. This was to establish the prevalence of injuries, the profile of injuries and extrinsic risk factors associated with injuries.

3.2 POPULATION

There are 42 high schools (independent and public) for ordinary education in the Johannesburg east district. Only 13 of the 42 schools have female soccer programmes.

3.3 SAMPLE SELECTION

All the 13 schools with female teams were contacted to participate in this study, but only nine schools were able to participate in the study as the other four schools were not running their female soccer programmes.

3.3.1 Inclusion criteria

All female soccer players in the first team of the above high schools regardless of the injury status and age were included.

3.3.2 Exclusion criteria

- Girls who were playing soccer for the first time in the school team during the year of the study.
- Girls who had transferred from other schools as the exposure (match and training) were not the same as the schools in the study.

3.4 THE QUESTIONNAIRE

The questionnaire was developed using relevant information from the literature (Gabbe et al. 2004). The questionnaire was developed to meet the objectives of the study and suit the study design. The questionnaire included the following: age, soccer background, and

training background, prevalence of injuries including the profile of injuries and extrinsic risk factors.

3.4.1 Content and construct validity

"Construct validity is a means of validation that relies on the theoretical context in which a test or measure is utilized" (Sim and Wright, 2000)." Content validity is concerned with a scope of a tool: the extent to which it taps the full domain of content of a concept or phenomenon" (Sim and Wright, 2000).The questionnaire was sent to 'experts' in the field of soccer to validate the content. This included two physiotherapists (lecturers) one in the musculoskeletal field and the other in research, two physiotherapists in sports, one with an interest in high school sports and the other with an interest in lower extremity injuries and the girls' soccer coach at the University of the Witwatersrand. Appropriate researchers and sports physiotherapists were included in the panel and one in the panel had previously developed a questionnaire on sports injuries. Input was also received from three physiotherapists who are working for various soccer teams. A statistician was also consulted for assistance in structuring the questions in order to make data analysis possible. Consensus was obtained on the format and content of the questionnaire.

3.5 PROCEDURE

3.5.1 Pilot study

Once the experts had refined and commented on the questionnaire a pilot study was conducted at two high schools (Mshukantambo and Randburg) in the Johannesburg north district. Thirty questionnaires were distributed to all the first team members from both the schools were included.

The purpose of the pilot study was to:

- Determine the clarity or ambiguity of the questions used in the questionnaire.
- Determine the time it took to explain the aims of the study and how to complete the questionnaire.
- Determine the time it took to complete the questionnaire.
- Establish test-retest reliability of the questionnaire.

3.5.1.1 Results of the pilot study

3.5.1.1.1 Clarity and ambiguity of questions

The wording was modified in the question about player position and level of play for the participants to be more specific in their answers. The need to add an option for other matches played was identified as some participants were also involved in various selection matches in the previous season other than matches played per week or per month at clubs or school. Some questions were taken out as they did not meet any of the objectives of the study. The question on type of injury was removed as all participants did not know or could not remember the type of injuries. Some questions were modified to meet the objectives of the study. Wording in some of the questions was modified into simple English for the participants to better understand. Age this year was used in preference to date of birth because the soccer players took too long to work out when they were born. Examples are front thigh – quadriceps, back thigh – hamstrings. The questionnaire was not translated in another language as everyone spoke English.

3.5.1.1.2 Duration

It took an average of 15 minutes to explain and administer the questionnaire.

3.5.1.1.3 Test-retest reliability of the questionnaires

The questionnaires were taken back to the same participants a week after the first questionnaire was filled out to check for the reliability of the responses. Thirty questionnaires were redistributed and there was 100% agreement of all the questions after the ambiguous questions were removed. The 100% agreement was achieved probably because the pilot study was conducted prior to the soccer; therefore there were changes in the injury patterns in the week between the two questionnaires being administered. It took an average of 10 minutes to explain and administer the questionnaire. The recall period on the questionnaire was a year for the main study; this was not tested in the test-retest reliability of the questionnaire. The pilot study was conducted in the beginning of the soccer season.

3.5.2 Main Study

The principals of schools in the Johannesburg east district were contacted telephonically to determine the ones which were involved with female soccer. Permission from the Department of Education of Gauteng province was requested to conduct the study in schools with female soccer teams in the Johannesburg east district (**Appendix 2)**. Appointments were made with the school principals and/or coaches to present information on the proposed study and to gain consent to include the school in the study **(Appendix 3)**. Once the schools had consented, meetings were held with the first team female soccer coach and players to inform them of the study. Consent forms were given to players to take home to obtain consent from their parents or guardians **(Appendix 4)**. Only those players with signed consent forms were included in the completion of the questionnaire. An appointment was made to coincide with a training session or during break. An explanation of how to fill the questionnaire and understanding of the terminology was provided to the participants during this session **(Appendix 5**). Participants were given questionnaires **(Appendix 1)** to complete during this session once they had given assent to participate in the study **(Appendix 4)**. The researcher remained with the participants during completion of the questionnaires. The questionnaires were collected immediately after completion. The coaches or teachers were present during the completion of the questionnaires. The data collection was done between April and August 2006

3.6 ETHICAL CONSIDERATION

- Consent was obtained from the Gauteng Department of Education **(Appendix 2)**, high school principals **(Appendix 3)**, parents and assent of the participants **(Appendix 4**). A detailed explanation of the study was given verbally and through the information sheet to the principals, coaches and participants.
- Ethical clearance was obtained from the University of the Witwatersrand, protocol number M060132. **(Appendix 6)**
- The questionnaires were coded using numbers to maintain confidentiality and information was used for research purposes only.

- A report is planned to be given to each school which participated in the study with regards to the common injuries in female soccer players.

4.0 DATA ANALYSIS

- Descriptive statistics of categorical variables were done using frequency distribution tables and graphs. The numerical variables were described by the use of means and standard deviations.
- For the qualitative questions, the similar responses were put into groups and a total count was done and converted into percentage.
- Initially univariate analysis was done to show associations between various factors (age, location of injuries, frequency of play, training duration, stretching and use of equipment) and injury. Multivariate logistic analysis was then done using the above factors. Odds ratios, 95% confidence interval and p-values are presented in tables. Chi square and where appropriate Fischer's exact tests were used for bivariate categorical variables and a t-test was used for comparing numerical variables across the group.

CHAPTER 4

4.0 RESULTS

4.1 INTRODUCTION

This chapter presents the descriptive data of demographic factors, soccer background, training and profile of injuries in high school female soccer players in the Johannesburg east district. It also describes the associations between location of injuries and player position, frequency of play and prevalence of injuries, stretching and location of injuries, training duration and injuries, and equipment and location of injuries of female high school soccer players in the Johannesburg east district. It will also describe various factors that were thought to influence injuries in the lower extremity.

4. 2 RESPONSE RATE

A total of one hundred and three questionnaires were completed from nine high schools in the Johannesburg east district. This was from schools that had active female soccer programmes during 2006, that is, from April to August 2006. Not all the participants responded to all the questions in the questionnaires, therefore the n (number) varies in different figures and tables.

4.3 DEMOGRAPHIC DATA

The data that were collected included age of starting to play soccer and current age during the study.

4.3.1 Age

The percentage distribution of current ages of the participants is illustrated in figure 4.1

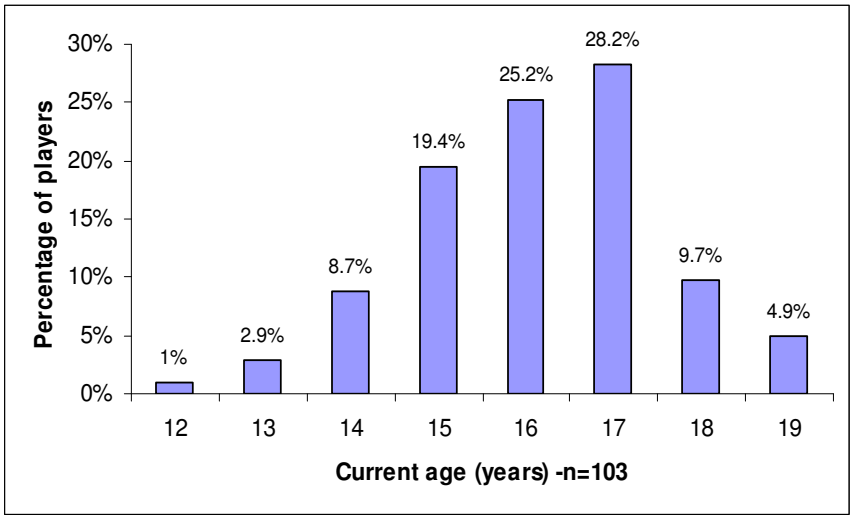

Figure 4.1 Percentage distribution of current age

The current age of the majority of participants was between fifteen (19.4%) and seventeen (28.2%) years of age. The mean and standard deviation of the current age was 16.1(±1.4).

Figure 4.2 below shows the ages when the participants started to play soccer.

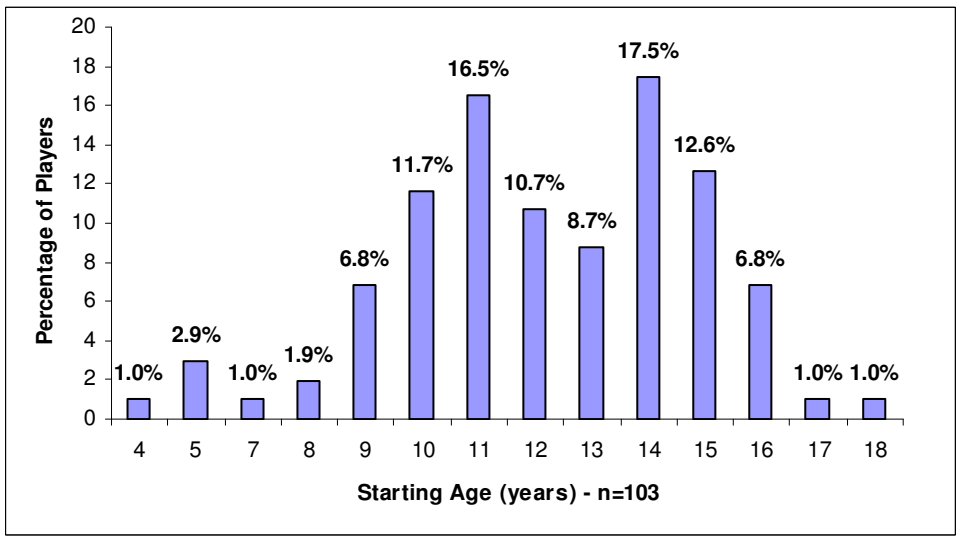

Figure 4.2 Percentage distribution of age of starting to play soccer

The majority of participants started playing soccer at 11 (16.5%) and 14 (17.5%) years of age. One percent started playing soccer as young as four years of age. The mean and standard deviation of age at which they started playing soccer was 12.2(±2.7)

4.4 SOCCER BACKGROUND

In the following subjections, the descriptive analysis of different variable is presented. These variables include player position, equipment, matches played per week, training and stretching.

4.4.1 Player Position

The players were requested to indicate the position they played in the team. Table 4.1, below shows the distribution of player position.

Table 4.1 Distribution of player position

Position	**n = 103**	%
Goalkeeper	8	7.8
Defender	42	40.8
Midfielder	34	33.0
Striker	19	18.4

The distribution of participants above shows that the highest percentage of the players were defenders (40.8 %) followed by midfielders at 33.0%.

4.4.2 Equipment

The players were requested to indicate the equipment they used during matches. The table below illustrates the distribution on wearing of shoes and shin guards.

Table 4.2 Use of equipment

Equipment	n = 103	%
Shoes		
Shoes with studs	83	**80.6**
Shoes without studs	18	**17.5**
Bare feet	2	**1.9**
Shin guards	54	**52.4**

The results shows that out of 103 subjects, 83 (80.6%) played with shoes with studs, 18 (17.5%) without studs and the remaining 2 (1.9%) participants played barefoot. Fifty four (52.4%) of the participants wore shin guards and the remaining 49 (47.6%) had no leg protection.

4.4.3 Matches played per week

The soccer season lasted for 3-4 months of the school year. Matches were sixty minutes in length with a five minute break at half time. The coaches or teachers confirmed these facts. The participants were requested to indicate the number of matches per week. The numbers of matches played per week are shown in Table 4.3 below.

Table 4.3 Matches played per week

Number of matches per week	n = 103	%
One	**79**	**76.7**
Two	21	20.4
Three	1	1.0
Five	2	1.9

The results show that 76.7% of the participants only played matches once a week during the soccer season

4.4.4 Training

The participants were requested to indicate whether they did skills and fitness training. Ninety three of the participants (91.2%) did skills and 98 (96.1%) did fitness training. The participants did training mainly twice a week where 40 (40.8%) did skills and 47 (47%) fitness training. The participants were further asked to report on the duration of training for both skills and fitness. Table 4.4 below illustrates the duration of skills and fitness training.

Table 4.4 Frequency distribution of duration of training

Duration of training (minutes)	**Skills n = 94**	**%**	**Fitness n = 98**	**%**
Less 30	5	**5.3**	6	6.1
30	15	**16**	3	3.1
45	28	**30**	17	17.3
60	25	**26.6**	31	31.6
90	21	22.3	41	41.8

The results show that 41.8% of the participants concentrated on fitness training for 90 minutes compared to 22.3% skills training. Thirty percent (30%) of the subjects only did skills training for 45 minutes and 41% did fitness training for ninety minutes.

4.4.5 Stretching

All the participants reported that they stretched, but there was no consistency as to whether they stretched before and after activities and the location of stretching. Table 4.5 shows the frequency and percentages of when stretching was done.

Table 4.5 Stretching

Stretching	Warm up n.=103	%	Training n =103	%	Matches n =103	%
Before	34	33.0	48	46.6	71	68.9
After	65	63.1	48	46.6	29	28.2
None	4	3.9	7	6.8	3	2.9

It can be seen that 46.6% of the participants stretched before and after training. The majority (68.9%) of participants stretched before matches and 28.2% stretched after matches.

The participants were asked further for the specific lower extremity muscle groups they stretched. These responses are illustrated in table 4.6 below.

Table 4.6 Location of stretching

Location of stretching	n = 103	%
Buttock	35	**35**
Groin	58	**58**
Hamstrings	71	**70.3**
Quadriceps	79	**78.2**
Calf	88	**87.1**

The results show the percentages of the different muscle groups that the participants stretched. Calf muscles were stretched by most of the participants (87.1%). The buttock and groin muscles were not as commonly stretched as the other groups of muscles.

4.5 PREVALENCE OF INJURIES

The one year (2005) prevalence of participants injured was (47) 46.1% and the point (2006) prevalence of participants injured was (34) 37.8%. The one year prevalence was thus higher than the point prevalence.

4.6 INJURY PROFILE

4.6.1 Location of injuries

Table 4.7 below shows the frequency of injury location as well as trends between 2005 and 2006. Out of a sample of 47 subjects who were injured a total of 78 injuries was recorded. The n, in the table below refer to the number of injuries.

Table 4.7: Frequency distribution of location of injuries and player position in 2005

Location of injuries	**2005**		**Goalkeeper**		**Defender**		**Midfielder**		**Striker**	
	n=78	**%**	**n=6**	**%**	**n =31**	**%**	**n=26**	**%**	**n=15**	**%**
Hip joint	5	4.9	0		3	**60**	1	20	1	20
Groin muscle	2	2.0	0		0		1	50	1	50
Quadriceps muscle	5	4.9	1	20	1	20	3	**60**	0	
Hamstrings muscle	5	4.9	1	20	3	**60**	0		1	20
Knee joint	19	**18.6**	1	5.3	8	2.1	6	31.6	4	21.1
Leg bone	7	6.9	1	14.3	2	8.6	3	42.9	1	14.3
Calf muscle	7	6.9	1	14.3	3	2.9	2	28.6	1	14.3
Ankle joint	18	**17.6**	0		6	**33.3**	8	**44.4**	4	22.2
Foot and toes	10	9.8	1	10	5	50	2	20	2	20

The results show that 18.6% of the injuries reported were knee joint injuries and 18% were ankle joint injuries. Of these injuries the midfielders (44.4%) and defenders (33.3%) reported the most injuries. The defenders had the highest number of injuries at the hip joint (60%), hamstrings (60%), gastrocnemius muscle (42.9%) injuries followed by knee injuries (42.1%) The midfielders had more quadriceps muscle (60%), groin injuries (50%), ankle injuries (44.4%) and leg bone (shin injuries) (42.9%). The strikers had more groin injuries (50%) and an equal distribution of injuries between the ankle and knee. There were no buttock and patella injuries reported in 2005 regardless of the player position.

The location of injuries per player position in 2006 is illustrated in table 4.8 below. The n, in the table below refer to the number of injuries.

Table 4.8: Frequency distribution of location of injuries and player position in 2006

Location of injuries	2006		Goalkeeper		Defender		Midfielder		Striker	
	n =42	%	n =2	%	n =18	%	n =14	%	n =8	%
Knee joint	12	13.3	1	8.3	6	**60**	2	16.7	3	25
Leg bone	7	7.8	1	**14.3**	3	42.9	2	28.6	1	14.3
Ankle joint	17	**18.9**	0		8	47.1	6	35.9	3	17.6
Foot and toes	6	6.7	0		1	16.7	4	**66.7**	1	16.7

In 2006 the defenders reported more knee joint injuries (60%) and midfielders had more foot and toe injuries (66.7%).

The participants were further asked to record when they had injuries occurring more than once in the same location (recurrent injuries). Table 4.9 below shows the recurrent injuries per location in 2005 and 2006.

Table 4.9: Frequency distribution of the recurrence of injuries

Location of injuries	Recurrent injuries- 2005		Recurrent injuries- 2006	
	n = 30	%	n = 17	%
Hip joint	2	4.3	0	
Groin muscle	1	2.1	0	
Quadriceps muscle	3	6.4	0	
Hamstrings muscle	3	6.4	0	
Knee joint	5	10.6	7	20.6
Leg bone	3	6.4	3	8.8
Calf	5	10.6	0	
Ankle joint	3	6.4	6	17.6
Foot and toes	5	10.6	1	2.9

The results show that in 2005, 10.6% of recurring injuries occurred in the knee, calf, foot and toes. The knee joint had more recurrent injuries (20.6 %) in 2006 with 17.6%.at the ankle.

4.6.2 Activities during which injuries occurred

The activities during which the injuries occurred are shown in Table 4.10 below.

The n in this instance depicts the number of injuries per location during different activities.

Table 4.10 Frequency distribution of the activities during which injuries occurred

Location of injury	Warm up		Matches		Training		Other Activities	
	n	(%)	n	(%)	n	(%)	n	(%)
Hip joint	2	25	4	50	0		2	25
Groin	1	20	2	40	1	20	1	20
Quadriceps muscle	1	20	1	20	1	20	2	40
Hamstrings muscle	1	33.3	0		1	33.3	1	33.3
Knee joint	1	3.7	18	66.7	5	18.5	3	11.1
Leg bone	1	9.1	6	54.5	2	18.2	2	18.2
Calf	0		4	66.7	2	33.3	0	
Ankle joint	3	11.5	18	69.2	4	15.4	1	3.8
Foot and toes	0		10	71.4	1	7.1	3	21.4

Table 4.10 above illustrates that injuries occurred mainly during matches. When looking at the location where most injuries occurred, namely the knee and ankle it can be seen that the injuries occurred during matches. Knee and calf injuries accounted for 66.7% of the injuries during matches and 69.2% of ankle injuries occurred during matches. Foot and toe injuries (71.4 %.) also occurred during matches.

4.6.3 Mechanism of injuries

The mechanism of injuries was divided into contact and non-contact injuries and the responses were grouped into the above categories. For an example: ‘fell while jumping for the ball’; ‘player from another team kicked me’; ‘I was tackled’; ‘I fell during running’; I fell into a ditch’. The contact injuries were further divided into contact with another player and contact with equipment (e.g. goal posts).

A count of similar responses was determined and the percentage was calculated from all the responses. Thirty three (32.42%) participants reported contact injuries with another player and three (2.94%) participants had contact with equipment .Thirty seven (35%) subjects had non contact injuries Six subjects (5.8%) did not explain how the injury occurred. The non contact injuries were thus higher than the contact injuries.

4.6.4 Severity of injury

Table 4.11 below shows the distribution of severity of injury. Fuller et al. (2006) describe injury severity as the number of days that elapse between the dates of injury to the date the players return to full participation in soccer. The severity of injury is categorized as minor (1-7days of absence), moderate (8-28days) severe (more than 28 days) (Hagglund, 2005). The n represents the total number of injuries.

Table 4.11 Severity of injury

Location of injury	Minor		Moderate		Severe	
	n	%	n	%	n	%
Buttock	0		0		0	
Hip joint	6	7.7%	2	16.7%	0	
Groin	5	6.4%	0		1	14.3%
Quadriceps muscle	5	6.4%	0		0	
Hamstrings muscle	2	2.6%	1	8.3%	0	
Knee joint	15	19.2%	3	25%	2	28.6%
Patella	0		0		0	
Leg bone	10	12.8%	0		1	14.3%
Calf	5	6.4%	0		0	
Ankle joint	17	21.8%	5	41.7%	3	43%
Foot and toes	13	16.7%	1	8.3%	0	
Total (97)	78	80%	12	12.4%	7	7.2%

The participants were asked to report on how serious the injury at each location was**.** Eighty percent (78) of the injuries were of a minor nature whereas 7(7.2%) were severe. The ankle joint had the highest percentage of minor (21.8%), moderate (41.7%) and severe (43%) injuries compared to other locations.

4.6.5 Management of injuries

This was an open ended question to give the participants freedom to express in their own words steps taken to manage their injuries. The count of different treatments was done and the percentage was calculated. Twelve percent of the participants with injuries did not consult a medical person. They treated their own injuries using ice, bandaging, and massage with over the counter topical medication. Figure 4.3 below demonstrates steps taken by participants to treat their injuries.

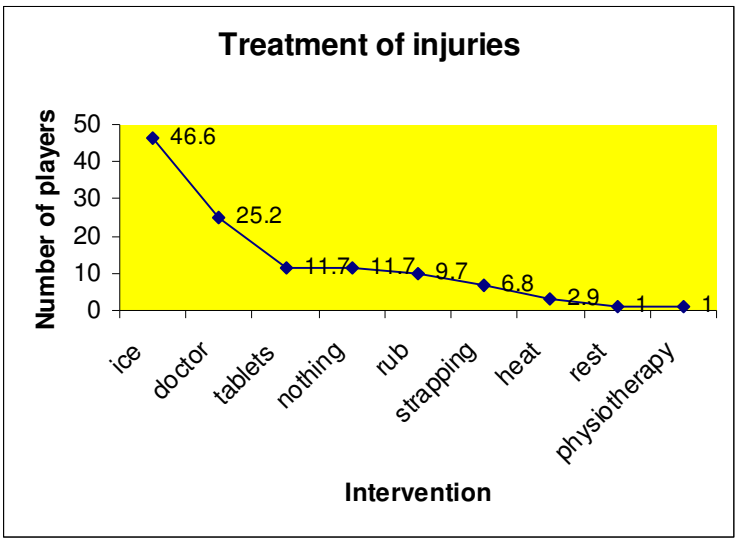

Figure 4.3 Treatment of injuries

Twenty five percent of participants consulted a doctor for the injuries. Only one percent of this population consulted a physiotherapist and rested their injuries**.**

4.7 THE ASSOCIATIONS OF VARIOUS FACTORS AND INJURIES

The chi square test (for categorical data) and t-test (for continuous data) were used to determine if there was any association between the following factors:

- Age vs. injury
- Duration of training vs. injury
- Matches per week vs. injury

- Player position vs. location of injury
- Location of injury vs. muscle stretched
- Use of equipment vs. location of injury

The n denotes the participants who had injuries for various variables.

4.7.1 Age and injury.

A t-test analysis was used to determine age (continuous variable) as a risk factor in association with injury for one year and point prevalence. There were no associations between the age of starting to play soccer (p=0.78) and current age (p=0.37) for injuries reported in 2005 (one year prevalence). For the point prevalence or injuries reported in 2006, current age was associated with injury (p=0.01). There was no association between the age of starting to play soccer and injury in 2006.

4.7.2 Duration of training and injury (2005 & 2006)

The n in tables 4.12 and 4.13 below depicts the number of injuries in 2005 and 2006 in association with the duration of training.

Table 4.12 Association between duration of training and injury in 2005

Duration of training (minutes)	**Skills**		**Fitness**	
	n	**%**	**N**	**%**
Less 30	5	5.4	5	5.1
30	5	5.4	1	1.0
45	9	9.7	7	7.2
60	13	14.0	12	12.4
90	10	10.7	18	18.6
p-value	0.06		0.37	

The results illustrates that there may be an association between duration of skills training and reported injuries in 2005 (p = 0.06) with more injuries reported as the duration of skills training increased. There was no association between injuries reported in 2005 and fitness training (p = 0.37).

Table 4.13 Association between duration of training and injury in 2006

Duration of training (minutes)	Skills n	%	Fitness n	%
Less 30	0		0	
30	0		0	
45	19	22.9	6	6.9
60	8	9.6	5	5.7
90	5	6.0	22	25.3
p-value	**0.0001**		**0.02**	

Those who were training for 30 minutes or less reported no injuries. The results from the table show that duration of skills training (p=0.0001) and fitness training (p=0.02) were associated with the presence of injuries in 2006 for those participants who training for 45 minutes. The longer the participants continued with skills training the lesser the injuries, whilst the increased fitness training the more the injuries reported.

4.7.3 Exposure (matches per week) and injury (2005 & 2006)

Table 4.14 below illustrates the association between the number of injuries and matches per week. The n, demonstrates the number of injuries in association with matches per week played by participants.

Table 4.14 Association between matches per week and injury

Matches per week	2005 n	%	2006 n	%
One	36	35.3	27	30
Two	9	8.8	6	6.7
Three	1	0.98	0	
Five	1	0.98	1	1.1
p-value	**0.74**		**0.37**	

There was no association between the number of matches played per week and injuries reported in 2005 (p = 0.74) and 2006 (p =0.37).

4.7.4 Location and player position

The n, in tables 4.15 & 4.16 below represents the number of injuries per location Table 4.15 below demonstrates the association between location of injury and player position in 2005.

Table 4.15 Association between injury and player position in 2005

2005	Goalkeeper		Defender		Midfielder		Striker		p-value
	N	%	n	%	n	%	n	%	
Hip joint	0		3	60	1	20	1	20	0.32
Groin	0		0		1	50	1	50	0.15
Quadriceps muscle	1	20	1	20	3	60	0		0.12
Hamstrings muscle	1	20	3	60	0		1	20	0.32
Knee joint	1	5.3	8	42.1	6	31.6	4	21.1	0.11
Leg bone	1	14.3	2	28.6	3	42.9	1	14.3	0.25
Calf	1	14.3	3	42.9	2	28.6	1	14.3	0.06
Ankle joint	0		6	33.3	8	44.4	4	22.2	0.39
Foot and toes	1	10	5	50	2	20	2	20	0.15

There was no association between the location of injuries and player position in 2005 as illustrated by p-values greater than 0.05.

Table 4.16 below demonstrates the association between location of injuries and player position in 2006

Table 4.16 Association between location of injuries and player position in 2006

2006	Goalkeeper		Defender		Midfielder		Striker		p-value
	n	%	n	%	n	%	n	%	
Knee joint	1	8.3	6	60	2	16.7	3	25	0.28
Leg bone	1	14.3	3	42.9	2	28.6	1	14.3	0.29
Ankle joint	0		8	47.1	6	35.9	3	17.6	0.36
Foot and toes	0		1	16.7	4	**66.7**	1	16.7	**0.05***

The results show that the midfielders had 66.7% toe and foot injuries and were most likely to incur foot and toe injuries (p = 0.05) compared to other positions.

4.7.5 Muscles stretched and location of injury

Table 4.17 below illustrates the association between muscles that were stretched and injury occurrence. The n denotes the number of injuries in participants who stretched different muscles and had injuries.

Table 4.17 Association between muscles stretched and injury

Location of injury	**2005**		**p-value**
	n	**%**	
Groin	2		-
Hamstrings muscle	4		0.17
Quadriceps muscle	2		0.17
Calf	6		-

All the participants who had groin and calf injuries were stretching; and there was no association between stretching calf and groin muscles and injury. There was also no association between stretching and injury for the hamstrings and quadriceps muscles.

No muscle injuries were reported in 2006; therefore no associations could be done.

4.7.6 The association between equipment and location of injury

Seventy two percent of ankle injuries were reported by subjects who had shoes with studs and only 27.8% of ankle injuries were reported by those who had shoes without studs. The participants who did not wear shin guards reported 71.4% of the leg injuries, and 28.6% of the leg injuries were reported by subjects who wore shin guards. There was an association between not wearing shin guards and the presence of leg injuries (shin) ($p = 0.01$).

4.8 RISK FACTOR SUMMARY

The following variables were used in a logistic regression analysis: age (starting age and current age training, duration of training, matches per week, player position, shoes and shin guards) to determine the nature of their association with injury.

Table 4.18 and 4.19 below summarises the risk factors associated with injury in 2005 and 2006. The odds ratios given in the tables below illustrate the protectiveness of the different variables against injury.

Table 4.18 Extrinsic risk factors associated with injuries in 2005

Variable 2005	**Odds ratio**	**Standard error**	**95% Confidence level**	**p-value**
Starting age	0.98	0.92	0.85-1.13	0.78
Current age	0.88	2.28	0.67-1.16	0.37
Training				
Skill	0.64	0.7	0.16-2.55	0.53
Fitness	0.26	0.17	0.03-2.64	0.26
Duration of training				
Skill	1.03	0.18	0.72-1.47	0.86
Fitness	1.24	0.18	0.86-1.77	0.25
Matches per week	0.94	0.29	0.53-1.6	0.83
Player position	0.75	0.23	0.48-1.18	0.2
Shoes	1.36	0.5	0.50-3.68	0.54
Shin guards	**0.35**	**0.41**	**0.16-0.79**	**0.01***

None of the above variables with the exception of "wearing of shin guards", were identified as risk factors in the logistic regression. The results show that the players who wore shin guards reduced the risk of having an injury (OR=0.35) (p=0.01)(CI 0.16-0.79)

Table 4.19 Extrinsic risk factors associated with injury in 2006

Variable 2006	**Odds ratio**	**Standard error**	**95% Confidence level**	**p-value**
Starting age	1.04	0.07	0.9-1.21	0.6
Current age	**0.64**	**0.19**	**0.4-0.9**	**0.01**
Training				
Skill	3.14	1.12	0.35-28.1	0.31
Fitness	1000	546	0.001-1000	1
Duration of training				
Skill	1.06	0.21	0.7-1.6	0.8
Fitness	**0.51**	**0.3**	**0.3-0.9**	**0.02**
Matches per week	0.83	0.38	0.4-1.7	0.62
Player position	0.9	0.24	0.55-1.45	0.65
Shoes	0.9	0.52	0.32-2.45	0.82
Shin guards	0.82	0.44	0.35-1.94	0.65

The age of the players was associated with injury. With older players having a greater chance of being injured (OR=0.64) (p=0.01)(CI 0.4-0.9). The duration of fitness training reduced the risk of injury (OR=0.51) (p=0.02)(CI 0.3-0.9).

CHAPTER 5

5.0 DISCUSSION

INTRODUCTION

The participation of adolescent females is increasing in South Africa in soccer and no study has been published in the past to determine the profile of injuries in this population. The literature on female soccer injuries is limited in the adolescent population in developing countries. This study was undertaken to determine common lower extremity injuries that were sustained by female soccer players in the Johannesburg east district. The common findings in this study will be discussed and then compared to similar studies. The prevalence of injuries, profile of injuries including location of injury, severity of injury, mechanism of injury, treatment of injury was established. The associations between different variables were established and will be discussed

5.1 PREVALENCE

The results of this study show that the 46.1% of the girls sustained injuries in 2005 and 37.8% in 2006. The point prevalence of injuries was lower than the one year prevalence as participants only recorded their most current injuries. The number of injuries was however lower than the rate of injury in the adult professional female soccer players which ranges from 55% - 70% (Giza et al., 2005; Faude et al., 2005).The difference between adolescent and adult female studies may be attributable to the level of exposure, where the professional players have increased number of training per 1000 hours. In this study, the matches were played mainly (76.7%) once a week. All the reviewed soccer studies agree that there is a high level of injuries in the lower extremities regardless of age, gender, and exposure and skill level.

5.2 PROFILE OF INJURIES

5.2.1 Location of injury

There were mainly knee and ankle injuries for both point and one year prevalence in this population of Johannesburg east district. The ankle is the main point of contact during soccer matches and training, therefore it is most likely to incur more injuries. The higher number of knee injuries and ankle injuries may be attributed to the skill of cutting, jumping and landing which is different in girls.

The higher number of knee and ankle injuries in this study is consistent with a number of prospective studies where the knee was the most commonly injured area followed by ankle injuries in a female population (Giza et al., 2005, Powell and Barber-Foss, Odion 2001,Emery et al 2006, Emery and Meeuwisse 2006). The skill of cutting and twisting in soccer was found to be the most common cause of the knee injuries specifically anterior cruciate ligament (Cowley et al., 2006), whereas Barber-Foss and Powell (2000) found that jumping and landing tasks increased the risk of knee injury in female soccer players.

Ford et al., (2005) when comparing the adolescent females and males during unanticipated cutting maneuver found females to have greater abduction of the knee which in turn increases the genu valgus which may be a risk factor for knee injuries specifically anterior cruciate ligament. The difference in angles of the knee and ankle joints during skills performance was also found by Swartz et al., (2005) when comparing the biomechanical differences during vertical jump landing between children and adults of both sexes. The knee flexion and knee valgus of the girls was increased during vertical jump landing compared to the boys, but less than the adults. The children had increased vertical ground reaction forces during landing which may increase the risk of injuries in both knee and ankle. Although there was no great difference in percentages of contact and non contact injuries, the increased vertical ground reaction forces during landing could also explain the non contact injuries (35.45%) being higher compared to contact injuries (32.42%) in this study. Junge et al., 2000 comparing two European regions found that 41.7% of injuries were non contact in Alsace and 54.7% in the Czech Republic and this was high compared to the contact injuries at 39.6%in Alsace and 19.5% Czech

Republic. Even though the study was done on male adolescent soccer players; the results are similar to this study.

The injuries to the calf muscle were significantly higher in all subjects in different playing positions despite being the most stretched location. The question arises whether improper knowledge on stretching the calf muscle contributed to the injuries. The programme or types of stretching exercises were not determined in this study. Since this study did not determine types of injuries (strain, contusion or sprain etc.), it was difficult to associate stretching with injury. The participants were unable to recall or did not know type of injuries they incurred.

5.2.2 Severity of injuries

The high number of minor injuries in this study group can be related to the limited hours of exposure in both training and games. The average skills and fitness training was twice a week for 60 to 90 minutes and the majority of participants (76.7%) played matches once a week. Barber-Foss (2000) and Le Gall et al., (2006) in their studies of high school soccer also found that there were more minor injuries. Goga and Gongal (2003) had more severe injuries reported and foul play was the major contributor. Poor application of rules or proper referring maybe contributed to foul play as well poor playing or pitch surface as the soccer players were amateurs.

5.3 RISK FACTORS

The main findings in risk factors are discussed in this section. There were no associations between starting ages, number of matches played per week, player position wearing of shoes, stretching and injury in this study.

5.3.1 Skill level

This study also found that, the older players had an increased risk of injury (p=0.01). The odds ratio (OR = 0.64,) indicates that the players had a 36% chance of reducing the risk of injury as they get older. This population started to play soccer at 12.2 (±2.7) and their age at the time of study was 16.1 (±1.4). This shows that as the age increases, the

incidence of injuries also increased. As this population is low level skilled players, the results agree with Dvorak and Junge, (2000) where most of the studies reviewed found low level skill players had an increased rate and incidence of injuries irrespective of age. Although age is an intrinsic factor; Murphy et al., (2003), see it as playing a role in contributing to injury of the lower extremity in the review. Consistently in most sports, adolescents are at a greater risk of injury than younger children, but injury decreases with skill level and age (Emery 2003, Schmidt-Olsen et al., 1991). This is in partial agreement with this study as the players increased the likelihood of injury with increasing age. However, the conclusion of six studies in the review by Murphy et al., (2003) showed an increase in the incidence of injury in older athletes compared to younger athletes this is in agreement with the findings of this study. The findings of this study also agree with Junge et al., (2000) where the high skilled youth players (16-18 years) had fewer injuries (24.5%) compared to same age low skilled youth players (28.2%).

5.3.2 Player Position

The defenders (40.8%) and midfielders (33%) were commonly injured in this study. Sixty percent of quadriceps and hamstrings muscle injuries were sustained by midfielders and defenders. This can be understood because soccer is more robust in midfield and strength is required to win the ball. The defenders put their lower extremities in line when defending a ball, hence most likely to be injured. The midfielders were found to most likely to incur foot and toes injuries ($p=0.05$) compared to other positions. Tackling and running a lot during matches for these players in the midfield position could be associated with injuries. Although other studies report that defenders and midfielders were injured more in relation to other positions of play (van Heerden 1992, Kucera et al., 2005, Dvorak and Junge 2000), the location of injuries was not related to player position.

5.3.3 Exposure

No injuries were reported for the shorter (30 minutes or less) duration of skills and fitness training in this study. For an injury to occur, the participants needed to be exposed long enough. A downward trend in the number of injuries was also found in this study with the increase in duration of skills ($p=0.0001$), the longer the duration of skills

training, the lower the number of injuries in 2006. Although there was statistical significance in the duration of fitness training (p=0.02), it was difficult to determine the trend with injury association. Table 4.13 in the results simple shows that if you are training for 45 minutes injuries may occur, however the odds ratio in the regression analysis for 2006 (Table 4.19) show that the longer the participants trained the less likely the injuries occurred. As skill and fitness improves so does the confidence of players in handling the opponents during matches. The decrease in the number of injuries as the duration of training increases in this study is in contrast with the male study done by Junge et al., (2000) where there was an increase in the number of injuries in the low skill level players.

5.3.4 Equipment

In this study there was not a high number of leg or shin injuries (6.9%), but the results show that wearing shin guards reduces the risk of having shin injuries (p=0.01). The likelihood of reducing an injury in this study was 65% (OR = 0.35, 95% CI). Contact with another player may cause of the shin acute injuries rather than overuse injuries. Lilley et al., (2002) had ankle injuries (24%) followed by shin injuries as the highest percentage of injuries (18%) in their retrospective study of adolescent soccer population, but it was not clear whether the participants were wearing shin guards or not, therefore comparing the studies makes it difficult. However, not wearing shin guards have been shown to have a direct link to have leg injuries (Dvorak and Junge, 2000). The ankle injuries were associated with wearing shoes with studs, but this is difficult to be conclusive as there could be other extrinsic factors like the pitch surface (hard, soft, grass or gravel).

5.4 STRENGTHS OF THIS STUDY

No other studies were found in South Africa that investigated adolescent female soccer injuries and related extrinsic risk factors.

5.5 LIMITATIONS

Conducting a retrospective study in this high school population made it difficult to determine the type of injuries as players had to recall information. The participants did not consult medical professionals to diagnose the injuries and they did not know the type of injury sustained. The aspects on exposure in the injury surveillance of female soccer in this study population make it difficult to compare with other studies as the calculation of hours was not the same.

CHAPTER 6

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The knee and ankle were the commonly injured locations in the lower extremity for the Johannesburg east district high school female soccer players with the defenders and midfielders having the most injuries. The midfielders also incurred the most foot and toe injuries. The injuries occurred mainly during matches and were minor injuries. Increasing skills and fitness training reduced the number of injuries in this population, with fitness training most likely to have an effect on injuries. The study also found that as the players grow older there were fewer injuries. Wearing of shin guards was found to reduce leg injuries in this population. The profile of injuries and the risk factors determined from this study does not differ from the studies done in male adolescent and adult soccer players.

6.2 RECOMMENDATIONS

There is a great need to conduct a similar study prospectively to get more detail on the injuries. Training for school coaches or educators on proper skills and fitness programmes to reduce the number of injuries should be implemented. The wearing of shin guards to prevent leg injuries is recommended, but this has financial implication for some adolescent soccer players as they may not afford them. The South African Football Association together with the Department of Sports and Recreation of South Africa should be approached to assist in provision of the protective equipment like shin guards. The school coaches or sports educators could be trained to record injuries in female soccer players in high school to monitor the injury trends and this may assist in the prevention and monitoring of injuries.

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APPENDIX 1

QUESTIONNAIRE:

COMMON LOWER EXTREMITY INJURIES IN FEMALE HIGH SCHOOL SOCCER PLAYERS IN JOHANNESBURG EAST DISTRICT

Name of School:
……

A. **SOCCER BACKGROUND**

1. At what age did you start playing soccer?

   .....

2. Age this year?

   ……..

3. What main position and level do you play?

   (Please tick ✓ in the appropriate box (es)

	School	Club	Provincial	National	Social
Goalie	☐	☐	☐	☐	☐
Defender	☐	☐	☐	☐	☐
Midfielder	☐	☐	☐	☐	☐
Striker	☐	☐	☐	☐	☐

4. How many matches were played in the last season/year (2005)?

	Matches per week	Matches per month	Other matches
School	☐	☐	☐
Club	☐	☐	☐
Provincial	☐	☐	☐
National	☐	☐	☐
Social	☐	☐	☐

5. Other sports/activities:

Name of Sport	Age of Starting	Level of participation (School, club, provincial etc.)	How often do you play per week?

6. Do you play with? (Please tick ✓ in the appropriate box (es))

Shoes with studs : ☐
Shoes without studs : ☐
Shin guards : ☐
bare feet : ☐

B. **TRAINING**

1. During training, do you do any of the following?

(Please tick ✓ in the appropriate box)

Skills training : ☐
Fitness training : ☐

1.1 How many days in a week do you do the training?

Skills training : …….. days
Fitness training : …….. days

1.2 How long is the duration of training?

(Please tick √ in the appropriate box)

		Skills	Fitness
Less than 30 minutes	:	☐	☐
30 minutes	:	☐	☐
45 minutes	:	☐	☐
1 hour	:	☐	☐
More than 1 hour	:	☐	☐

2. Do you do stretching? Yes ☐ No ☐

If yes, when do you stretch? (Please tick √ in the appropriate box)

Before warm up	:	☐
After warm up	:	☐
Before training	:	☐
After training	:	☐
Before match	:	☐
After match	:	☐

2.2 Which areas do you stretch?

(Please tick √ in the appropriate box)

Buttock muscle	:	☐
Groin muscle	:	☐
Hamstrings (back thigh) muscle	:	☐
Quadriceps (front thigh) muscle	:	☐
Calf (back of the leg) muscle	:	☐

C. **INJURIES**

1.1 Have you in the past year (2005), had an injury? Yes ☐ No ☐

1.2 If yes, how many injuries did you have in the last year (2005) on the following areas?

(Please fill the number)

Buttock muscle	:	.....	Patella (knee cap)	:	.....
Hip joint	:	.....	Leg bone (shin splints)	:	.....
Groin muscle	:	.....	Calf (back leg) muscle	:	.....
Quadriceps (front thigh) muscle	:	.....	Ankle joint	:	.....
Hamstrings (back thigh)muscle	:	.....	Foot and toes	:	.....
Knee joint/ligament	:	.....			

2.1 Do you have any injuries this year (2006)? Yes ☐ No ☐

2.2 If yes, how many injuries do you have this year (2006)?

(Please fill the number)

Buttock muscle	:	.....	Patella (knee cap)	:	.....
Hip joint	:	.....	Leg bone (shin splints)	:	.....
Groin muscle	:	.....	Calf (back leg) muscle	:	.....
Quadriceps (front thigh) muscle	:	.....	Ankle joint	:	.....
Hamstrings (back thigh)muscle	:	.....	Foot and toes	:	.....
Knee joint/ligament	:	.....			

3. During what activity did the injury occur?

(Please tick √ in the appropriate box)

Location of Injury		Warm up	Matches	Training	Other Sports/Activities
Buttock muscle	:	☐	☐	☐	☐
Hip joint	:	☐	☐	☐	☐
Groin muscle	:	☐	☐	☐	☐
Quadriceps (front thigh) muscle	:	☐	☐	☐	☐
Hamstrings (back thigh)muscle	:	☐	☐	☐	☐
Knee joint/ligament	:	☐	☐	☐	☐
Patella (knee cap)	:	☐	☐	☐	☐
Leg bone	:	☐	☐	☐	☐
Calf (back leg) muscle	:	☐	☐	☐	☐
Ankle joint	:	☐	☐	☐	☐
Foot and toes	:	☐	☐	☐	☐

4. Describe how the injury occurred?

Buttock muscle : .....

Hip joint : .....

Groin muscle : .....

Quadriceps (front thigh) muscle : .....

Hamstrings (back thigh)muscle : .....

Knee joint/ligament : .....

Patella (knee cap) : .....

Leg bone (shin splints) : .....

Calf (back leg) muscle : .....

Ankle joint : .....

Foot and toes : .....

5. How serious was the injury?

Classification:
Minor – up to 7 days
Moderate – 8-28 days
Severe – more than 28 days

(Please tick √ in the appropriate box)

Type of Injuries		Minor	Moderate	Severe
Buttock muscle	:	☐	☐	☐
Hip joint	:	☐	☐	☐
Groin muscle	:	☐	☐	☐
Quadriceps (front thigh) muscle	:	☐	☐	☐
Hamstrings (back thigh)muscle	:	☐	☐	☐
Knee joint/ligament	:	☐	☐	☐
Patella (knee cap)	:	☐	☐	☐
Leg bone	:	☐	☐	☐
Calf (back leg) muscle	:	☐	☐	☐
Ankle joint	:	☐	☐	☐
Foot and toes	:	☐	☐	☐

6. What measures did you take to make your injury better?
E.g.: put ice, take tablets, visit doctor, visit physiotherapy, did strapping, had operation, had plaster of Paris etc.

Area		
Buttock muscle	:	……
Hip joint	:	……
Groin muscle	:	……
Quadriceps (front thigh) muscle	:	……
Hamstrings (back thigh)muscle	:	……
Knee joint/ligament	:	……
Patella (knee cap)	:	……
Leg bone (shin splints)	:	……
Calf (back leg) muscle	:	……
Ankle joint	:	……
Foot and toes	:	……

APPENDIX 2

UMnyango WezeMfundo
Department of Education

Lefapha la Thuto
Departement van Onderwy

Date:	28 November 2005
Name of Researcher:	Mtshali Primrose
Address of Researcher:	3 St Andrews Court
	37 Frimley Road
	Robertsham 2091
Telephone Number:	(011) 7173702
Fax Number:	(011) 7173719
Research Topic:	Common Lower Extremity Injuries in Female Injuries in Female High School Soccer Players in Johannesburg East District
Number and type of schools:	15 Secondary Schools
District/s/HO	Johannesburg East & North

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

Permission has been granted to proceed with the above study subject to the conditions listed below being met, and may be withdrawn should any of these conditions be flouted:

1. ***The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.***
2. ***The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.***
3. ***A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.***

4. A letter / document that outlines the purpose of the research and th ant
outcomes of such research must be made available to the principals, SG
District/Head Office Senior Managers of the schools and districts/offices c
respectively.

5. The Researcher will make every effort obtain the goodwill and co-operation of all
officials, principals, chairpersons of the SGBs, teachers and learners involved.
who offer their co-operation will not receive additional remuneration from the Dep
while those that opt not to participate will not be penalised in any way.

6. Research may only be conducted after school hours so that the normal
programme is not interrupted. The Principal (or in the case of ordinary public Senior Manager
district/head office) must be consulted about an appropriate time when the researc
may carry out their research at the sites that they manage.

7. Research may only commence from the second week of February and must be con
before the beginning of the last quarter of the academic year.

8. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the
Such research will have been commissioned and be paid for by the Gauteng Depa
of Education.

9. It is the researcher's responsibility to obtain written parental consent of all learne
are expected to participate in the study.

10. The researcher is responsible for supplying and utilising his/her own research reso
such as stationery, photocopies, transport, faxes and telephones and should not
on the goodwill of the institutions and/or the offices visited for supplying such reso

11. The names of the GDE officials, schools and districts/offices visited as well as
participants in the study may not appear in the research report without the written
of each of these individuals and/or organisations.

12. On completion of the study the researcher must supply the Senior Manager: Sir
Policy Development, Management & Research Coordination with one hard copy
and one Ring bound copy of the final approved research report. The researcher
also provide the said manager with an electronic copy of the research abstract/sum
and/or annotation.

13. The researcher may be expected to provide short presentations on the purposes, fi
and recommendations of his/her research to both GDE officials and the su
concerned.

14. Should the researcher have been involved with research at a school and/or a district
office level, the Senior Manager concerned must also be supplied with a brief summ
the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertakin
looks forward to examining the findings of your research study.

Kind regards

ALBERT CHANEE
ACTING DIVISIONAL MANAGER: OFSTED

The contents of this letter has been read and understood by the researcher.	
Signature of Researcher:	
Date:	01 December 200

APPENDIX 3

CONSENT FOR THE SCHOOL

I……

principal of……give my permission to Siphe Mtshali to conduct a study to determine common lower extremity injuries in female soccer players in my school.

I understand that participation of pupils is voluntary and that there are no risks involved in the study.

Signed……..

Date…….

APPENDIX 4

CONSENT FORM FOR PARENT/GAURDIAN

I……as a parent/guardian grant consent for my child to participate in the study conducted by Siphe Mtshali. I have read the information sheet and understand the objectives of the study. My child has been assured that the study is voluntary and that she can discontinue participation at any time. I also understand that withdrawal from the study will not affect her school activities and participation in soccer.

Signed……..

Date……..

ASSENT FORM FOR PARTICIPANTS

I ……have read the information sheet and agree to take part in the study conducted by Siphe Mtshali. All my questions have been answered to my satisfaction. I understand that my participation is voluntary and that I can discontinue participating at any time from the study. I understand that withdrawal from the study will not affect my school activities and participation in soccer.

Signed…….....

Date…….....

APPENDIX 5

INFORMATION SHEET FOR PARTICIPANTS

Hi, my name is Siphe Mtshali. I am doing my Masters in Physiotherapy at the University of the Witwatersrand. I am doing a study to establish the common lower limb injuries in girls who play soccer in the school. You are invited to participate in the study.

Participation is voluntary and refusing to participate in the study will not affect your school activities and participation in soccer.

The objectives of this study:

- To establish the number of injuries that occurred in the legs because of soccer this year and past year.
- To establish the location and type of injuries.
- To establish whether there is an association between location of injuries to the player position and frequency of play.
- To identify possible extrinsic risk factors contributing to injuries.

There is an increase in participation of females in soccer, so the need to understand the types and patterns of injuries. Research has also shown that girls are at higher risk of injury than boys especially in contact sports and the injury rates are different from those for boys the girls are sustaining most injuries.

If you agree to participate in the study you will be asked to complete a questionnaire asking about your involvement in soccer as well as injuries you have had while playing soccer. You will receive an explanation on how to complete the questionnaire.

You can withdraw from the study at any time without any effect on your school activities and soccer participation. There are no risks involved in the study. Information obtained from the questionnaires will be confidential and used for research purposes only. This study will identify the risk factors and assist the coaches and health team members to develop prevention methods in order to keep the players injury free.

If you need to get in touch with me at any given moment, please use the details provided below.

Thank you for help.

Siphe Mtshali (Ms)

Tel: 011 717 3715 (work); Mobile: 072 310 6078; Email: mtshalip@therapy.wits.ac.za

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Mtshali

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M060132**
PROJECT	Common Lower Extremity Injuries in Female High School Soccer Players in Johannesburg East District
INVESTIGATORS	Ms PTS Mtshali
DEPARTMENT	Physiotherapy
DATE CONSIDERED	06.01.27
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 06.03.07 **CHAIRPERSON** .....

pp (Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Ms NP Mbambo

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES