

UNIVERSITY OF THE WESTERN CAPE

Faculty of Community and Health Sciences

RESEARCH PROPOSAL

**Title: FACTORS ASSOCIATED WITH INJURIES AMONG MARATHON
RUNNERS IN ELDORET, KENYA**

| | | |
|--------------------------|---|------------------------------|
| Student Name | : | Fred Kiplagat Chesergon |
| Student Number | : | 3419746 |
| Type of Thesis | : | Full Master's Thesis |
| Degree | : | MSc Physiotherapy |
| Department/School | : | Physiotherapy |
| Supervisor | : | Dr. Hamilton Grant Pharaoh |
| Co-Supervisor | : | Dr. Wallace Mugambi Karuguti |
| Date | : | April 2017 |



10 Keywords: Intrinsic factors, extrinsic factors, sports injury, prevention programs, flexibility, footwear, muscle balance, muscle imbalance, warm-up, cool down.

DECLARATION

I hereby declare that the proposal **Factors associated with injuries among marathon runners in Eldoret, Kenya** is my own work that has not been submitted for any degree of examination in any other university and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

Fred Kiplagat Chesergon

Signature:

 April 2017

UNIVERSITY of the
WESTERN CAPE

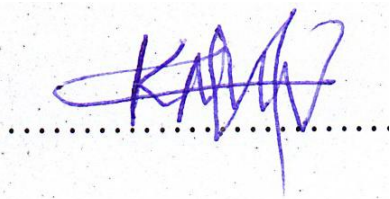
Supervisor

Dr. Hamilton Grant Pharaoh


April 2017

Co-Supervisor

Dr. Wallace Mugambi Karuguti


April 2017

DEDICATION

Firstly, I would like to dedicate this thesis to God, my heavenly Father and would like to give Him all thanks and glory for allowing me to complete this great milestone in my life.

Secondly, I would like to dedicate this thesis to my immediate family. To my late, father Solomon Chesergon, my mother Salome Tingo Chesergon, thank you very much for all your prayers, support and assistance throughout my study. I really appreciate all your support. I would also like to thank my daughters, Faith Jepkoech and Emily Jepkorir, and my sons, Francis Kiprono and Emmanuel Kiprop for their prayers, support and encouragement when I was discouraged.

Finally, I would like to dedicate this thesis to my beloved wife, Mrs. Christine Jeruiyot Kiplagat. Thank you for all your support and encouragement throughout my study. There were times when I was discouraged and you always motivated me with words of encouragement. I really appreciate everything that you have done. Thanks a lot for standing firm despite the challenges you went through when taking care of everyone in our family while I was studying at the University of the Western Cape in South Africa.

ACKNOWLEDGEMENT

I would like to thank the Lord our God and Jesus Christ for allowing me the opportunity to have undertaken this challenge and successfully completing my thesis. It was not easy road to undertake but through prayer, strength, wisdom and perseverance given by God, I was able to complete it.

Furthermore, I would like to thank and acknowledge my supervisor, Dr. Hamilton Grant Pharaoh, for all his time and hard work he invested in my thesis. Thank you for all your guidance and constructive criticism upon my work and encouraging me throughout the process. I really appreciate everything you have done for me. I would like to thank my Co supervisor, Dr. Wallace M. Karuguti of Jomo Kenyatta University and all the staff at the Physiotherapy department at the university of the Western Cape and Moi University in Kenya who supported and encouraged me throughout my study.



I would like to acknowledge and thank Mr. R. Chemitei of Eldoret National Polytechnic for assisting with the statistics and analysis of my thesis. Thank you for analyzing my results and speeding up the process of writing my thesis.

A special thanks goes to all the management at the Athletic training camps in Eldoret namely, Kiplombe/Kimumu camp, Rosa Athletic camp (Kaptagat), PACE training camp (Kaptagat), Global sports (Chirchir) and Kimumu-Kiplombe (Eldoret) camps for assisting with the process of data collection of my study. I appreciate all the long hours you sacrificed and patience shown while assisting in collecting the data for my study.

I would like to thank and acknowledge Dr. L. K. Lelei and Prof. Mining of Moi University, Dr. Christer Anderson and Dr. Ogle from Linkoping University, Sweden,

for their financial contribution toward my thesis through the Moi-Linkoping University collaboration. I am truly grateful for your support that helped me complete my thesis. I would also like to thank Prof. Michael Rowe of the University of the Western Cape for editing my thesis. May the Almighty God bless you.

Thank you to everyone who said a kind word of encouragement and who gave warm smiles and nods while listening to my challenges and for the motivation to continue in faith during these challenges. I pray that our Almighty God may bless you abundantly.



ABSTRACT

Background: Extrinsic factors like terrain, hard running surfaces or incorrect shoes have been known to be contributing factors to injury, and intrinsic factors such as poor flexibility, mal-alignment anthropometry, previous injury and running experience have been identified in playing a role too. Little is known about the factors associated with injuries among marathon runners in Eldoret, Kenya. It is therefore important to identify the possible risk factors associated with running injuries in order to prevent further injury and severe long-term complications **Aim:** To investigate factors associated with injuries among marathon runners in Eldoret, Kenya. **Design:** A cross-sectional, descriptive, quantitative study design was utilized in this study. **Population and sampling:** The study was conducted in five training camps in Eldoret, Kenya and aimed to collect data among two hundred registered marathon runners training in camps around Eldoret town, Kenya. Six sections of a self-administered questionnaire designed for two hundred marathon runners were used for data collection. The validity was ensured by doing a thorough literature review and reliability of the instruments was established through piloting. The instrument was reviewed by experts in the field of sports and by experienced coaches working as technical advisors in the Athletics Kenya Federation. Fifteen participants were selected to participate in the pilot study to determine the quality of the instruments, clarity and time consumption. **Data analysis:** Data was captured using the Statistical Package for Social Sciences (22.0) and analysis was in the form of descriptive and inferential statistics. Findings were presented in the form of tables and graphs. **Ethics:**

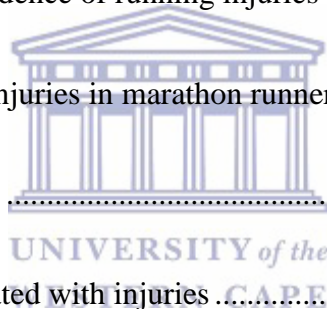
Ethics clearance was granted by the Research Committee of the University of the Western Cape and from the relevant authorities in Kenya. Participation was voluntary, participants' anonymity and confidentiality was assured and participants had the right to withdraw from the study at any time without any negative impact on them. The researcher was responsible for ensuring that the research method used was appropriate for data collection. Anonymity and confidentiality of the information collected was maintained and will be kept secure for five years after which it will be destroyed. The researcher also taught the research assistants how the data collection process was conducted. **Results:** The study revealed that most of the athletes were younger than thirty years, running to earn an income. The most common location of injuries comprised the knee, Achilles tendon, and the hip among others with overall injury prevalence at over 70.0%. The study results indicate that the athletes have knowledge of injury prevention and 78.0% of the athletes being able to seek medical assistance from a physiotherapist. The risk factors associated with running injury among marathon runners included the duration of running and use of orthotics ($p < 0.05$). Age, running terrain, using one pair of shoe, operation history and running pace among others were not risk factors ($p \geq 0.05$). **Conclusion:** There is still a significantly high prevalence of injuries among marathon runners in Eldoret whose risk factors can be identified. **Recommendations:** The study recommends interventions on mitigating injuries such as enhancing orthotics and optimizing the length of training programmes.

TABLE OF CONTENTS

| | |
|---------------------------------------|-------|
| DECLARATION | ii |
| DEDICATION | iii |
| ACKNOWLEDGEMENT | iv |
| ABSTRACT..... | vi |
| TABLE OF CONTENTS..... | viii |
| LIST OF TABLES | xiv |
| LIST OF FIGURE..... | xvi |
| ABBREVIATIONS AND ACRONYMS | xvii |
| DIFINITION OF TERMS..... | xviii |
| CHAPTER ONE | 1 |
| INTRODUCTION | 1 |
| 1.1 Introduction of the chapter | 1 |
| 1.2 Background of the study | 1 |
| 1.3 Problem statement | 4 |
| 1.4 Research question..... | 5 |
| 1.5 Aim of the study..... | 5 |
| 1.6 Objectives of the study..... | 5 |
| 1.6.1 Conceptual Framework..... | 6 |



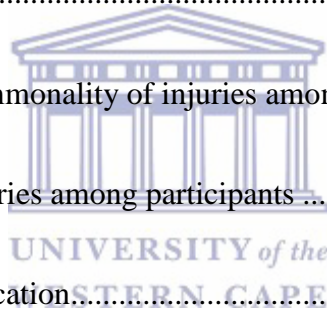
| | |
|---|----|
| 1.7 Significance of the study | 6 |
| CHAPTER TWO | 9 |
| LITERATURE REVIEW | 9 |
| 2.1 Introduction of the chapter | 9 |
| 2.2 Marathon running as a sports event..... | 9 |
| 2.2.1 Marathon running as a form of physical activity | 10 |
| 2.2.2 Participating in marathon running events..... | 11 |
| 2.3 Prevalence and incidence of running injuries | 12 |
| 2.4 Common types of injuries in marathon runners | 13 |
| 2.5 Location of injuries | 13 |
| 2.6 Risk factors associated with injuries | 15 |
| 2.6.2 Intrinsic Factors | 23 |
| 2.7 Injury prevention strategies | 25 |
| 2.8 Knowledge of injury prevention among marathon runners | 26 |
| 2.9 Physiotherapy intervention..... | 26 |
| 2.10 Criticism of literature review | 27 |
| 2.11 Theories | 30 |
| 2.11 Conclusion..... | 31 |
| CHAPTER THREE | 33 |



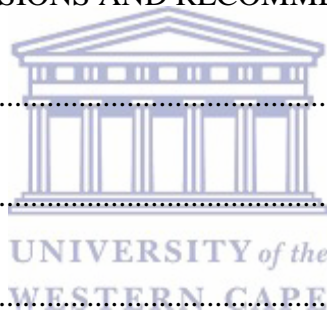
| | |
|---|----|
| MATERIALS AND METHODS..... | 33 |
| 3.1 Introduction of the chapter | 33 |
| 3.2 Research setting..... | 33 |
| 3.3 Research design | 33 |
| 3.4 Study population and sampling..... | 34 |
| 3.4.1 Study population | 34 |
| 3.4.2 Study Sample..... | 34 |
| 3.4.3 Sampling..... | 35 |
| 3.4.4 Inclusion criteria..... | 36 |
| 3.4.5 Exclusion criteria..... | 36 |
| 3.5 Data collection instruments..... | 36 |
| 3.5.1. Translation of instruments..... | 37 |
| 3.5.2. Reliability of the instrument..... | 37 |
| 3.5.3 Validity of the instrument | 37 |
| 3.5.3.1 Pilot study..... | 38 |
| 3.6 Data collection procedure..... | 38 |
| 3.7 Data analysis | 39 |
| 3.8. Ethical considerations | 39 |
| CHAPTER FOUR..... | 41 |



| | |
|--|----|
| RESULTS | 41 |
| 4.1 Introduction | 41 |
| 4.2 Demographics..... | 41 |
| 4.2.1 Gender of the runners | 41 |
| 4.2.2 Demographic data of the runners | 42 |
| 4.2.3 Reasons for running | 43 |
| 4.2.3 Medical history..... | 44 |
| 4.2.3 Running history | 44 |
| 4.3 Prevalence and commonality of injuries among participants..... | 47 |
| 4.3.1 Prevalence of injuries among participants | 47 |
| 4.3.2 Pain and injury location..... | 48 |
| 4.3.3 Recovery from Injuries..... | 49 |
| 4.3.4 Type of pain over past year | 50 |
| 4.3.3 Description of the pain over one past year | 51 |
| 4.3.4 Recurrence of Injuries | 51 |
| 4.4 Knowledge of injury prevention among the marathon runners..... | 53 |
| 4.4.1 Marathon data details | 55 |
| 4.4.2 Resting time and type of training | 56 |
| 4.4.3 Stretching exercise | 58 |



| | |
|---|----|
| 4.4.4 Running Environment | 60 |
| 4.5 Risk factors for injuries | 65 |
| 4.5.1 Intrinsic factors (Demographic data)..... | 66 |
| 4.5.2 Extrinsic Factors..... | 68 |
| 4.5.2.1 Terrain, Sport Wear and Medical History | 68 |
| 4.5.2.2 Type of Training and Stretching Exercises | 70 |
| CHAPTER FIVE | 72 |
| DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS..... | 72 |
| 5.1 Overview | 72 |
| 5.2 Summary | 72 |
| 5.2 Discussion | 72 |
| 5.2.1 Discussion based on research objectives..... | 73 |
| 5.2.1.1 Prevalence and commonality of injuries among marathon runners | 73 |
| 5.2.1.2 Types of Injuries Sustained by Marathon Runners | 74 |
| 5.2.1.3 Management Strategies of Injuries among Marathon Runners | 75 |
| 5.2.1.4 Knowledge of Injury Prevention among Marathon | 75 |
| 5.2.1.5 Common Factors Associated With Injuries in Marathon Runners | 76 |
| 5.3 Conclusion..... | 78 |
| 5.4 Recommendations | 79 |



| | |
|--|-----|
| 5.5 Recommendations for further study | 80 |
| APPENDICES | 97 |
| APPENDIX 1I (a): CONSENT FORM | 106 |
| APPENDIX 1I (b): FOMU YA UIDHINISHO | 108 |
| APPENDIX 1II (a): INFORMATION SHEET | 109 |
| APPENDIX 111 (b): KITAMBULISHO: KARATASI CHA TAARIFA (TRANSLATED INFORMATION SHEET) | 113 |
| APPENDIX v: INJURY REPORT FORM..... | 117 |
| APPENDIX XI: LETTER TO THE CAMP MANAGEMENT | 118 |
| APPENDIX XII: LETTER TO ATHLETICS KENYA FEDERATION | 119 |



LIST OF TABLES

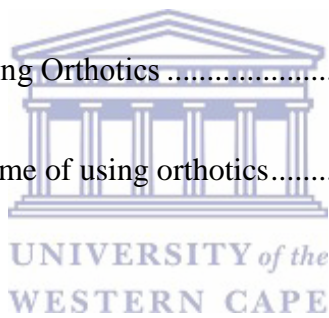
| | |
|--|----|
| Table 4. 1 Athletics data: Age, height, weight and BMI..... | 42 |
| Table 4. 2 Reason to start running..... | 44 |
| Table 4. 3 Time and weekly frequency of running as a sport | 45 |
| Table 4. 4 Average distance run by participants per week..... | 47 |
| Table 4. 5 Location of pain | 49 |
| Table 4.6 Type of pain experienced during running | 50 |
| Table 4.7 Description of the pain over past year..... | 51 |
| Table 4.8 Injury re-occurrence and seeking of medical assistance | 52 |
| Table 4.9 Best treatment for the injuries..... | 55 |
| Table 4.10 Marathon Summary details | 56 |
| Table 4.11 Resting period after training per week | 57 |
| Table 4.12 Type of training..... | 57 |
| Table 4.13 Regular stretching exercises..... | 58 |
| Table 4.14 Time spent holding a stretch | 59 |
| Table 4.15 Frequency of engaging in a strengthening programme..... | 59 |
| Table 4.16 Length of time using one pair of shoes | 61 |
| Table 4.17 Pair of shoes bought in a year | 61 |
| Table 4.18 Prescriber of orthotics | 62 |

| | |
|--|----|
| Table 4.19 Deformity in the feet | 64 |
| Table 4. 20 Part of the foot that strikes the surface first | 64 |
| Table 4. 21 Type of running surface | 65 |
| Table 4. 22 Intrinsic Risk factors for injury among participants | 66 |
| Table 4. 23 Risk factors of injuries among athletes | 68 |
| Table 4. 24 Risk factors for injuries..... | 70 |



LIST OF FIGURE

| | |
|---|----|
| Figure 4. 1 Gender of the respondents | 42 |
| Figure 4. 2 Running Pace of the Runners..... | 46 |
| Figure 4. 3 Injury during training race | 48 |
| Figure 4.4 Period taken to recover over past year..... | 50 |
| Fig 4.5 Operation and Metal | 52 |
| Figure 4. 6 Seeking medical assistance for treatment of the running injuries..... | 53 |
| Figure 4. 6 Athletes' running Surface..... | 60 |
| Figure 4.7 Athletes' Using Orthotics | 62 |
| Figure 4. 8 Length of time of using orthotics..... | 63 |



ABBREVIATIONS AND ACRONYMS

| | |
|------|---|
| AAOS | American Academy of Orthopaedic Surgeons |
| AK | Athletics Kenya |
| BMI | Body Mass Index |
| IAAF | International Amateur Athletics Federation |
| IOC | International Olympic Committee |
| IREC | Institutional Research and Ethics Committee |
| ITB | Iliotibial Band |
| ITBS | Iliotibial Band Syndrome |
| PFPS | Patellofemoral Pain Syndrome |
| ROM | Range of Motion |
| SPSS | Statistical Package for Social Sciences |
| USA | United States of America |
| UWC | University of the Western Cape |
| LLOI | Lower legs overuse injuries (LLOI) |



DEFINITION OF TERMS

Marathon running: Defined as a long-distance running event with an official distance of 42.195 kilometres (26.219 miles, or 26 miles 385 yards), usually run as a road race (Bahr, 2009)

Running related injury: Any musculoskeletal pain in the lower extremity or back causing a restriction of running for at least one week, that is, three scheduled consecutive training sessions (Buist et al., 2009). According to Rebella et al., (2008) the injury has been based on time loss from participation, exceeding one day, missing practice more than two sessions or one week.

Initial injury: Any first injury that a runner sustains during the running season either during training or competition. (Rauh, 2005).

Subsequent injury: Defined as an injury to the same or different body part, which occurred after the runner's initial injury (Rauh, 2005).

Athletic exposure: Any practice or competition where a runner is at risk of sustaining an injury. (Rauh et al., 2000).

Prevalence: In epidemiology, it is defined as the ratio (for a given time period) of the number of occurrences of a disease or event to the number of units at risk in the population (Rauh et al., 2000).

Leg length: The distance from the anterior superior iliac spine to the medial malleolus. (Johnston et al, 2003).

Risk factor: A risk factor is defined as a variable that, while not necessarily proven to be causative, is considered to be associated with the onset of injury (Ryan et al, 2000).



UNIVERSITY *of the*
WESTERN CAPE

CHAPTER ONE

INTRODUCTION

1.1 Introduction of the chapter

This chapter describes the background of the study by giving the general, international and national aspects of marathon running, and the factors associated with injuries among marathon runners. The chapter also includes the problem statement, the main aim of the study, the objectives guiding the study and its significance.

1.2 Background of the study

Athletics is a popular sport the world over (Jacobsson, 2012). A wide variety of sports events are under the umbrella of athletics, this including; walking, track and field events, marathons and long distance running. Participants of athletic events have been prone to experience accidents and injury (Bennel & Crossley, 2006). Data from previous athletic events such as the Olympics, marathons and international championships showed a cumulative injury incidence close to 10% per occasion (Alonso et al., 2010; Junge et al., 2009).

A study conducted by Rebella, Edwards, Greene, Hussein, and Brousseau, (2008) revealed that an occurrence rate of 2.5 to 7.1/1000 injuries among athletes. Van Ghent et al. (2007) did a study in America which revealed that a large percentage of the population participated in running events and that a large number of the runners incurred at least one injury annually, if not more. Marathon running is a race that cover long distances with a standard of 42.195 kilometres. Injuries associated with athletics have the same devastating effect in marathon runners as in other races.

A study by Fredericson and Misra (2007) reported injuries to runners at all levels of experience, with yearly incidence rates as high as 90% in those training for marathons. A different study in Europe determining the occurrence of track related injuries in a city marathon, revealed that 287 out of 4973(58%) had experienced small form of injury during preparation for the race (Maughan and Miller, 2007). A study in Nigeria reported a prevalence of 17.2% injuries in marathon runners (Ogwumike and Adeniyi, 2010).

Kenya is one of the leading nations in the field of athletics in the world. It is especially famous for long distance races where it has produced many world champions. However, even while Kenyan athletes excel in marathons, there is little information on the challenges that these athletes struggle with which range from injuries suffered in training and while competing. The seriousness of the injuries suffered by these athletes have been measured by determining time loss from participation in times of days and sessions as a result of injuries incurred, exceeding one week (Rebella et al., 2008).

The International Olympic Committee (IOC) defines injuries through loss of time by the athlete and their need for medical attention (Junge et al., 2009; Alonso et al., 2011). Athletes suffer injuries through various causes. Injuries they suffer can be traumatic caused by specific events in their athletic careers while there are those injuries that occur as a result of them being unable to take part in their training sessions or competitions known as ‘time-loss’ injuries (Fuller et al 2006, Fuller et al., 2007). Excessive strain of body structures (overuse) is also classified as a cause of injury. A strain injury does not occur as a result of a single identifiable event however it is a result of repeated strain to a body part (Fuller et al., 2006). Strain injuries are defined as gradual developing injuries or injuries occurring as a result of little strain to

the same part over an extended period of time (Bahr, 2009). Strain injuries have been reported to be experienced frequently in long distance races, which require the athletes to train long periods to develop endurance. This process causes them to adapt a routine that can become monotonous overtime (Bahr, 2009). Common risk factors associated with injuries among marathon runners include muscle imbalance, muscle weakness, previous injury, sport specific training (both preseason and during season), incomplete rehabilitation, poor running technique, poor running surface, footwear and suddenly increased mileage (Puluska, 2005; Maffey, & Emery, (2007).

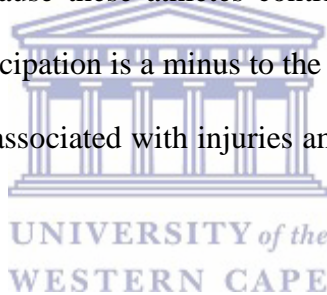
The management of injuries in athletes is important because it enables the athletes to deal with their injuries effectively giving them the chance to go back to the track and continue with their athletic endeavours that earn them their livelihoods. However, managing these injuries faces many challenges since the field lacks a prescribed way of providing treatment (Jacobsson, 2012). Jacobsson (2012) posits that the address and treatment of injuries incurred by athletes lacks uniformity in that other nations injured athletes are nursed in health facilities (Reid, Nelson, Roberts & McKenzie, 2012), in certain clubs, athletes are treated in high level competitions (Alonso et al., 2009 & Alonso et al., 2011) while others are treated in school settings.

According to a report by Alonso et al., (2009) on international championship, treatment should be provided for all athletes who take part in the championship. Van Michelen et al., (2012) made recommendations for the adaptation and utilization of a set procedure aimed at preventing injury in sports. The model contained four steps, which included to determine the extent of the problem in the sport investigated; determine the causes; initiate preventative measures; and assess their effectiveness. Ice therapy (Cryotherapy) is one of the simplest therapeutic modalities in the

management and treatment of injuries incurred in soft tissue injuries ranging from sprains, dislocations and contusions (Bleakley, McDonough & MacAuley, 2009).

On the developing countries in Sub-Saharan Africa is Kenya. It is faced with the problems that plague third world nations, which include scarce resources to meet needs of its populace. Kenya is credited for producing a majority of long distance athletics champions. However, most of these athletes are not able to compete for extended periods of time due to the injuries they sustain.

The excessive high rate at which the country losses its athletes negatively affects not only the athletes themselves but also the economy of the country and their communities. This is because these athletes contribute greatly to the economy and their exit from active participation is a minus to the economy. It is therefore important to understand the factors associated with injuries among marathon runners in Eldoret, Kenya.



1.3 Problem statement

Marathon running is an affordable and convenient form of physical activity that is enjoyed by millions of people across the world. However, running as a form of physical activity is also associated with an increased risk of injury. Intrinsic and extrinsic factors have been found to contribute to marathon injuries in other parts of the world (Van Mechelen, 2007). In Kenya, the records department of the main referral hospital in the North Rift Region, Moi Teaching and Referral Hospital has reported an increase in the number of athletes seeking medical attention at the Physiotherapy Department from January to December 2011. The number increased from 66 in the year 2011 to 140 in the same period in 2013. To reduce this possibility of sustaining an injury, it is essential to identify the factors associated with running

injuries in order to manage and prevent these injuries from occurring. However, there is insufficient information concerning the factors associated with injuries among marathon runners in Eldoret. Therefore, this study was conducted in order to learn more about the factors associated with injuries to marathon runners.

1.4 Research question

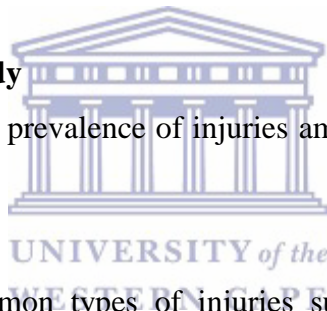
What are the factors associated with injuries among marathon runners in Eldoret, Kenya?

1.5 Aim of the study

To investigate the factors associated with injuries among marathon runners in Eldoret, Kenya.

1.6 Objectives of the study

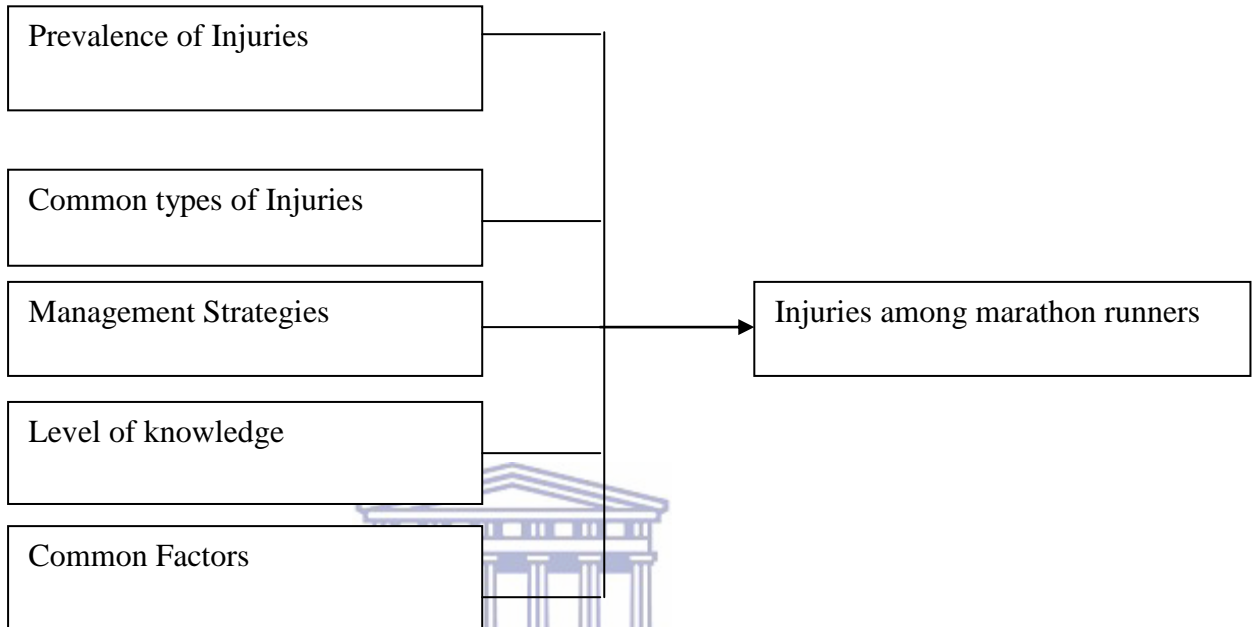
- 1) To determine the prevalence of injuries among marathon runners in Eldoret, Kenya.
- 2) To describe common types of injuries sustained by marathon runners in Eldoret, Kenya.
- 3) To determine the management strategies of injuries among marathon runners in Eldoret, Kenya.
- 4) To describe the knowledge of injury prevention among marathon runners in Eldoret, Kenya.
- 5) To determine the common factors associated with injuries in marathon runners in Eldoret, Kenya



1.6.1 Conceptual Framework

Independent Variable

Dependent Variable



1.7 Significance of the study

The results of this study may facilitate an increase in the awareness of the factors associated with injuries among runners and service providers. This study will provide information on identifying the possible risk factors that cause injury and management strategies for new and recurrent injuries. In addition, the results may assist in modifying training programmes, and developing prevention strategies that are relevant for marathon runners by coaches. Furthermore, coaches may use the information provided here to develop appropriate training and prevention programmes for runners who are at risk of sustaining injuries. This knowledge will enable runners to act proactively in the management and prevention of injuries by seeking the necessary medical attention before the injury worsens. When the runner is independent and free from injury, they will be able to train and compete at a higher

performance level and gain the benefit of the positive health effect that running offers without sustaining injury (Hreljac et al., 2006).

Medical personnel will be able to utilize the information provided by this study to develop a screening process for identifying runners who are at a higher risk of developing running injuries. This will hopefully lead to reduced incidence of injuries, increase in performance, reduced cost of treatment and rehabilitation, reduced absenteeism of runners from training and competitions, and return to their previous levels of performance.

The results of this study will be the foundation for the development and implementation of an injury prevention programme for marathon runners in Kenya. These results may determine the prevalence of injuries, common types, management strategies, knowledge of injury prevention and common factors associated with injuries in marathon runners in Eldoret, Kenya. The community also may benefit from this study through improved understanding of the various factors resulting in running injuries among marathon runners. These runners play an important role in creating employment for their neighbours in the projects they develop when they win major marathons, and by raising funds in aid of development projects in the community.

1.9 Outline of the thesis

Chapter one describes the background of the study by giving the general, international and national aspects of marathon running, as well as the factors associated with injuries among marathon runners. The chapter also includes the problem statement, the aim of the study, the objectives guiding the study and the significance of the study. Chapter two covers a review of the literature, describing marathon running as a sport, and form of physical activity, participation in marathon events, the incidence

and prevalence of running injuries, common types of injuries in marathon runners, the location of injuries, and the risk factors associated with injuries among marathon runners. The chapter concludes with information on the knowledge of injury prevention programmes, and physiotherapy interventions that have been used in other studies.

Chapter three describes the methods used in this study, including a description of the research setting, the research design, and the population and sampling. In addition, the research instruments and the translation, reliability and validity aspects are described along with the pilot study, as well as the procedure, data analysis, and ethics considerations. Chapter four presents the findings of the study in the form of frequencies, means, percentages and standard deviations, where applicable. The results established the prevalence of injuries, management strategies employed, common types of injuries, knowledge of injury prevention and the common factors associated with injuries among the participants. In chapter five the results of the collected data are discussed, compared with other studies and suggestions on possible interventions to mitigate the severity of the injuries. The chapter also provides a summary of the results of the study, the conclusion, discussion of the findings limitations encountered while conducting the study and gives recommendation for future scholars interested in looking at sports injuries

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction of the chapter

This chapter presents a description of marathon running as a sport, and form of physical activity, participation in marathon events, the incidence and prevalence of running injuries, common types of injuries in marathon runners, the location of injuries, and the risk factors associated with injury among marathon runners. The chapter concludes with information on the knowledge of injury prevention programmes, and physiotherapy intervention used in other studies and theoretical framework.

2.2 Marathon running as a sports event

Marathon running is defined as covering a road race of 42.195 km. This has been in existence and has been considered as part and parcel of the Olympics since 1896. This was established in the wake of the New York City Marathon that was organized in the year 1976, the sport exploded globally. In the last four decades, numerous athletes have taken part in the various marathons organized in the world including those held in Tokyo, Boston, London, Berlin, Chicago and New York, which have seen tens of thousands complete in each event. These long races, which are referred to as the “World Marathon Majors Series”, clearly show how the athletic event has evolved over time from the initial Olympic completions to a fitness phenomenon that networks the world over (Burfoot 2007).

Marathon running is one of the most popular leisure sports activities. Despite the beneficial health effects, there are also negative side effects should that also should be recognized that include the risk of injury. In the early stages of marathon running, women were not allowed to participate because of fear of developing injuries. The

first woman to take part and complete a marathon race was Violet Piercy in the year 1926 in London but track record time was not put in the records. The first woman to officially take part in the Boston marathon was Kathrine Switzer in 1967. Today, women make up about 40 % of all participants in the New York City Marathon. Numerous women have taken part in marathons narrowing the gender gap with their male counterparts who take part in these races. For example, the gender gap in 2003 marathon was approximately 8 %, this was lower than the differences in many other running distances (Burfoot, 2007). The women have also improved their performance tremendously and more quickly than the male folk. It is estimated that women marathoners have the potential to seal the gap between them and the men and even overtake them (Olson et al. 2011).

2.2.1 Marathon running as a form of physical activity

The road races are considered as a form of physical activity and have been widely researched on across the world. The long distance race is practiced by different people for various reasons ranging from competitive reasons and health related reasons. Despite the fact that running is a common mode of physical exercise, it can be quite monotonous and routine oriented which can cause stress in the body. This can cause different kinds of strain such as Achilles tendinopathies, plantar fasciitis, and iliotibial band syndrome (ITBS). It is important to have a grasp on the correct running technique since athletic-related injuries are common. This includes the entire kinetic chain, which involves the interaction of an individual's musculature, skeletal, and nervous systems.

Athletics is a form of physical activity that improves cardio-respiratory function, health and wellbeing (Van Gent et al., 2007). The popularity of running increases levels of physical activity in people of all ages. This is of great value since physical

dormancy is a major factor in causing for many chronic diseases of lifestyle, leading to decreased lifespan, loss of physical function, and obesity issues (Ryan et al., 2006). Running is an affordable and convenient sport and has considerable benefits but as already noted, it is also a major cause of injuries in the lower limbs (Gerlach et al., 2008; Butler et al., 2006). Therefore, proper running techniques are important not only for the sake of minimizing risks of injury but also providing an understanding for the best gear for running such as footwear. This enables the individual to improve their individual technique. This also enables the individuals to understand the operations of their musculature, nervous and skeletal systems coordination and how these affects the kinetic chain and therefore give an understanding of the most energy-efficient and least injury-prone running technique.

2.2.2 Participating in marathon running events

The number of individuals participating in athletic events has been increasing steadily over the past decades. According to many marathons, qualifying for a major race like the Boston Marathon equals a great accomplishment. For a person to take part in such a race, they must be able to meet specific qualifications in terms of time. These races draw participants from various occupations; others are for recreational purposes but also seasoned competitors from the world over. Between the period of 2007 and 2011, the number of participants in the Boston Marathon has been on the rise and even doubled, rising to over 26,000 entrants (History of the Marathon (2012)). The Chicago Marathon is also another race that has experienced a major increase in the number of its participants (Race History (2011)) and the New York City Marathon.

In addition, Lovelace (2011) reported that the Nationwide Children's Hospital Columbus Marathon has also experienced tremendous growth since 2006. Parkar, (2012) asserts that the Indianapolis Monumental Marathon is also another race that

has seen has experienced exponential growth over the years as seen by the number of registrations received since it began in 2008. The statistics reveal that participation in marathons has been increasing significantly in the past several years. The Kass Fm International marathon is one of the races run in Eldoret, Kenya that has reported an increase in registration for the event. The race usually takes place in the month of November every year and it attracts a large turnout with more than 7,000 entrants and well over 100,000 spectators lining up the course from Kapsabet to Eldoret (IAAF, 2015). This event has attracted local and international runners because the winners are awarded large sums of money, get attracted to financially strong managers and young runners can know the time they can run in a full marathon.

2.3 Prevalence and incidence of running injuries

Fredericson and Misra (2007) found a yearly incidence of injury to be as high as 90% in those training for marathons in the United States. Van Middelkoop et al. (2007) found a lower incidence of injury (18.2%) among the 647 participants of the Rotterdam marathon and reported a higher prevalence rate of injury (54.8%) in the 12 months before the marathon took place. The cases of injuries were 3.2 injuries for every 1000 running hours in exposure time. In a study by Brukner & Khan (2013), distance-running injuries were found to contribute 12.3% of all cases of injuries presenting to a Sports Clinic in Melbourne, Australia yearly.

In Africa, the prevalence of injuries on marathon runners has been on the increase. In Nigeria, a study done by Ogwumike and Adeniyi (2010) revealed that 17.2% of the runners reported injuries with significant occurrence in first-time marathon runners. Unfortunately, very little literature on the incidence of running injuries in other African countries is available. In Kenya, majority of the marathon runners get injuries because of the bad roads. This contributes to injury prevalence (IAAF, 2015) and

raises a need for future studies to determine the prevalence and incidence of injury in marathon runners especially in Eldoret where runners drop in large numbers due to injuries for prevention strategies to be implemented.

2.4 Common types of injuries in marathon runners

There are different types of overuse injuries that are prevalent in runners. According to the American Academy of Orthopaedic Surgeons (AAOS, 2013) the most serious injuries found in runners was tendonitis (22%), stress fractures (13%), muscle strains (9%), joint sprains (8%) and ligament stretches or tears (7%). Similar Anderson et al. (2011) found that muscle strains and tendonitis were the most common type of injury reported by runners. Taunton et al., (2012) found the following during a retrospective study of 2012 participants from 2008-2010. Patellofemoral pain syndrome (PFPS) was the most prevalent injury reported. Iliotibial band syndrome (ITBS), plantar fasciitis, menisci injuries, tibial stress syndrome, Achilles tendinopathies, patellar tendinopathies, gluteus medius injuries, tibial stress fractures and spinal injuries.

Prior studies reveal that the lower extremities are prone to experience athletic related injuries. Studies reveal that generally mostly affected area of injury among the athletes in the United States was the knee (Fredericson & Misra 2007). This is similar to the results of a study by Maughan and Miller (2007) in Europe that reported the same. According to a study by Ogwumike and Adeniyi (2010) in Nigeria, the thigh is the most common area of injury among athletes (76.4%) and pain due to sprain of the groin ligaments (9.2%) was the least common injury.

2.5 Location of injuries

According to a prospective study conducted by Taunton et al., (2013) studying 17 training clinics and 844 runners, it was found across all the clinics that the knee was the most prevalent area of injury scooping 33.7% of 249 injuries in total, with 36%

for men and 32% for women. The study also included the following areas as common injury areas among athletes; the shin (15.2%), foot (13.2%), calf and Achilles tendon (10%), ankle (10.4%), hip and pelvis 15 (9.2%), lower back (5.6%), hamstring (2.4%) and thigh (0.8%). Fifty percent of the injured runners indicated that they had sustained similar injuries in the past, showing that the past can forestall injuries that the athletes are likely to experience in the future.

A study conducted by American Academy of Orthopaedic Surgeons (AAOS, 2013) of 853 runners confirmed that the knee is the most prevalent area of injury, as it was reported by 28% of the runners. The foot, ankle, hip and lower back were reported in this order as other common sites of injury. Similarly, a study done in South Africa by Puckree et al., (2007) found that knee injuries accounted for 51% of injuries among 88 runners. Other studies done by Fields (2011) and Chang (2012) reported affected sites of musculoskeletal running injury are knee (25%), lower leg (20%), foot (16%), ankle (15%), upper leg (10%), hip and pelvis (7%), and lower back (7%). Recent reports show that the number one knee problem in runners is Iliotibial band syndrome (ITBS) (McKean, 2006).

A study by Rauh et al. (2007) found a different outcome, where 148 injured runners (out of 393) reported that the shin was the most prevalent area of injury (42%), with the knee (23%) behind it, hip (12%) and ankle (10%) for females, (30%) in males then shin (22%) and in the rear the ankle (13%). However, van Middelkoop et al. (2007) found the calf to be the most prevalent area of injury during the Rotterdam marathon (33.9%), with the second most common site being the knee (27%), followed by the thigh (17.8%). Buist et al., (2010) also found that the lower leg (calf and shin) was the most common site of injury in women (35.7%) and the knee in men (38.4%).

2.6 Risk factors associated with injuries

The tremendous growth in the participation of physical activities and sports has been coupled with increase in the incidences of sports related injuries (Parkkari et al, 2011). Van Mechelen (2007) reported that the aetiological factors associated with running injuries include previous injury, lack of running experience, running to compete, and excessive weekly running distance. Other factors are lack of warm-up, stretching and cool down exercises, instability in the running pattern, and running on one side of the road. Bahr and Krosshaug (2005) gave examples of extrinsic factors that include exposure, environment, and protective equipment and intrinsic factors such as age, gender, body composition, health, physical fitness, anatomy abnormalities, motor abilities, sport specific skills, and psychological profile of the athlete.

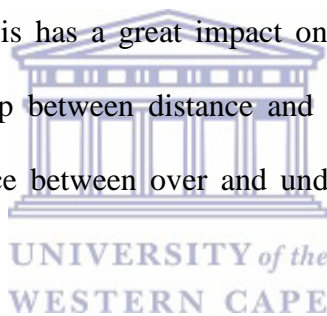


UNIVERSITY of the
WESTERN CAPE

External contributors such as the methods used in training, the area of training and the training gear have also been credited for being risk factors for injuries. However, internal personal related factors such as the individual muscle strength, flexibility and mal-alignment of the leg have been hypothesized to be the likely factors and were widely studied in the year 2010, which could further explain as possible explanations for injuries among athletes (Taunton et al., 2013). According to Cameron, (2010) it is important to identify the modifiable risk factors, since they are under the control of the runner. The three most commonly cited independent factors for injury are (a) rapid increase in weekly mileage; (b) previous injuries; and (c) the level of athletes' experience (Marti et al. 2008; Fredericson & Misra 2007).

The distance covered in the race is also one of the major risk factors associated with injuries. Incurring sudden increases in mileage, or sudden changes in training pattern in terms of volume or intensity (Van Gent et al., 2007; Warren & Jones, 2007 Walter

et al., 2009; Macera et al., 2011; Taunton et al., 2013) can also lead to injuries. According to Nielsen et al. (2012), marathoners should have a continual incremental volume of their weekly exercise before the marathon. They should be encouraged to run a minimum of 30 km/week before a marathon. This is essential because it reduces their probability risk of injury (Fredericson & Misra 2007; Rasmussen et al., 2013). A study by Rasmussen et al. (2013) found no difference in terms of injuries among marathoners with 30-60 km/week and those with more than 60 km/week, Macera et al. (2009) and Walter et al. (2009) reported that athlete's with a running volume of greater than 64 km/week had a greater risk factor for sustaining a running-related injury. Strong evidence provided that purported progressively increasing the training distance on a weekly basis has a great impact on the development of knee injury. However, this relationship between distance and injury is not simple and perhaps maintaining a fine balance between over and under exercise could be the solution (Olson et al. 2011).



Other predictors of injuries such as previous injuries could help illuminate this further (Walter et al. 2009; Taunton et al. 2013). Other questions that are posed include whether those with previous musculoskeletal problems were at a higher risk of re-injury (Macera et al. 2009). Ensuring complete recovery of injured athletes before putting pressure on the injured parts is essential in preventing re-injury (Macera et al. 2009). The experience of the athletes is more attuned to their bodies, is able to detect any malfunction, and therefore can have a decrease in the number of injuries experienced. They are also more likely to develop musculoskeletal adaptations to running and experience has given them a better mastery of training techniques and lowering their injury rate during training. Pertaining recovery time after an injury, study by Satterthwaite et al. (2009) showed that injuries of experienced runners heal

slower. However Van Middelkoop et al. (2007) reported that experienced runners of more than 10 years were more likely to recover faster.

2.6.1 Extrinsic factors

Extrinsic factors that can increase the incidence of stress fractures include an increase in weekly mileage, running shoes that are older than 6 months and training on hilly terrain (Macera et al., 1989).

Training methods

According to Van Gent *et al.* (2007), the main factors contributing to running related injuries in the lower parts of the limbs is previous injury and an increase in total weekly mileage. Other factors include changes in running intensity and running equipment (Magrum & Wilder, 2010). The runner's body systems cannot adapt appropriately or quick enough to the new stresses being placed on them when changes to the environment occur quickly. Consequently, injury arises. A training programme should expose tissue to appropriately dosed and graduated stress interspersed with adequate periods of rest (usually 24 to 48 hours). The timing of recovery is just as important as the loading of exercise (Clement, 1982). A suitable recovery prevents running injuries, which are the result of overloading a tissue's capacity to adapt.

Running distance

Studies conducted by Brill and Macera (2009) and Van Mechelen (2012) revealed that mileage is considered as one of the major causes to injury. The studies assert that it was hard to accurately determine the risk of injury to a population. This was despite having other risk factors, the only thing that can be done is by taking into account the exposure period. These studies recommended that investigations should be made into the risk of injury for an athletic population and take into consideration a method of recording exposure time.

Intensity

The intensity of training is associated with the pace of running or their speed. Studies by Derrick (2010) and Mercer (2012) indicated that an increase in the pace of running pace is associated with generating greater pressure forces within the musculoskeletal structures involved in running, creating a possibility of experiencing an injury. Johnston et al. (2013) revealed that a careful increase in training intensity of less than 10% per week, may decrease the risk of injury. However, Buist et al. (2008) using a randomized controlled trial over a 13 week period, did not find any difference in the incidence of running injuries among a modified training program that applied this 10% rule, and a normal training program. Further research is needed for conclusive results regarding training intensity and its relationship to injury as a risk factor.

Frequency

Training frequency refers to the number of days the runner trains per week (Taunton et al., 2013). Yeung and Yeung (2011) suggested that injuries were more likely to occur among athletes who trained for more than three days per week. Van Gent (2007) also determined that runners who trained for more than two days per week were more likely to incur injuries. However, in a study by Taunton et al. (2013) it was established that women who do training through a fixed program one a week and were part of group participation had an increased likelihood of injury. Based on these results, the most optimal frequency of training that would keep the athlete competitive and reduce the risk of injury was found to be 2-3 days per week.

Duration

The duration in training refers to the running time in minutes on a weekly basis the runner has to meet (Buist et al., 2008). According to a study by Yeung and Yeung (2011) on revising the training schedule as an intervening mechanism to prevent cases of lower limb running injuries revealed that athletes who trained for more than 30 minutes a day were at a greater risk of experiencing injuries compared to runners who trained for only 15-30 minutes a day. Therefore, it was of paramount significance that runners should only run for 15-30 minutes a day thereby reducing the incidence rate of injury.

Distance

Mileage or distance in running refers to the number of kilometres (or miles) that the runner runs on a daily basis. According to a randomized controlled trial conducted by Pollock et al. (1976) an increase in weekly running distance was related to running injuries. Brill (2005) agreed with this as running distance is a consistent factor in population-based research among recreational runners and is closely associated with an increased risk of injury. Other scholars (Macera, 2009; Walter, 2009) found that weekly increase in distance beyond 64km was a major cause of increase in injury among the male.

Training surfaces

Studies that have been conducted revealed that training surface is a risk factor for injury in marathon runners. According to Macera et al. (1989), long distance runners are likely to experience injuries when they run on sidewalks. Another study by Clement, (1981) showed that harder training surfaces were related to injuries such as Patellofemoral syndrome and tibial stress syndrome. On the other hand, the study also

revealed that running on loose surfaces was linked to meniscus injuries. Further training or running up and down hilly regions was related to the development of patellar tendinopathies and iliotibial band friction syndrome (Taunton et al., 2003).

Evidence from clinical examinations reveals that injuries are likely to occur when new surfaces are rapidly introduced. However, mixing the training ground has been brought forth as a good mechanism to decrease the risk of injuries in two ways. Firstly, it allows the correction of strength imbalances by conditioning the key muscles that generally are not affected by running, and secondly by adding diversifying training through the adoption of a non-weight bearing activity to make up for weekly mileage such as cycling or swimming. This second step aims to reduce the impact pressure that contributes to injury. The scholars also found that terrain used in running did not influence the number of injuries.

A study by James et al. (2009) found that there was no association between running on hard surfaces and increased rate of risk of injury when the weekly distance was controlled. The apparent lack of effect of the training surface may stem from the difficulty of adequately quantifying the time and intensity of running spent on each of the running surfaces.

Running experience

Runners with experience were found to have a decreased probability of injuries. This was attributed to the fact that these seasoned athletes were able to stop training or competition when they feel any symptom that can lead to injury developing (Taunton et al. 2003) thereby avoiding cases of overuse injuries where possible. According to a study by Satterthwaite et al. (1999) on recovery time after a running injury, the study found that the injuries of experienced runners heal slower. Contrary to this Van

Middelkoop et al. (2007) asserted that experienced runners of more than 10 years were more likely to recover faster. Experience was found to be one of the four outlined factors contributing to injury (Van Mechelen, 2012)

Footwear

Prior sentiments held by the sport shoe and orthotics community was that shoes and orthotics play the role of aligning the skeleton. However, studies conducted in the field do not support this view (Nigg, 2010). The skeletal structure of an individual athlete works on minimizing the adjustment made while running such as heel-toe running. The changes experienced if indeed there are any are generally subject specific, small, and often inconsistent. The muscle activities are used to ensure that the skeleton stays aligned (Nigg et al., 2015). Therefore if this hypothesis was correct, a good running shoe that had the potential of enhancing running performance would have to be a shoe that allows or supports the skeleton as it moves when the athlete is running. A good shoe therefore would hence wise demand less muscle activity for the task of movement (Nigg et al., 2015).

Strength and flexibility

The strength and flexibility of muscle of the quadriceps, gastrocnemius and soleus group is associated with injury (Clement, 1981). Johansson (1992) asserted that muscle tiredness reduces the athletes' ability to resist impact which can result in injury. A review by Yeung and Yeung (2001) of two studies conducted by Andrish, Bergfeld and Walheim (1974) which involved runners stretching shortly before and after the racing session together with three more researches where runners stretched immediately before running (Pope, Herbert & Kirwan (1998) revealed that risk was only reduced when five sets of stretches at a time before and after training were held

for 30 seconds. This was however, only indicated in one of the studies (Pope, Herbert & Kirwan (1998).

The other stretching protocols (one to three sets held for 10 to 30 seconds) did not affect the risk of injury (Andrish, Bergfeld & Walheim, (1974). Shrier (1999) reviewed a number of controlled studies which involved stretching before exercise. These studies however revealed that A stretching before running did not prevent injury (Macera, Pate, Powell, Jackson, Kendrick & Craven, (1989). These studies revealed that there was a non- significant trend toward a higher rate of injury in those who did stretch. Science offered the following explanations in relation to stretching and skeletal muscle strain; it gives a better compliance by reducing the amount of energy that can be absorbed by muscles.; the different sarcomere lengths enable injuries during eccentric muscle contractions even though all sarcomeres are not stretched beyond their normal length; mild stretching has the potential of causing damage at the cellular level while stretching masks muscle pain (Shrier, 1999). The authors suggested that athletes should diversify and include both strengthening and stretching training in order to prevent injury. To stimulate muscle action during running strengthening exercises such as the eccentric strength training (contraction of a lengthening muscle) should be adopted (Fyfe & Stanish, (1992).

Age of the runner

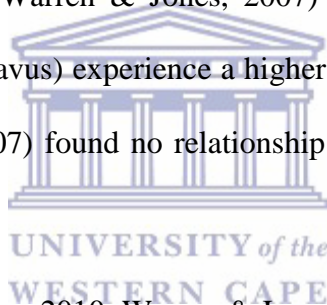
The running category of masters begins at the age of 40 and it is at this age that studies have revealed the first decline in endurance peak endurance (Lepers et al., 2010; Sultana et al., 2008; Tanaka & Seals, 2008). Masters runners should have a suitable training program that is adapted from one they used when they were under 40 years in order to avoid injuries. As they age, runners develop age-related changes in the muscle tendon units (McKean et al., 2006). Macera et al. (2009) concluded the

older the athlete got there was a decrease in the occurrence of running related injuries, however the study also concluded that only those runners with no injuries could keep running with age successfully.

2.6.2 Intrinsic Factors

Anthropometry

Athletes possess different bodily structures and statures. They differ in terms of height and stoutness (Kleindienst *et al.*, 2013). Data from this field show that on average, an athlete is 176.5 cm tall and has a body mass of 65.8 kg, with a greater range these calculation (152–197 cm and 40– 100 kg) (Kleindienst *et al.*, 2013). Scholars, (McKenzie *et al.*, 2005; Warren & Jones, 2007) reported that runners with high longitudinal arches (pes cavus) experience a higher probability of injury on the track. However, Wen *et al.* (2007) found no relationship between arch height and running injuries.



Studies like (James & Jones, 2010; Warren & Jones, 2007) revealed that athletes with a greater range of motion in plantar flexion experience more injuries compared to runners with less mobility in this direction. According to Van Mechelen *et al.* (2013) there was no difference in ankle range of motion between runners with lower extremity injuries and those without. He suggested that, military recruits who sustained stress fractures during training were likely to have less ankle flexibility compared to those without. Anatomical variables such as tibia varum, rearfoot varus, and leg length discrepancies had the likelihood of being grouped together as lower extremity alignment abnormalities. According to the view of different authors, these factors, and other problems related to alignment of the body are associated with overuse running (Lysholm & Wiklander, 2007; Stanish, 2009). However, others did

not find these associations (Wen et al. 2007; Walter et al. 2009). As a result of the different conflicting reports one can indeed conclude that the mechanism through which an injury occurs while running are very individualistic. This therefore necessitates further research in this field to clearly identify the different runners and their specific body related risk factors

Fatigue

Fatigue can be theorized as a primary causative agent for injuries related to running (Willems et al., 2012). However, there have been a number of various factors that have been seem to affect fatigue- induced injuries. Using a foot scan, Willems et al., (2012) analysed the force distribution underneath the feet, before and after a 20 km run. The findings of the study revealed that there was an increase in the loading under the whole and medial arch. These findings imply that as fatigue sets in, the natural landing of the foot is reduced which in turn leads to increased likelihood of stress fractures (Weist et al., 2004).

Biomechanical variables.

More recent evidence on biomechanical correlations with the incidence of stress fractures in runners reveals that excessive hip adduction and rear-foot eversion can be a contributing factor to tibial stress fractures (Pohl et al., 2008).

Hesar et al. (2009) conducted a prospective study based on measurement of plantar pressure while running barefoot in order to determine the internal risk factors associated with lower leg overuse injuries (LLOI). They found that that there was more laterally directed force distribution in the initial contact phase, together with increased laterally directed force displacement in the forefoot contact phase, and a greater pressure and loading beneath the lateral border of the foot could be attributed to pace-related internal risk factors forestalling the development of LLOI. This

suggests that a runner landing in a more supinated position has a greater potential risk for developing a LLOI. It is pertinent to note that Hesar et al. (2009) compared barefoot runners with shod runners so it is unclear if the shoes could have been an extrinsic factor influencing gait pattern abnormalities. Other anatomical considerations contributing to stress fractures include low bone mineral density, leg length discrepancy, and a Q angle that is greater than 15 30 degrees (Magness et al., 2011; McCormick et al., 2012). Furthermore, asymmetrical lateral differences as well as strength and flexibility asymmetries may have implications for increased injury risk in runners. Plisky et al. (2006) demonstrated that high school basketball players with asymmetrical right/left differences in dynamic postural control have a 2.5 times probability of sustaining a lower extremity injury. More prospective studies including one using a sample population of endurance runners need to be conducted in order to draw more definitive conclusions on the role of asymmetry in LLO.

Studies by Marti et al. (2008) and Macera et al. (2009) on history of previous injury indicated that a prior injuries are significant predictors of re-injury among athletes. The data indicate that 50% of the injured athletes indicated that they had experienced a similar injury in the same area of their body. Macera (2009) states that it is not clear whether this high rate of re-injury suggests incomplete healing of the original injury, a personal propensity for re-injury, or an uncorrected biomechanical problem. This therefore posed a question on the importance of full recovery of the athletes before resuming training or competition (Marti et al., 1988; Macera et al., 1991).

2.7 Injury prevention strategies

Several authors have discussed a number of preventive strategies that include warm up, stretching, regular cool down, correction of poor running style, adequate rehabilitation with sufficient recovery time, proprioceptive training, good training or

competition surface, training using properly fitted footwear, sports first aid, sports massage, ankle bracing and taping, and adherence to the rules (Junge & Dvorac, 2009).

2.8 Knowledge of injury prevention among marathon runners

Knowledge or information of how intrinsic and extrinsic factors cause running related injuries and the techniques that can be employed to prevent them is crucial for runners as it enables them to avoid these risks. According to Larson et al. (2006), individual (intrinsic) causes are always factors as a result of sports related injuries and can be prevented by training the athletes in proper techniques. These factors include joint instability, muscle tightness, inadequate rehabilitation, or a lack of proper training. Athletes are expected to maintain high fitness levels, observe the rules of the sport, wearing safety equipment when required, and to seek assistance immediately in the case of injury. The authors concluded that if athletes understand and practice safety and preventive measures, the number of injuries would be reduced.

2.9 Physiotherapy intervention

There are different approaches to management including conservative (resting the part) and surgical (minor repairs to major operations) approaches. Physiotherapy intervention is the treatment of choice that is started pre- and post-conservative or surgical management (Brannigan & McEntee, 2010). The physiotherapist advises the injured runner on how to restore optimal function of the affected muscles and educates them on secondary preventive measures, which may include manual mobilization techniques (Konin & Nofsinger, 2007). However, primary intervention is regarded as the best way of reducing the risk of recurring injuries. During the rehabilitation phase, the physiotherapist provides health education programs that include injury prevention measures such as warm up, cool down, and stretching

techniques (Van Mechelen (2007). Therefore, the physiotherapist must use sound principles of healing, exercise physiology, manual therapy and rehabilitation, as well as knowledge of the specific stresses and strains that the injured area was exposed to within a given sport, in order to provide a successful outcome for the athlete (Quinn, 32 2010). Despite the fact that these methods are common conservative treatments, opting for professionally provided assistance ranging from physiotherapy, is encouraged before an athlete attempts any personal rehabilitation initiatives.

2.10: Criticism of literature review

On prevalence of injuries, researches have been done on the percentage and occurrences of the injury but the causes of injuries and how to prevent them has not been done. In Kenya for example, majority of the marathon runners get injuries because of the bad roads. This contributes to injury prevalence (IAAF, 2015) and raises a need for future studies to determine the prevalence and incidence of injuries, and implementation of injury prevention strategies.

Studies reveal that the mostly affected area of injury among the athletes in the United States was the knee (Fredericson & Misra 2007). But Taunton et al., (2012) found the following during a retrospective study of 2012. That Patellofemoral pain syndrome (PFPS) was the most prevalent injury reported. Iliotibial band syndrome (ITBS), plantar fasciitis, menisci injuries, tibial stress syndrome, Achilles tendinopathies, patellar tendinopathies, gluteus medius injuries, tibial stress fractures and spinal injuries were also common. Therefore, from these studies it is clear that there are injuries that occur in the body of the athlete and can affect any part of the body depending on the mechanism of the injury.

Many studies show that associated risk factors of injury are external for example; Bahr and Krosshaug (2005) gave examples of extrinsic factors that include exposure,

environment, and protective equipment. Van Mechelen (2007) reported that the aetiological factors associated with running injuries include previous injury, lack of running experience, running to compete, and excessive weekly running distance. Also Taunton et al., (2013) reported that a number of external contributors such as the methods used in training, the area of training and the training gear have been credited for being risk factors for injuries.

However, little internal personal related factors such as the individual muscle strength, flexibility and mal-alignment of the feet have been hypothesized to be the likely factors. From the above study, there is no conclusive information on whether interpersonal related factors may be the main causes of the injuries among the experienced and non-experienced athletes.

Injury prevention measures that include warm up, stretching, regular cool down, correction of poor running style, adequate rehabilitation with sufficient recovery time, proprioceptive training, good training or competition surface, training using properly fitted footwear, sports first aid, sports massage, ankle bracing and taping, and adherence to the rules (Junge & Dvorac, 2009) have been considered to be the primary intervention and is regarded as the best way of reducing the risk of recurring injuries.

However, in situations where the runner has already been injured, small percentage of studies on how to restore optimal function of the affected muscles and education on secondary preventive measures have been done, which include manual mobilization techniques (Konin & Nofsinger, 2007). It is therefore necessary to consider ways of secondary preventive measure for emergencies rather than only concentrating on primary measures.



UNIVERSITY *of the*
WESTERN CAPE

2.11 Theories

FINCH (2006)

Finch (2006) acknowledged that the model proposed by W. van Mechelen et al. (1992) had been valuable in guiding research on sports injury prevention and aligning it with public health approaches to injury prevention outside of sport, but she also identified a major shortcoming of the model. Specifically, it failed to consider challenges in implementing injury-prevention measures in sport settings; in fact, it completely neglected factors contributing to the adoption (or non-adoption) of preventive behavior. To remediate this deficiency, Finch proposed the six-step TRIPP framework, which is short for Translating Research into Injury Prevention Practice.

Translating Research into Injury Prevention Practice (TRIPP)

The first four steps of TRIPP resemble the four steps of the model put forth by W. van Mechelen et al. (1992). Specifically, step one of TRIPP consists of injury surveillance - an ongoing process of monitoring the occurrence of sports injuries in order to establish the extent of the problem and gauge progress towards achieving prevention aims. Step two is identical to the second step of the van Mechelen model - establishing the etiology and mechanisms of injury. Step three involves using a multidisciplinary approach based on theory and research to identify possible solutions to the sport injury problem and develop corresponding preventive interventions. Step four consists of subjecting the preventive measures generated in the third step to evaluation under "ideal conditions" - that is, laboratory or controlled clinical or field settings in which researchers deliver interventions to coaches and athletes who have been convinced and helped to participate through incentives and reminders.

In the fifth and sixth steps of TRIPP, Finch (2006) departs from the model of W. van Mechelen et al. (1992). The purpose of TRIPP step five is to "describe intervention context [in order] to inform implementation strategies. This process involves getting a sense of the real-world sport contexts in which to apply the preventive measures developed in step three and evaluated in step four. Doing so requires gathering information about athletes', coaches', and administrators' knowledge, attitudes, and current behaviors regarding sport safety practices. Ultimately, the critical tasks of step five are to determine how likely the target sport populations are to accept and adopt preventive interventions and to plan for implementation. In step six, based on the information gathered in step five, the preventive measures are implemented and evaluated in naturalistic sport settings under real-world conditions. In addition, whereas step four examined the *efficacy* of interventions, step six assesses their effectiveness. Despite their importance, steps five and six are under-represented in the research literature (Klügl et al., 2010).

2.11 Conclusion

Running is a day-to-day physical activity that is practiced worldwide and for different purposes. Parties engage in running for recreational purposes, others for health related benefits and for professional purposes. In order to reap maximum benefits from running, safeguard against injuries and ensure that running is productive, having a good form is essential. Running is a repetitive process and as a result, there are various injuries that are prone to occur. These include; plantar fasciitis, Achilles tendinopathies, and Iliotibial band syndrome. Although there are a number of treatments available for these injuries, prolonged injuries and re-injuries could adversely affect an individual's running abilities. It is therefore crucial to

provide an understanding of the injuries and how they occur, providing recommendations on how to prevent them while at the same time seeking professional help in order to determine the best treatment plan.



CHAPTER THREE

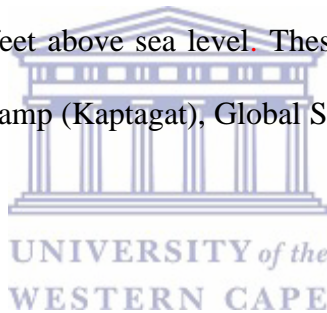
MATERIALS AND METHODS

3.1 Introduction of the chapter

This chapter describes the methods used in this study. A description of the research setting, the research design, the population and sampling is given. In addition, the research instruments, translation, reliability, validity and the pilot study, the procedure, data analysis and the ethical considerations are presented.

3.2 Research setting

The study was conducted in athletics training camps in Eldoret town in Uasin Gishu County in the Republic of Kenya. The training camps are situated in altitudes of between 7000 and 8000 feet above sea level. These camps are Kiplombe, Kimumu, PACE Athletics training camp (Kaptagat), Global Sports camp (Chirchir), One in One Sports camp (Chirchir).



3.3 Research design

This study made use of a cross-sectional, descriptive study design. Data collection was done at one point in time and was suitable for this study because the participants were found in specific camps where the researcher collected data on one day that was scheduled by the camp managers (Polit, Beck & Hungler, 2011). The study design meant that data gathering was economical, ethical, rapid and easy to manage within a limited period. The descriptive component of the study was appropriate in this context because it was clear, specific and had a measurable definition of the disease or condition in question (Crimes & Schulz, 2012). A quantitative research approach was used to collect the data. According to Creswell (2014), this is an approach that tests objective theory by examining the relationship among variables. The variables were measured with instruments, so that the numbered data could be analysed using

statistical procedures. This approach was suitable in this study because it enabled responses to be easily aggregated for analysis, as they were systematic and easily presented in a short space of time.

3.4 Study population and sampling

3.4.1 Study population

The runners were training in five athletic camps that were located in high altitude areas not far from Eldoret town, and consisted of elite and amateur male and female runners. In every camp there were at least forty (40) registered senior (20-39 years) and veteran (40-49 years) marathon runners, as well as those who had recently graduated from half marathon training. More than half of these runners had competed in international marathon races while the rest had demonstrated the potential for future progress. The runners train in the camps for a specified period of time after which they do time trials to enable their coaches to determine their strengths and the type of races they may be competitive in, either at the local or international level. Runners who participated in this study were those who met the inclusion criteria and had signed the consent forms. The marathon and track runners in the camps were under the care of highly qualified camp managers and coaches. The management of the camps transferred about twenty (20) runners from each camp to other camps in Europe or America in the months of April, May, September and October, in order to train and compete in marathon races. A total of 201 runners who had made the inclusion criteria formed the study population.

3.4.2 Study Sample

All registered runners available in the camps who had consented were included in the study (Mugenda & Mugenda, 2013). The study adopted census to select the

participants for the study. There were five camps in total where the study was conducted.

The sample size was 201 respondents according to available records every training camp accommodated on average about forty (40) registered runners. Census was adopted because it helped to maintain a complete sampling unit and to correct the missing and misreported data. However, a small number did not consent and were left out. The table 3.1 depict this.

Table 3. 1 Training Camps in Eldoret

| SNo. | Name | Population | Sample |
|------|--|------------|--------|
| 1. | Kiplombe/Kimumu camp | 45 | 40 |
| 2. | PACE Athletics training camp (Kaptagat) | 39 | 39 |
| 3. | Global Sports camp (Chirchir) | 41 | 41 |
| 4. | One in One Sports camp (Chirchir) | 39 | 39 |
| 5. | Rosa training camp | 46 | 42 |
| | Total | 210 | 201 |

3.4.3 Sampling

The researcher used purposive sampling in this study which was suitable because the study focused on the specific characteristics of the marathon runners. In addition, the target population was small. This approach also has the added benefit of being fast,

inexpensive, relatively easy, and an accessible group of participants (Mugenda & Mugenda, 2013).

3.4.4 Inclusion criteria

The study included all elite and amateur marathon runners (male and female) who were registered with Athletics Kenya (AK) Federation. Each runner had competed in a full marathon race either locally or abroad and had trained in one of the five camps for at least one month. It was necessary that each participant was present in the camp during the period of data collection.

3.4.5 Exclusion criteria

New registered marathon runners who had been in the camp for less than one month and those from outside country since the study was interested in Kenya runners who are registered in Athletics Kenya (AK) Federation .

3.5 data collection instruments

Data was collected using a structured, self-administered questionnaire that had been adopted from Pharaoh and Assuman (2008). This instrument was used in Rwanda on soccer players in 2008 and was selected for study because injuries affecting marathon runners are similar to the injuries affecting soccer players. In addition, little research has been done on injuries affecting marathon runners, especially instruments that were self-administered questionnaires, and so suitable questionnaires were not available. Furthermore, the questionnaire met most of the objectives of this study and only minor adjustments to address the local situation in the training camps. This questionnaire was recommended in this study because it was cost-effective and offered considerable advantages in the way it was constructed and administered. The questionnaires comprised of six sections; section A, gathering socio-demographic information; section B, assessing the prevalence of injuries; section C, assessing the

types of injuries; Section D, assessing management strategies of injuries; section E, assessing the knowledge of injury prevention, and section F, assessing factors associated with injuries among marathon runners.

3.5.1. Translation of instruments

The questionnaire, consent forms and information sheets were in two versions, English and Kiswahili. The Kiswahili version was translated from English by an independent translator and then back to English in order to ensure that the true meaning of the question was not lost during translation. Respondents were advised to choose the questionnaire in their preferred language. However, the Kiswahili version was not preferred because the respondents were all literate and fluent in English language.



3.5.2. Reliability of the instrument

Andersen used the same questionnaire in 2009 in Sweden and reported a Cronbach alpha of 0.81 which was within the normal limit of 0.6-0.80. The same instrument was also used by Pharaoh and Assuman (2008) in soccer players in Rwanda. The researcher used the relevant questions for marathon runners and made minor modifications based on the research objectives and determined the reliability of the instrument through a piloting phase. After modification, the reliability of the instrument was tested through piloting and the Cronbach alpha of 0.82 was attained hence the instrument was considered reliable enough for the study.

3.5.3 Validity of the instrument

The supervisor and senior Kenyan physiotherapists in the field of sports were asked to comment on the ability of the instrument to achieve the intended objectives. The validity of the instrument was further improved through piloting.

3.5.3.1 Pilot study

A pilot study was conducted in preparation for the main study in order to test the research instrument (Polit, Beck, & Hungler, 2011). A sample of 15 registered marathon runners who were not part of the main study or setting were asked to assist with the pilot study. The pilot study was used to determine if the instructions were comprehensible, and if the statistical and analytical processes were effective. Pilot testing ensured that the research instrument was used properly and the information obtained was consistent. The questionnaire was tested among athletes and was re-tested again two weeks later.

3.6 Data collection procedure

After seeking and obtaining permission to conduct the study from UWC Senate, Study Leave Committee, the Institutional Research and Ethics Committee (IREC) in Eldoret and the athletics Kenya (AK) Federation, the researcher recruited two research assistants who were fluent in English and Kiswahili and had basic knowledge of athletics. The researcher introduced himself, and the two assistants, and explained the purpose of the study to the camp managers and presented the approval letters from all the relevant authorities. The camp managers introduced the researcher and the assistants to the coaches. A convenient day for the athletes was set aside for the researcher to meet the participants and explain the role of the research assistants, the aim of the study, the information sheet, consent form and instructions on how to complete the questionnaire. Those who volunteered were asked to complete and sign the informed consent forms. The questionnaire, consent forms and information sheets were in English and Kiswahili so that non-English speaking respondents were not disadvantaged. The researcher collected the completed questionnaires on the same day as soon as they were completed.

3.7 Data analysis

Following coding of the questionnaire, the Statistical Package for Social Sciences version 22 was used for data capturing. The data analysis process was conducted in the following manner. Firstly, descriptive statistics were used to summarize the demographic data so that it could be presented as frequencies, distributions tables, ranges, means, percentages and standard deviations. Secondly, the factors under investigation were categorized into binary responses based on similar conditions of the response in question. Proportions and means were calculated for categorical and continuous variables respectively. Variables were summarized into tables and figures for Univariate analysis. Bivariate and Multivariate analysis was conducted to identify the independent predictors of injuries sustained by athletes. Odds and Adjusted Odds Ratio (OR and AOR) were used as measures of association at 95% Confidence Interval (CI) in order to estimate the strength of associations between risk factors (the independent variable) and injuries sustained. Factors at bivariate analysis with p-value ≤ 0.05 were included in unconditional logistic regression analysis at multivariate level.

3.8. Ethical considerations

The researcher sought permission to conduct the study from the Higher Degrees, Research and Study Grant Committees at the University of the Western Cape. Following this, the researcher approached the ministry of Youth Affairs and Sports, the Athletics Kenya Federation, and the Institutional Research and Ethics committee for permission to conduct the study in Kenya. Written informed consent was sought from all participants after explaining the aim and objectives of the study to them. Participants were informed that their participation in the study was voluntary, and were assured of confidentiality and anonymity. The researcher used special codes

instead of names to identify participant responses and the questionnaires were stored in a safe locker that only the researcher had access to. The five camps were addressed as camp A, B, C, D and E. Participants were informed of their right to withdraw from the study at any time, they decide without causing any consequences. This information was provided in the information sheet. The researcher made a commitment to provide copies of the results to the runners and all the relevant stakeholders through a presentation. The researcher referred the injured runners to specialists in health institutions within Eldoret town for more investigation and further management.



CHAPTER FOUR

RESULTS

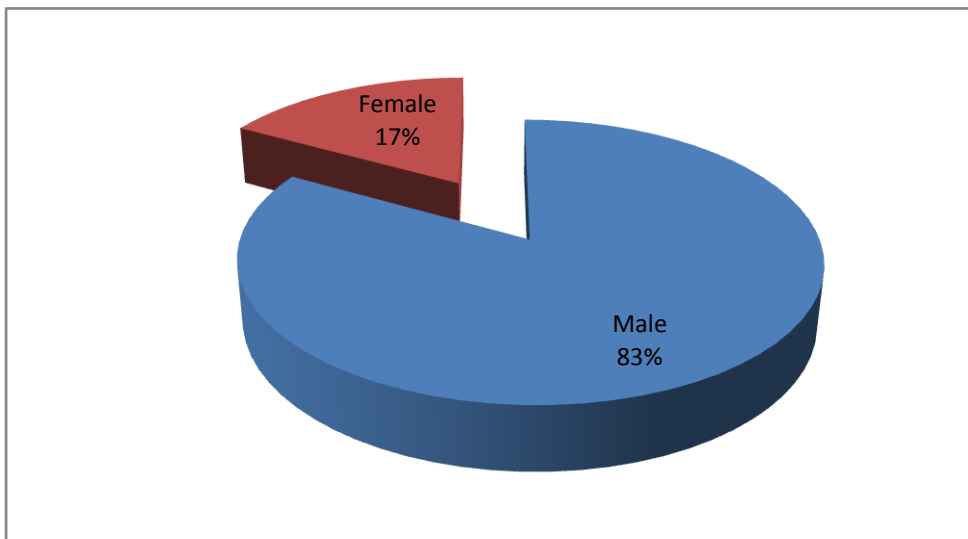
4.1 Introduction

This chapter presents the findings obtained from participants via the survey questionnaire. The prevalence of running injuries among participants in this study stood at over 70%. While the findings indicated that injuries occur in almost every part of the body, the most common parts included the knee, Achilles tendon, and the hip. The risk factors associated with running injury among marathon runners included the duration of running, use of orthotics, experience of pain while running, and seeking medical assistance.

4.2 Demographics

4.2.1 Gender of the runners

The study results indicated that the majority of the athletes (83.1%) were males while



(16.9%) were females (Figure 4.1).

Figure 4. 1 Gender of the respondents

4.2.2 Demographic data of the runners

Other demographic information included bio data such as age, weight, height, and Body Mass Index (BMI). The study results showed that the youngest athlete was aged 20 years while the oldest athlete was aged being 50 years, with the mean age is 27.83 years. The study results indicated that the lightest athlete weighed 57.0 kg while the heaviest weighed 78.0 kg, with the mean weight being 55.9 kg (Table 4.1). The average height of the athletes was 7.49 ft, varying from 1.20 ft to 178.0 ft. The mean BMI was 18.37, with the number being 15 while the maximum was 23 (Table 4.1).



Table 4. 1 Athletics data: Age, height, weight and BMI

| Demographic data | N | Mean | SD |
|-------------------------|------------|--------------|-----------------|
| Age (yrs) | 201 | 27.83 | 5.496 |
| Weight (kg) | 201 | 55.9047 | 6.35354 |
| Height (ft) | 201 | 7.4942 | 17.33828 |
| BMI | 201 | 18.37 | 2.994 |

4.2.3 Reasons for running

The study sought to find out the reasons that participants started running. Most respondents (68.9%) ventured into running activities in order to earn an income, as well as being affordable and convenient. Other reasons cited by the runners included improving self-esteem and confidence (21.4%), to get healthy (5.3%), to lose or manage weight (4.1%), and to decrease stress levels (0.5%) (Table 4.2).



Table 4. 2 Reason to start running

| Reason | Responses | |
|---|------------|---------------|
| | N | Percent |
| To get healthy | 10 | 5.1% |
| To lose weight or manage weight control | 8 | 4.1% |
| To decrease stress levels | 1 | 0.5% |
| Improvement of self esteem and confidence | 42 | 21.4% |
| To start sports running activity | 135 | 68.9% |
| Total | 196 | 100.0% |

4.2.3 Medical history

The study attempted to explore the medical history of the respondents and found that none had previously suffered from chronic diseases, or at least they reported that there had been no symptoms of any disease. This was retrieved from the runners' camp medical records where the runners are supposed to submit their medical history before admission in the camp.

4.2.3 Running history

The study also explored the running history of the participants. This included seeking answers to questions such as the length of time the respondent has been running, the number of days that participants are running each week, the running pace during the weekly training, and the average distance run weekly. The results were compared with the coaches' time records to avoid bias in inflation of the time result given by respondents. The study results showed that most participants had been running for less than 5 years (35.3%), followed by those who had been running for more than 10 years at 30.8%. Those who had been running for less than 10 years and more than 10 years comprised 25.9% and 8.0% respectively (Table 4.8). The study findings

indicated that a large proportion of the athletes (90.0%) had been running every day per week, followed by those who ran three times per week (6.5%) and lastly those who ran just once a week (3.5%). (Table 4.3).

Table 4. 3 Time and weekly frequency of running as a sport

| Time running for sport | Frequency | Percent |
|-------------------------------|------------------|----------------|
| Less than a year | 16 | 8.0 |
| Less than 5 years | 71 | 35.3 |
| Less than 10 years | 52 | 25.9 |
| More than 10 years | 62 | 30.8 |
| No of days ran weekly | | |
| Everyday | 181 | 90.0 |
| Three times per week | 13 | 6.5 |
| Once a week | 7 | 3.5 |
| Total | 201 | 100.0 |



The study revealed that most athletes had a normal running pace of between 3 and 5 minutes per kilometre (86.6%), 9.0% took less than 3 minutes per kilometre, 3.0% fell between 5 and 7 minutes per kilometre and 1.5% were between 7-10 (Table 4.2).

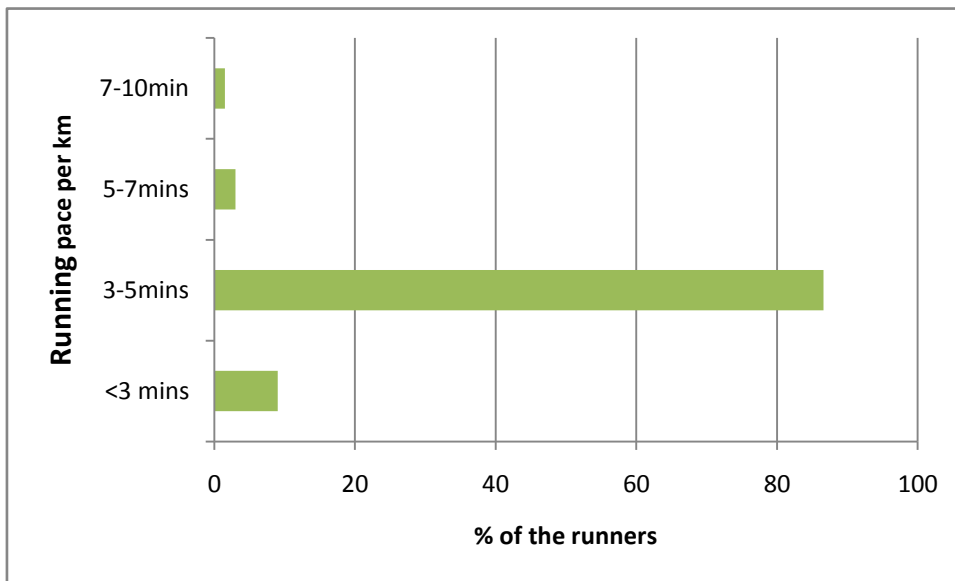


Figure 4. 2 Running Pace of the Runners

The study sought to identify the distance (in kilometres) run each week by the participants. The study findings showed that the participants (46.8%) ran more than 100 kilometres per week. This was followed by those who covered 81- 100 kilometres (17.9%), 51-80 kilometres (13.9%), 32 -50 kilometres (10.9%), and 0 - 32 kilometres (10.5%) (See table 4.4).

Table 4. 4 Average distance run by participants per week

| Distance covered weekly | Frequency | Percent |
|--------------------------------|------------------|----------------|
| 0-32km | 0 | 0.0 |
| 32-50km | 43 | 21.4 |
| 50-80km | 28 | 13.9 |
| 80-100km | 36 | 17.9 |
| More than 100km | 94 | 46.8 |
| Total | 201 | 100.0 |

The above results showed that, a higher proportion of the athletes do up to a maximum of 15 kilometres per day.

4.3 Prevalence and commonality of injuries among participants

Prevalence and commonality among the participants was determined during the study period, which was between September 2016 and September 2017.

4.3.1 Prevalence of injuries among participants

The study sought to determine whether these participants had sustained an injury during a training session. The study results showed that a significant proportion of the athletes had indeed sustained an injury during training (74.1%).

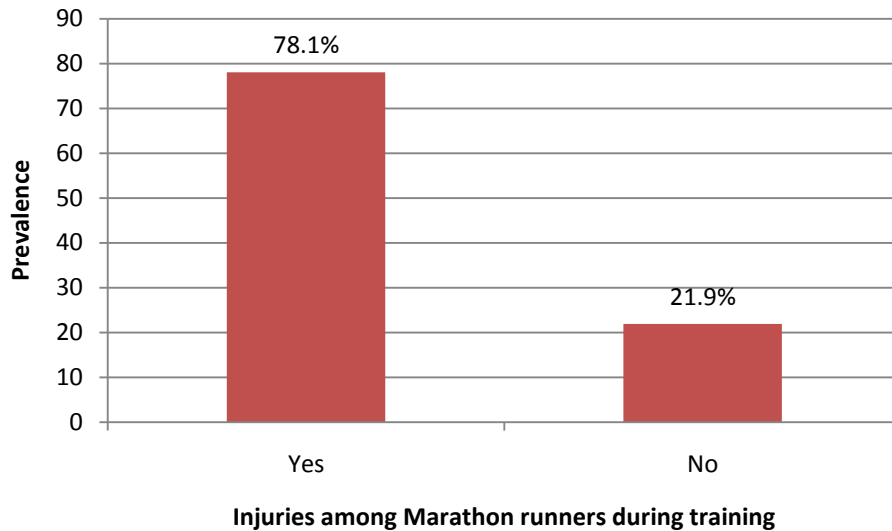


Figure 4. 3 Injury during training race

The data in Figure 4.3 shows that 7 out of every 10 participants had sustained an injury. A non-parametric test using Chi-square test showed that the proportion of participants who had sustained an injury was significant ($\chi^2=63.527$, $df=1$, $p=0.00$). This implies that injuries are common phenomena among marathon runners and confirms the need to look into ways of mitigating them.

4.3.2 Pain and injury location

While running, athletes experience pain due to their injuries. The study indicated that a significant proportion (88.6%) of participants had experienced pain during running. There are several parts of the body that these athletes experienced pain but the most common parts of the body where injuries occur included the knee (19.5%), achilles tendon (15.3%), and hip (12.0%). The tibia (1.5%) and Iliotibial Band Syndrome (ITB) (3.9%) were the least common (Table 4.5).

Table 4. 5 Location of pain

| Body Part | Frequency | Percentage |
|--------------------------|------------------|-------------------|
| Back | 14 | 6.9% |
| Hip | 24 | 12.0% |
| Groin | 16 | 8.1% |
| Front thigh (Quadriceps) | 8 | 3.9% |
| Back thigh (Hamstrings) | 16 | 8.1% |
| ITB | 8 | 3.9% |
| Knee | 39 | 19.5% |
| Achilles tendon | 31 | 15.3% |
| Ankle | 15 | 7.5% |
| Foot | 9 | 4.5% |
| Calf | 9 | 4.5% |
| Buttock | 8 | 4.2% |
| Shin bone | 3 | 1.5% |
| Total | 201 | 100.0% |



The above results agree with other studies identifying the knee as the most common injury location among athletes.

4.3.3 Recovery from Injuries

The result of this study showed that most injuries (32.3%) experienced by participants took a period of 1-3 weeks for full recovery. More serious injuries could take more than eight weeks for complete recovery. The proportion of participants who had sustained such serious injuries was 17.4%, while those who took between 4 and 8 weeks were 24.4%. However, individuals recovered in only a few days 15.4% (Figure 4.4).

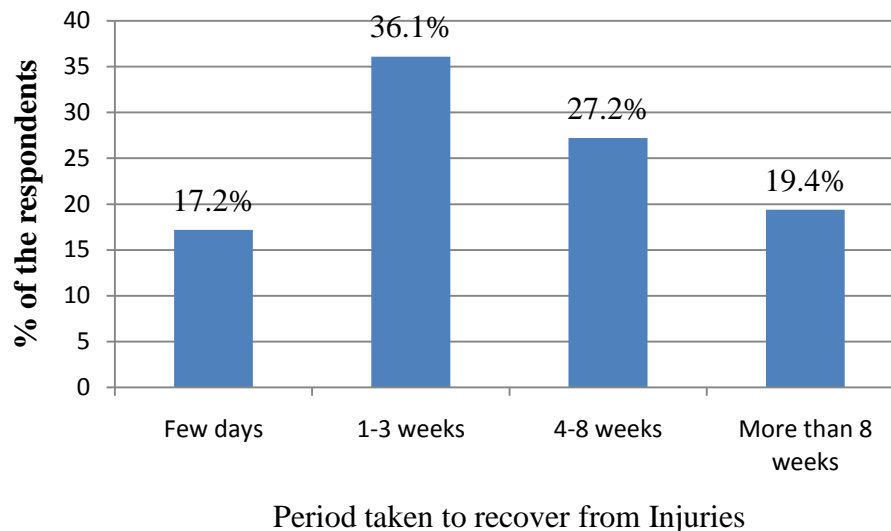


Figure 4.4 Period taken to recover over past year

4.3.4 Type of pain over past year

Participants who had mild pains were regarded as either those who had no response 10.9% and dull pain response 31.8%. For moderate pain participants, throbbing pain was 35.3%. In addition, severe pain participants had sharp, intense pain 14.4%, continuous pain 3% and burning pain, numbness or pins and needles 4.5%. See table 4.6.

Table 4.6 Type of pain experienced during running

| | Type of Pain | Frequency | Percent |
|-----------------|--|-----------|-------------|
| Mild | No response | 22 | 10.9 |
| | Dull pain | 64 | 31.8 |
| Moderate | Throbbing pain | 71 | 35.3 |
| Severe | Sharp, intense pain | 29 | 14.4 |
| | Continuous pain | 6 | 3.0 |
| | Burning pain, numbness or pins and needles | 9 | 4.5 |
| | Total | 201 | 100.0 |

4.3.3 Description of the pain over one past year

When the participants were asked to describe the type of pain they had experienced, a higher proportion of (41%) reported that they experienced pain during training but that it subsided after warming up. The study also found that 28.0% of the athletes experienced pain both before and after the training session. Other participants 8.3% said that they experienced pain after a marathon and that the pain was so bad that they had to stop running. Table 4.7

Table 4.7 Description of the pain over past year

| Description of the pain | Responses | |
|--|-----------|---------|
| | N | Percent |
| Pain during running but after warming up it subsides | 89 | 41.0% |
| Pain before and after training session | 61 | 28.1% |
| Pain while sleeping and brings discomfort | 12 | 5.5% |
| Pain is so bad that I can't run at all or have to stop running | 18 | 8.3% |
| Pain after running downhill | 19 | 8.8% |
| Pain after a marathon | 18 | 8.3% |

4.3.4 Recurrence of Injuries

A large number of participants (59.2%) reported that their injuries had re-occurred following treatment. This suggests that the injuries among the participants became worse so that they were at risk. However, almost a third of the participants (2.8%) reported never experiencing injuries again after having undergone treatment (see Table 4.9). Most participants (70.1%) reported regularly seeking medical assistance when their injuries re-occurred following treatment (Table 4.9).

Table 4.8 Injury re-occurrence and seeking of medical assistance

| | Injury re-occurrence later | | Seeking medical assistance | |
|--------------|----------------------------|--------------|----------------------------|--------------|
| | Frequency | Percent | Frequency | Percent |
| Yes | 119 | 59.2 | 141 | 70.1 |
| No | 66 | 32.8 | 44 | 21.9 |
| Total | 201 | 100.0 | 100.0 | 100.0 |

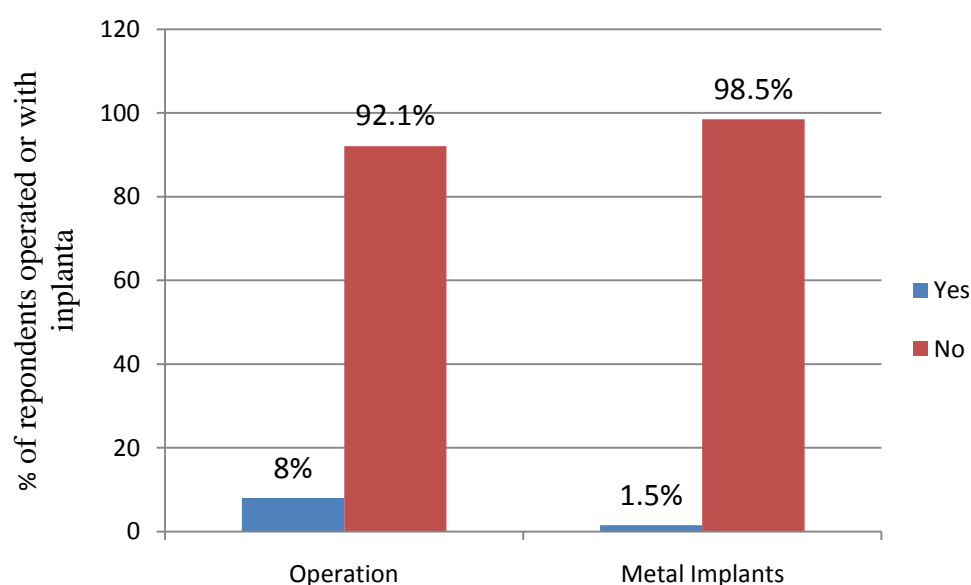


Fig 4.5 Operation and metal implants

Asked whether participants had previously undergone surgery, a majority (92.1%) indicated that they had not had any operation due to running injuries. The remaining participants (8%) reported having had surgery due to their injuries (Figure 4.4). Of those who had undergone surgery, 1.5% reported having had metal implants while the rest (98.5%) indicated they have not (Figure 4.4).

4.4 Knowledge of injury prevention among the marathon runners

The study determined the knowledge of participants with respect to the prevention of injury. This was considered from the perspective of who they would consult in the event of an injury or to suggest the best treatment method for dealing with an injury. The study results showed that a significant proportion (78.0%) of participants seek medical assistance from a physiotherapist. The massage therapist came second at 58.0%, with 15.0% likely to seek medical assistance each from a doctor or fellow athlete. Other participants reported that they would seek assistance from the coach (6.0%), podiatrist (4%), or orthopaedic surgeon 4.0% each (see Table 4.5). About 21% of participants did not have appropriate knowledge with respect to seeking medical assistance.

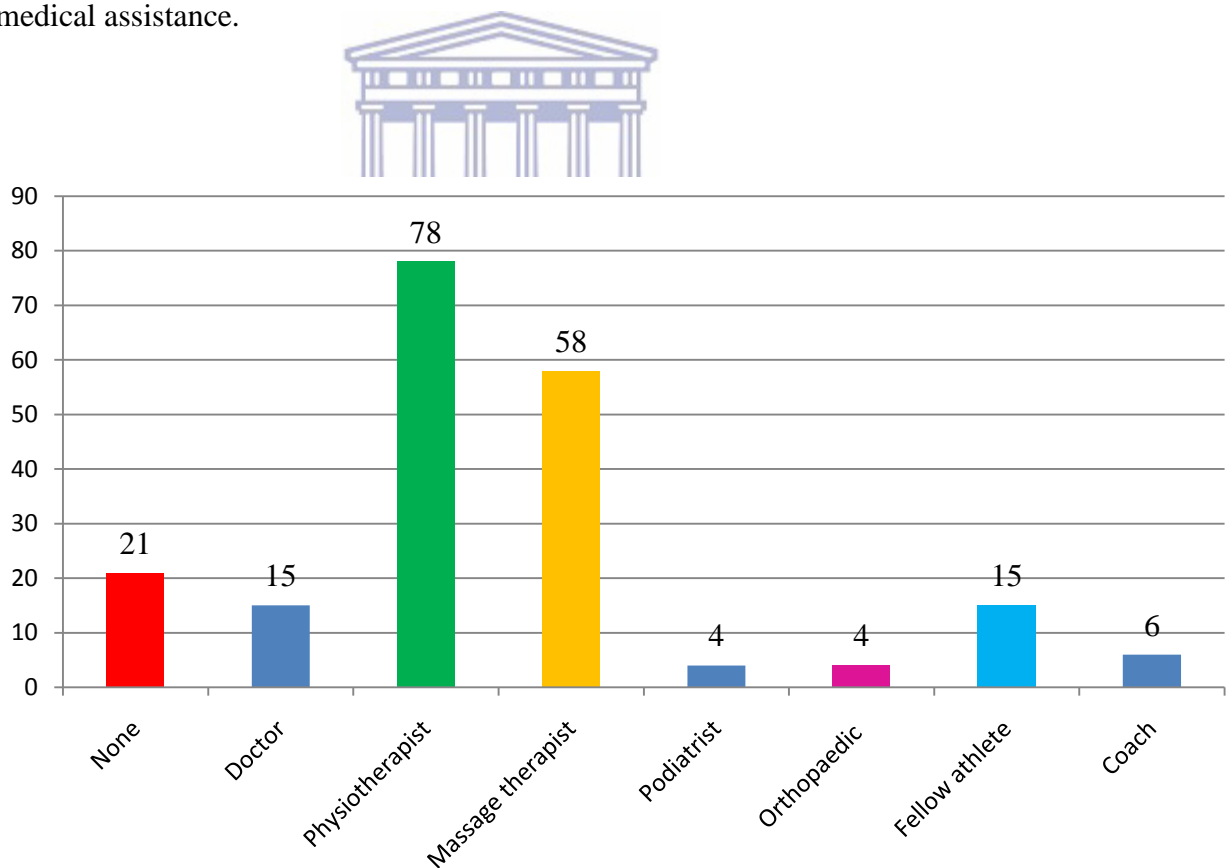


Figure 4. 6 Seeking medical assistance for treatment of the running injuries


Participants were also asked what they thought was the best treatment for their injuries during training or running. The study showed that the highest proportion of

respondents (32.9%) suggested that the best method for treating the injuries sustained included ice, heat and massage. Only (3.2%) of participants suggested orthotics. All participants suggested at least one method of treatment implying that they had a degree of knowledge on appropriate types of treatment necessary to counter the injuries sustained (Table 4.9)



Table 4.9 Best treatment for the injuries

| Treatment | Responses | |
|----------------------------|------------|-------------|
| | N | Percent |
| Medication | 29 | 9.2% |
| Ice, heat and massage | 104 | 32.9% |
| Stretching/strengthening | 66 | 20.9% |
| Orthotics | 10 | 3.2% |
| Change in training routine | 11 | 3.5% |
| Reducing running distance | 27 | 8.5% |
| Change in running surface | 18 | 5.7% |
| Change in running shoes | 29 | 9.2% |
| Rest | 22 | 7.0% |
| Total | 316 | 100% |



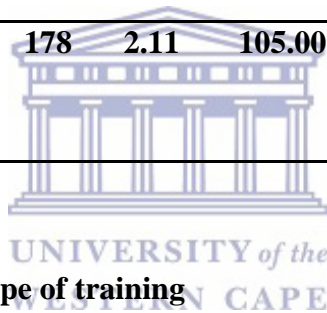
The logo of the University of the Western Cape, featuring a classical building with columns and a pediment, with the text 'UNIVERSITY of the WESTERN CAPE' below it.

4.4.1 Marathon data details

The study results sought to explain the mean averages of the time and races run by the participants. It was noted that the mean average time for half marathon (21.1km) was high at 59.26 minutes and the average 42.2km time the mean was 3hrs 21minutes (Table 4.10).

Table 4.10 Marathon Summary details

| | N | Min. | Max. | Mean | Std. Dev. |
|--|------------|-------------|---------------|---------------|------------------|
| Number of half marathons participated annually | 185 | 0 | 25 | 3.01 | 2.482 |
| Average time (21.1km) | 190 | 1.00 | 75.00 | 59.2600 | 17.44693 |
| Number of full Marathon participated annually (42.2km) | 184 | .00 | 49.00 | 2.2897 | 3.58016 |
| Average time (42.2km) | 181 | 1.00 | 118.70 | 3.2071 | 9.65202 |
| Marathon running pace | 178 | 2.11 | 105.00 | 4.3128 | 9.02872 |



4.4.2 Resting time and type of training

Resting is a key component of allowing the body to recover used energy before the start of a training session or a marathon race. Participants in this study were asked whether they rest every week, or every second, third day or once in a week. The study results indicated that a high proportion (90.0%) of the athletes often rest once a week after training for a whole week. A small number of participants rested after every second day (4.5%), while the others rested after every third day (5.5%) (Table 4.11).

Table 4.11 Resting period after training per week

| Rest frequency | Frequency | Percent |
|-----------------------|------------------|----------------|
| Every second day | 9 | 4.5 |
| Every third day | 3 | 1.5 |
| Once a week | 189 | 94.0 |
| Total | 201 | 100.0 |

The type of training that marathon runners undergo must also be considered. The study results showed that most participants (72.6%) practiced alternating long and short distances on different days. Those who practiced alternate days of high and low effort consisted of 18.4% of participants, higher than those who practiced almost the same distance everyday (4.5%), while those who practiced on lots of hills and interval training (multiple runs of short duration with little rest between bursts) were reported to be 2.5% and 2.0% of all participants respectively (Table 4.12).

Table 4.12 Type of training

| Type of training | Frequency | Percent |
|--|------------------|----------------|
| Alternate long and short distance on different days | 146 | 72.6 |
| Almost the same distance every day | 9 | 4.5 |
| Alternate days of high and low effort | 37 | 18.4 |
| Lots of hills | 5 | 2.5 |
| Interval training (multiple runs of short duration with little rest between burst) | 4 | 2.0 |
| Total | 201 | 99.5 |

4.4.3 Stretching exercise

With respect to stretching exercises, the study findings showed that 57.7% of participants regularly engaged in stretching exercises both before and after training. This was followed by those who stretched only after training (33.3%), and then by those who stretched only when they had pain (3.5%). Those who stretched only before training were 2.5% of participants and those who never stretched made up 3.0% of participants (Table 4.13).

Table 4.13 Regular stretching exercises

| Stretching exercises | Frequency | Percent |
|-----------------------------|------------------|----------------|
| Only before training | 5 | 2.5 |
| Before and after training | 116 | 57.7 |
| Only after training | 67 | 33.3 |
| Only when I have pain | 7 | 3.5 |
| Never | 6 | 3.0 |
| Total | 201 | 100.0 |

The length of time that one holds a stretch has a direct bearing on how the body adapts before or after training. The study attempted to ascertain the length of time that participants stretched. The study results showed that most participants (43.8%) held their stretch for at least a minute, followed by those who took less than 30 seconds (23.4%). A group of participants stretched for less than 20 seconds (21.9%), others for less than 10 seconds (7.0%), and finally a portion of participants reported never stretching at all (4.0%) (Table 4.14).

Table 4.14 Time spent holding a stretch

| Period of stretch | Frequency | Percent |
|--------------------------|------------------|----------------|
| Less than 10 secs | 14 | 7.0 |
| Less than 20 secs | 44 | 21.9 |
| Less than 30 secs | 47 | 23.4 |
| At least a minute | 88 | 43.8 |
| Do not stretch at all | 8 | 4.0 |
| Total | 201 | 100.0 |

The study also attempted to find out whether the runners engaged in a regular strengthening program. The study findings indicated that a higher proportion of the participants (69.2%) engaged in such programs. The rest (30.9%) did not make use of strengthening programmes. Of those who engaged in regular strengthening programmes, 20.9% did this twice a week, 19.4% every day, 16.9% did it once a week, and 10.4% did it three times a week. See table 4.15.

Table 4.15 Frequency of engaging in a strengthening programme

| Frequency of Program | Frequency | Percent |
|-----------------------------|------------------|----------------|
| Once a week | 34 | 16.9 |
| Twice a week | 42 | 20.9 |
| Three times a week | 21 | 10.4 |
| Everyday | 39 | 19.4 |
| Total | 136 | 67.7 |

4.4.4 Running Environment

The study sought to determine the terrain used by participants during their training, as this has a bearing on the injuries that the athletes sustain. Participants were asked which of three surface categories they mostly trained on, including flat, uneven and hilly terrains. The study findings showed that a minority of participants (8.7%) ran or practiced on flat surfaces, 8.7% ran on hilly surfaces, while the rest (70.8%) practiced on uneven slopes and surfaces (Figure 4.7).

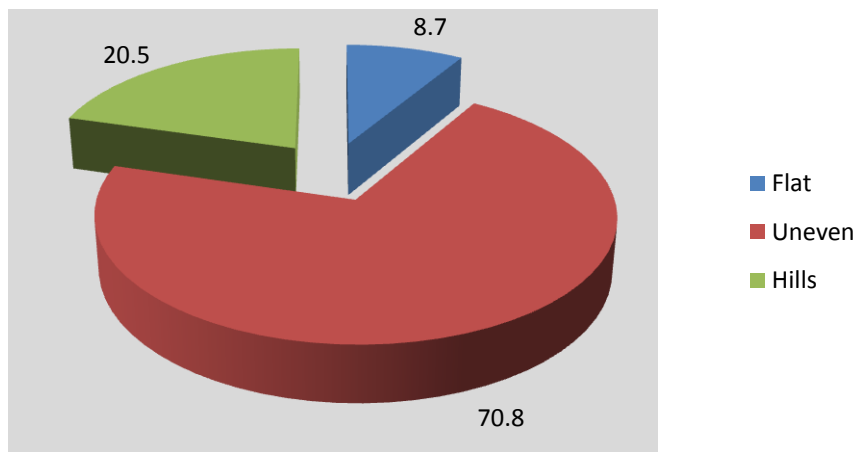


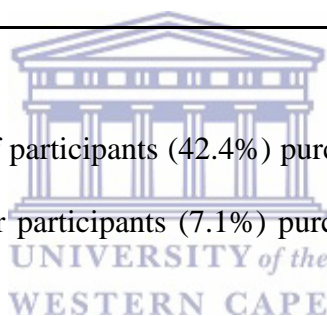
Figure 4. 4 Athletes' running Surface

The period of time that the athletes used a pair of shoes before discarding, was also captured. The study results revealed that most participants (58.7%) only used a pair of shoes for 3 - 6 months, while others (27.6%) used a pair of shoes between 6 and 12 months. The remaining (2.6%) participants used a pair of shoe between 18 and 24 months (Table 4.16).

Table 4.16 Length of time using one pair of shoes

| Period | Frequency | Percent |
|-------------------|------------------|----------------|
| 3-6 months | 118 | 58.7 |
| 6-12 months | 56 | 27.6 |
| 12-18 months | 11 | 5.6 |
| 18-24 months | 5 | 2.6 |
| More than 2 years | 11 | 5.6 |
| Total | 201 | 100 |

The highest proportion of participants (42.4%) purchased at least three pairs of shoes within a year, while other participants (7.1%) purchased one pair of shoes within a year (Table 4.17).

**Table 4.17 Pair of shoes bought in a year**

| Shoes | Frequency | Percent |
|--------------|------------------|----------------|
| 1 pair | 14 | 7.1 |
| 2 pairs | 50 | 24.7 |
| 3 pairs | 85 | 42.4 |
| 4 pairs | 52 | 25.8 |
| Total | 201 | 100 |

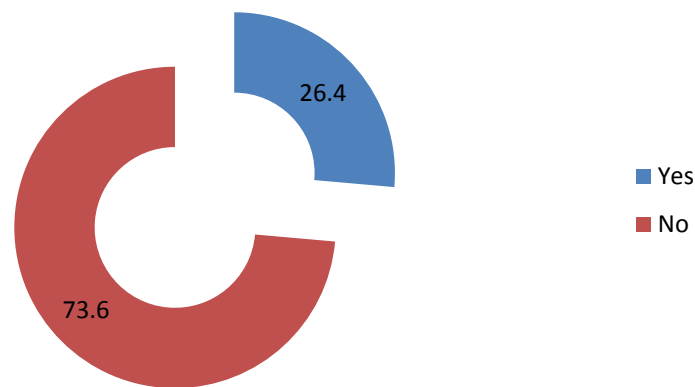
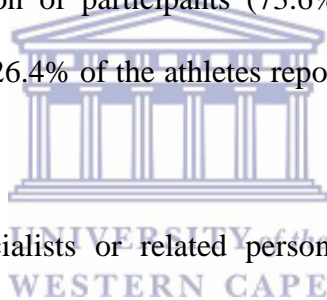


Figure 4.7 Athletes' Using Orthotics

With respect to the use of orthotics by the athletes during running, the study showed that the highest proportion of participants (73.6%) reported that they do not use orthotics. The remaining 26.4% of the athletes reported using orthotics to correct foot alignment (Figure 4.7).



There were several specialists or related personnel who prescribed orthotics to participants, including podiatrists, surgeons, physiotherapists, and massage therapists. The study results show that 23% of participants engaged a massage therapist to prescribe for them and 15% engaged a physiotherapist (Table 4.18).

Table 4.18 Prescriber of orthotics

| Prescriber | Frequency | Percent |
|----------------------------|-----------|------------|
| Orthopedic surgeon | 6 | 8.5 |
| Physiotherapist | 15 | 30.5 |
| Massage therapist | 23 | 44.1 |
| Podiatrist/foot specialist | 7 | 13.6 |
| Others | 2 | 3.4 |
| Total | 53 | 100 |

For the participants who used orthotics during running, the study sought to establish how long they wore them. The majority of participants (20.4%) used the orthotics within a period of 0 – 6 months, and 9% used them within a period of 6 – 12 months. Finally, 0.5% of participants used orthotics within 18 – 24 months and the same for more than two years, as shown in (Figure 4.8).

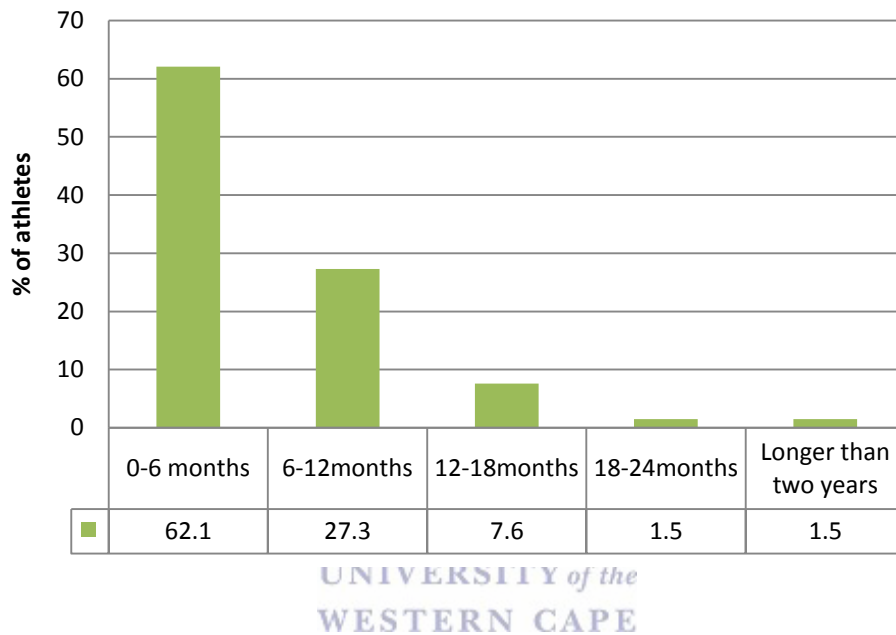


Figure 4. 5 Length of time of using orthotics

The use of orthotics by participants implied that the athletes had deformities in their feet that needed to be corrected. This study sought to determine whether the orthotics were used to correct flat feet or high arches. The study findings indicated that 54.4% of participants had high arches, while the rest (45.6%) had flat feet (Table 4.9).

Table 4.19 Deformity in the feet

| Deformity | Frequency | Percent |
|------------------|------------------|----------------|
| Flat feet | 24 | 45.6 |
| High arches | 29 | 54.4 |
| Total | 53 | 100 |

The part of the foot that makes contact with the ground first is fundamental to understanding how a runner sustains injuries. The study findings indicated that 61.2% of participants had their toes and ball of the foot striking the surface first, and 12.4% had their heel striking the ground first (Table 4.20). A number of participants (18.9%) reported that their whole shoe struck the surface first. (See table 4.20)

Table 4. 6 Part of the foot that strikes the surface first

| Part of the foot | Frequency | Percent |
|-------------------------|------------------|----------------|
| Whole foot | 38 | 18.9 |
| Heel | 25 | 12.4 |
| Toes, foot ball | 123 | 61.2 |
| Others | 15 | 7.5 |
| Total | 201 | 100 |

Literature suggests that the type of surface that an athlete runs on is a risk factor for the development of injuries. The study explored the type of the surface that participants ran and practiced on. The study considered hard surfaces such as gravel

and soft surface such as sea sand, muddy roads, artificial tracks, and grass. The study showed that 81.2% of athletes trained on hard surfaces, 9.6% trained on muddy roads, while 2.8% worked on grass and artificial tracks respectively (See Table 4.21).

Table 4. 7 Type of running surface

| Type of Surface | Responses | |
|----------------------------|------------|---------------|
| | N | Percent |
| Grass | 6 | 2.8% |
| Soft surface e.g. sea sand | 7 | 3.7% |
| Hard surface e.g. gravel | 163 | 81.2% |
| Artificial track | 6 | 2.8% |
| Muddy roads | 19 | 9.6% |
| Total | 218 | 100.0% |



4.5 Risk factors for injuries

The study sought to establish the risk factors for injuries among athletes in Eldoret, Kenya. The factors selected for investigation were divided into three categories; bio data such as age, gender, weight and height, and length of running time; running environment such as terrain, equipment, medical history, and participation including the number of half and full marathons, average training time and rest periods, types of training, and stretching exercises. Participants whose running career spanned fewer than five years were three times less likely (OR 0.344; 95%CI: 0.172-.689, $p=0.002$) to be injured, compared to those whose tie spent running spanned more than 15 years. Therefore, the length of time spent running was a risk factor for these participants to sustain injuries.

Age (OR 1.327; 95%CI: 0.678-2.597, p=0.409), gender (OR 0.727; 95%CI: 0.280-1.887, p=0.512), height (OR .831; 95%CI: 0.424-1.630, p=0.590), (OR 0.892; 95%CI: 0.444-1.792, p=0.748), and running pace (OR 0.825; 95%CI: 0.916-15.967, p=0.050) were not determined to be risk factors for injury in these participants (Table 4.22).

Risk factors are classified as both intrinsic and extrinsic factors.

4.5.1 Intrinsic factors (Demographic data)

Table 4. 8 Intrinsic Risk factors for injury among participants

| Factor | Category | Injury | | OR | 95%CI | p-value |
|-------------------|---------------------|------------|-----------|-------|-------------|---------|
| | | Yes | No | | | |
| Age | 28 years and below | 93(80.2%) | 64(75.3%) | 1.327 | 0.678-2.597 | 0.409 |
| | Over 28 years | 23(19.8%) | 21(24.7%) | | | |
| Gender | Male | 129(77.2%) | 38(22.8%) | 0.727 | 0.280-1.887 | 0.512 |
| | Female | 28(82.4%) | 6(17.6%) | | | |
| Weight | Light | 82(76.6%) | 25(23.4%) | 0.831 | 0.424-1.630 | 0.590 |
| | Heavy | 75(79.8%) | 19(20.2%) | | | |
| Height | Short | 53(76.8%) | 16(23.2%) | 0.892 | 0.444-1.792 | 0.748 |
| | Tall | 104(78.8%) | 28(21.2%) | | | |
| Length of running | Less than 5 years | 59(67.8%) | 28(32.2%) | 0.344 | 0.172-.689 | 0.002 |
| | More than 15 years | 98(86.0%) | 16(14.0%) | | | |
| Running Pace | Less than 5 mins/km | 153(79.3%) | 40(20.7%) | 3.825 | 0.916-15.97 | 0.050 |
| | More than 5 mins | 4(50.0%) | 4(50.0%) | | | |

Participants who used orthotics were about three times more likely to sustain an injury (OR 2.71; 95%CI: 1.07-6.83, $p=0.03$) relative to participants who did not use orthotics. Extrinsic factors for participants who experienced pain while running were about 26 times (OR 26.481; 95%CI: 8.30-84.51, $p=.000$) more likely to sustain an injury compared to athletes who did not use orthotics. Participants who sought medical assistance after sustaining an injury were three times less likely to suffer an injury (OR 3.267; 95%CI: 1.739-6.135, $p=.000$) compared with those who did not seek medical assistance.

This study found other factors that were not risk factors to an athlete sustaining an injury. These factors include terrain (OR 1.004; 95%CI: 0.438-2.301), length of using one pair of shoe (OR 1.004; 95%CI: 0.438-2.301), the number of pairs of shoes bought in any given year (OR .431; 95%CI, 0.147- 1.260), part of the shoe striking surface first (OR 1.697; 95%CI: 0.731-3.942, $p\text{-value}=0.215$), having had an operation (OR 3.230; 95%CI: .890-11.718, $p=.061$), and having a metal implant inserted in your body (OR 1.71; 95%CI: 1.52-2.00, $p=0.147$) (Table 4.23).

4.5.2 Extrinsic Factors

4.5.2.1 Terrain, Sport Wear and Medical History

Table 4. 9 Risk factors of injuries among athletes

| Factor | Factor Category | Injury | | OR | 95%CI | p-value |
|---|------------------------|--------------------|------------------|-----------|--------------|----------------|
| Terrain | Even surface | Yes 125 (79.6%) | No 35 (79.5%) | 1.004 | 0.438-2.30 | 0.992 |
| | Uneven surface | 32 (20.4%) | 9 (20.5%) | | | |
| Length of running using 1 pair of shoe | <= 1 year | 147 (93.6%) | 42 (95.5%) | 0.700 | 0.15-3.32 | 0.652 |
| | > 2 years | 10 (6.4%) | 2 (4.5%) | | | |
| No. of pair of shoes bought per year | <1 pair | 10 (6.4%) | 6 (13.6%) | 0.431 | 0.147-1.26 | 0.116 |
| | > 1 pair | 147 (93.6%) | 38 (86.4%) | | | |
| Use of orthotics | Yes | 47 (29.9%) | 6 (13.6%) | 2.71 | 1.07-6.83 | 0.030 |
| | No | 110 (70.1%) | 38 (86.4%) | | | |
| Shoe part striking surface 1st | Whole | 43 (27.4%) | 8 (18.2%) | 1.697 | .731-3.942 | 0.215 |
| | Part | 114 (72.6%) | 36 (81.8%) | | | |
| Experience of pain | Yes | 153 (97.5%) | 26 (59.1%) | 26.48 | 8.30-84.51 | 0.000 |
| | No | 4 (2.5%) | 18 (40.9%) | | | |
| Medical assistance | Yes | 96 (67.6%) | 46 (32.4%) | 3.267 | 1.739-6.135 | 0.000 |
| | No | 23 (39.0%) | 36 (61.0%) | | | |
| Operation | Yes | 13 (81.2%) | 106 (57.3%) | 3.230 | 0.89-11.72 | 0.061 |
| | No | 3 (18.8%) | 79 (42.7%) | | | |
| Metal implant | Yes | 3 (100.0%) | 0 (0.0%) | 1.707 | 1.518-1.919 | 0.147 |
| | No | 116 (58.6%) | 82 (41.4%) | | | |

| | | | | | | |
|------------------------|---------------|-------------|------------|-------|-------------|-------|
| Recovery period | Few weeks | 49 (75.4%) | 16 (24.6%) | 0.794 | 0.394-1.600 | 0.518 |
| | Several weeks | 108 (79.4%) | 28 (20.6%) | | | |

Extrinsic factors for athletes who had participated in a marathon were two times more likely (OR 2.366; 95%CI: 1.154-4.851, $p=.017$) to sustain an injury than those who had not. Athletes whose training covered more than 80 kilometres per week on average were two times more likely (OR 0.452; 95%CI: 0.229-0.891, $p=.020$) to be injured as opposed to those who trained for fewer than 80 kilometres per week. The average training time per week was also a risk factor, with those training for 10 hours or more per week being about three times more likely to be injured than those training for fewer than 10 hours. The type of training experienced was a risk factor for participants, with those having alternate training being three times (OR 2.941; 95%CI: 0.963-8.985, $p=.049$) more likely to sustain injuries compared to those who did not do alternate training. Engagement in regular strengthening program (OR 2.015; 95%CI:1.009-4.025, $p=.045$), Engaging in a regular strengthening programme (OR 3.395; 95%CI: 1.699-6.783, $p=.000$) was also a risk factor for injury among athletes in Eldoret, Kenya.

The average distance run per week (in kilometres) (OR .633; 95%CI: .320-1.254, $p=.188$), the number of full marathons (OR . 1.198; 95%CI:233-6.156, $p=.828$), frequency of rest after training (OR .828; 95%CI: 0.253-2.705; $p=.754$), and engagement in stretching exercise (OR 3.690; 95%CI: .505-26.982, $p=0.170$) were not risk factors for injuries sustained by athletes in Eldoret, Kenya (Table 4.24).

4.5.2.2 Type of Training and Stretching Exercises

Table 4. 10 Risk factors for injuries

| Factor | Factor Category | | Injury | | OR | 95%CI | p-value |
|---|--------------------------|-------------|------------|----|-------|-------------|---------|
| | Yes | No | Yes | No | | | |
| Participation in marathon | Yes | 124 (82.1%) | 27 (17.9%) | | 2.366 | 1.154-4.851 | .017 |
| | No | 33 (66.0%) | 17 (34.0%) | | | | |
| Average distance run per week (in kms) | Less than 80 | 51 (72.9%) | 19 (27.1%) | | .633 | .633-1.254 | .188 |
| | More than 80 | 106 (80.9%) | 25 (19.1%) | | | | |
| No. of half marathons | Less or equal to 3 | 119 (75.3%) | 39(24.7%) | | .401 | .148-1.091 | .066 |
| | More than or equal to 3 | 38 (88.4%) | 5 (11.6%) | | | | |
| No. of full marathons run annually | No. of half Marathons | 151 (78.2%) | 42 (21.8%) | | 1.198 | .233-6.156 | .828 |
| | More than or equal to 3 | 6 (75.0%) | 2 (25.0%) | | | | |
| Average training time per week | Less or equal to 10 | 52 (69.3%) | 23 (30.7%) | | .452 | 0.229-0.891 | .020 |
| | More than or equal to 10 | 105 (83.3%) | 21 (16.7%) | | | | |
| Rest after training | Less or equal to 3 days | 12 (75.0%) | 4 (25.0%) | | .828 | .253-2.705 | .754 |
| | More than 3 days | 145 (78.4%) | 40 (21.6%) | | | | |
| Type of training | Alternate | 149 (79.7%) | 38 (20.3%) | | 2.941 | 0.963-8.985 | .049 |
| | Uniform | 8 (57.1%) | 6 (42.9%) | | | | |

| | | | | | | |
|--|------------|-------------|------------|-------|-------------|-------|
| Engagement in stretching exercise | Stretching | 155 (78.7%) | 42 (21.3%) | 3.690 | .505-26.982 | .170 |
| | None | 2 (50.0%) | 2 (50.0%) | | | |
| Engagement in regular strengthening programme | Yes | 116 (85.3%) | 25 (18.0%) | 3.395 | 1.699-6.783 | 0.000 |
| | No | 20 (14.7%) | 24 (36.9%) | | | |

The study revealed that most of the athletes were younger than 30 years and the reason for running was to earn an income. The study showed that 81.2% of athletes trained on hard surfaces, 9.6% trained on muddy roads, while 2.8% worked on grass and artificial tracks respectively. A significant proportion of the athletes had indeed received an injury during training (74.1%). The most common location of injuries comprised the knee, Achilles tendon, the hip, tibia (1.5%) and ITB (3.9%) among others, with overall injury prevalence at over 70.0%. The study results indicate that the athletes have knowledge of injury prevention with 78.0% of the athletes were able to seek medical assistance from a physiotherapist. The risk factors associated with running injury among marathon runners were; duration of running, use of orthotics and seeking medical assistance ($p < 0.05$) among others. The study results also revealed that a number of the identified factors were not risk factors for running injury. These factors include age, running terrain, using one pair of shoe for long, history of surgery and running pace among others ($p \geq 0.05$).

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

The chapter is divided into three sections; a discussion of the objectives of the study, the conclusion, and the recommendations for further research.

5.2 Summary

Athletes need to observe the best dieting practices, training, and other programs to do well in their sport, as well as to prevent injuries. The knowledge on ways of preventing injury and who to consult in case of injury is a responsibility of the individual athlete and the coaches who should advise them. Risk factors for participants in this study included the use of orthotics, running experience, seeking medical assistance after injury, the frequency of participating in marathons, and the mileage covered. A range of recommendations based on the research findings included creating awareness on world best practices towards injury prevention, and exhaustively dealing with them as they occur.

5.2 Discussion

There were more males than females who participated in this study, and therefore marathon running is a sport that is still dominated by males. There is a need to encourage women to participate to close the gender gap that persists. The study results contrast with other studies such as those by Burfoot (2007) that the marathon gender gap is being reduced. Contrary to statistics that female participants make up to 40% of all participants in marathons, for example, in the New York City Marathon, this study indicates that the gender gap is at 66%. This implies that the gender gap is not static and that more must be done to encourage women who wish to enter into the sport.

Demographic data such as age, weight, height, and BMI were within acceptable ranges. There were no significant risk factors associated with any of this bio data. It was clear that participants ventured into the sport because they were optimistic of financial success. Running is also affordable and convenient. Within the camps, participants in this study had varied experiences. Others had been involved in the sport for fewer than five years, while others had been participating for ten years or more. The study results are reliable because participants had in-depth information on the sport. Practice is the key for most athletes and success usually comes with proper preparation in terms of the training provided by the coach. Ninety per cent of these participants ran almost every day in the week. A small number of participants reported running for fewer days but this had more to do with personal preference, since they may have had fewer days available for training. Like any other sport, marathon running requires strategy, and continuous and consistent training is important. Competitors in marathon running must have running paces within world standards. The athletes in this study were well within the recommended running pace for marathon competitions. During training, a running pace of between three and seven minutes per kilometre is sufficient to compete at an international level. As the results have indicated, the training that these athletes went through was self-determined, as per the coach's instruction. Participants had individual routines that were dependent on the event that they were preparing for. Therefore, the distance covered per week would have been dependent on such factors.

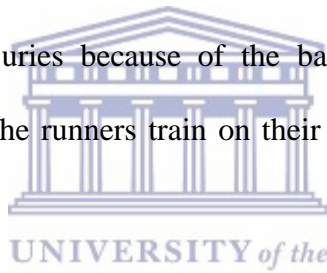
5.2.1 Discussion based on research objectives

5.2.1.1 Prevalence and commonality of injuries among marathon runners

The study found out that 7 out of every 10 participants had sustained an injury during the training in Eldoret town. This means that injury occurs at higher percentage during

the training time and it is in line with the study of Fredericson and Misra (2007) which found a yearly incidence of injury to be as high as 90% in those training for marathons in the United States.

The study findings contradicted with Van Middelkoop et al. (2007) study where they found a lower incidence of injury (18.2%) among the 647 participants of the Rotterdam marathon and reported a higher prevalence rate of injury (54.8%) in the 12 months before the marathon took place. The cases of injuries were 3.2 injuries for every 1000 running hours in exposure time. In a study by Brukner & Khan (2013), distance-running injuries were found to contribute 12.3% of all cases of injuries presenting to a Sports Clinic in Melbourne, Australia yearly. In Kenya, majority of the marathon runners get injuries because of the bad roads, and poor training from coaches and majority of the runners train on their own hence neglecting all injuries and assumes to be minor.



5.2.1.2 Types of Injuries Sustained by Marathon Runners

The study indicated that a significant proportion (88.6%) of participants had experienced pain during running. There are several parts of the body that these athletes experienced pain but the most common parts of the body where injuries occur included the knee (19.5%), achilles tendon (15.3%), and hip (12.0%). The tibia (1.5%) and Iliotibial Band Syndrome (ITB) (3.9%). This study findings supports the findings of other studies like the American Academy of Orthopaedic Surgeons (AAOS, 2013) where the most serious injuries found in runners was tendonitis (22%), stress fractures (13%), muscle strains (9%), joint sprains (8%) and ligament stretches or tears (7%). Similar Anderson et al. (2011) found that muscle strains and tendonitis were the most common type of injury reported by runners.

Generally, Patellofemoral pain syndrome (PFPS) was the most prevalent injury reported. Iliotibial band syndrome (ITBS), plantar fasciitis, menisci injuries, tibial stress syndrome, Achilles tendinopathies, patellar tendinopathies, gluteus medius injuries, tibial stress fractures and spinal injuries are the common injuries to the athletes and runners.

5.2.1.3 Management Strategies of Injuries among Marathon Runners

The study findings showed that the highest proportion of respondents (32.9%) suggests that the best method for management of injuries sustained included using ice, heat and massage. Only (3.2%) suggested orthotics. All participants suggested at least one method of treatment implying that they have a degree of knowledge on appropriate types of treatment necessary to counter the injuries sustained. A number of preventive strategies that include warm up, stretching, regular cool down, correction of poor running style, adequate rehabilitation with sufficient recovery time, proprioceptive training, good training or competition surface, training using properly fitted footwear, sports first aid, sports massage, ankle bracing and taping, and adherence to the rules (Junge & Dvorac, 2009). According to Junge & Dvorac, (2009) prevention is better than cure.

5.2.1.4 Knowledge of Injury Prevention among Marathon

The study results indicated that a high proportion (90.0%) of the athletes often rest once a week after training for a whole week, most participants (72.6%) practiced alternating long and short distances on different days. Also 57.7% of participants regularly engaged in stretching exercises both before and after training and that a higher proportion of the participants. (69.2%) engaged in such programs like observing the rules of the sport, wearing safety equipment when required and seek assistance immediately in the case of injury.

Larson et al. (2006) supported the study findings that injuries can be prevented by training the athletes in proper techniques and to avoid factors that associated with injuries such as muscle tightness, inadequate rehabilitation, or a lack of proper training techniques. Athletes are required to maintain high fitness levels, observe the rules of the sport, wearing safety equipment when required, and to seek assistance immediately in the case of injury. The authors concluded that if athletes understand and practice safety and preventive measures, the number of injuries would be reduced.

5.2.1.5 Common Factors Associated With Injuries in Marathon Runners

The factors are both intrinsic and extrinsic.

On intrinsic factors; participants whose running career spanned fewer than five years were three times less likely (OR 0.344; 95%CI: 0.172-.689, $p=0.002$) to be injured, compared to those whose time spent running spanned more than 15 years. Therefore, the length of time spent running was a risk factor for these participants to sustain injuries. Age (OR 1.327; 95%CI: 0.678-2.597, $p=0.409$), gender (OR 0.727; 95%CI: 0.280-1.887, $p=0.512$), height (OR .831; 95%CI: 0.424-1.630, $p=0.590$), (OR 0.892; 95%CI: 0.444-1.792, $p=0.748$), and running pace (OR 0.825; 95%CI: 0.916-15.967, $p=0.050$) were not determined to be risk factors for injury in these participants.

According to Kleindienst *et al.*, (2013) athletes possess different bodily structures statures, and differ in terms of height and stoutness. Data from this research show that on average, an athlete is 176.5 cm tall and has a body mass of 65.8 kg, with a greater range these calculation (152–197 cm and 40– 100 kg) (Kleindienst et al., 2013). Scholars, (McKenzie et al., 2005; Warren & Jones, 2007) reported that runners with high longitudinal arches (pes cavus) experience a higher probability of

injury on the track. However, Wen et al. (2007) found no relationship between arch height and running injuries.

Other factors are lack of warm-up, stretching and cool down exercises, instability in the running pattern, and running on one side of the road. Bahr and Krosshaug (2005) gave examples of intrinsic factors such as age, gender, body composition, health, physical fitness, anatomy abnormalities, motor abilities, sport specific skills, and psychological profile of the athlete that are in line with study findings.

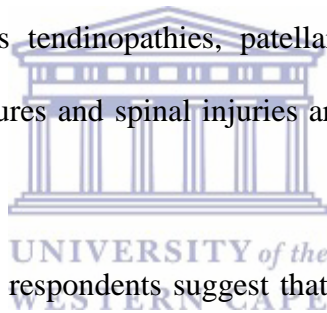
On extrinsic factors, athletes who had participated in a marathon were two times more likely (OR 2.366; 95%CI: 1.154-4.851, $p=.017$) to sustain an injury than those who had not. Athletes whose training covered more than 80 kilometres per week on average were two times more likely (OR 0.452; 95%CI: 0.229-0.891, $p=.020$) to be injured as opposed to those who trained for fewer than 80 kilometres per week. The average training time per week was also a risk factor, with those training for 10 hours or more per week being about three times more likely to be injured than those training for fewer than 10 hours. Bahr and Krosshaug (2005) gave examples of extrinsic factors that include exposure, environment, and protective equipment and intrinsic factors such as age, gender, body composition, health, physical fitness, anatomy abnormalities, motor abilities, sport specific skills, and psychological profile of the athlete that have been reported in this study.

The findings of this study are in line with (Parkkari et al, 2011) and Van Mechelen (2007) that reported the aetiological factors associated with running injuries include previous injury, lack of running experience, running to compete, and excessive weekly running distance.

5.3 Conclusion

Participants had sustained an injury during the training in Eldoret town. This means that injury occurs at higher percentage during the training time. In Kenya, majority of the marathon runners get injuries because of the bad roads, and poor training from coaches and majority of the runners train on their own hence neglecting all injuries and assumes to be minor.

There are several parts of the body that these athletes experienced pain but the most common parts of the body where injuries occur included the knee, achilles tendon, and hip. Generally, the knee and achilles tendon were the most prevalent injury reported. Iliotibial band syndrome (ITBS), plantar fasciitis, menisci injuries, tibial stress syndrome, Achilles tendinopathies, patellar tendinopathies, gluteus medius injuries, tibial stress fractures and spinal injuries are the common injuries to runners known worldwide.



The highest proportion of respondents suggest that the best method for management of injuries sustained included ice, heat and massage. All participants suggested at least one method of treatment implying that they have a degree of knowledge on appropriate types of treatment necessary to counter the injuries sustained. A number of preventive strategies that include warm up, stretching, regular cool down, correction of poor running style, adequate rehabilitation with sufficient recovery time, proprioceptive training, good training or competition surface, training using properly fitted footwear, sports first aid, sports massage, ankle bracing and taping, and adherence to the rules. But prevention is better than cure.

Athletes often rest once after training for a whole week, and practiced alternating long and short distances on different days. An higher percentage of the participants regularly engaged in stretching exercises both before and after training.

Participants whose running career spanned fewer than five years were three times less likely to be injured, compared to those whose tie spent running spanned more than 15 years. Therefore, the length of time spent running was a risk factor for these participants to sustain injuries. Age, gender, height and running pace were not determined to be risk factors for injury in these participants.

5.4 Recommendations

In relation to this study, there is a clear indication that the prevalence of injury was high among participants. In addition, there are many risk factors for injuries that urgently require interventions. Therefore, the study recommends that;

1. Injuries among marathon runners are a common phenomena and a concerted effort is needed to look for ways of mitigating these challenges.
2. The knowledge of runners in injury prevention is the key to reducing the prevalence of injuries and stakeholders must invest in two areas: firstly, creating awareness around the requirements for injury prevention, and secondly, when injuries do occur there is need to manage it appropriately in order to avoid injury recurrence.
3. The results of this study indicated an increase in injuries among marathon runners in African countries. This is even more evident in Kenya where the sport is popular. Therefore the study recommends appropriate measures of mitigating injuries, such as:

- (i) Ensuring the best use of orthotics made by orthotists.
- (ii) Ensuring runners seek or get the best medical assistance from specialists in the field of sports medicine and follow up treatment.
- (iii) Prepare prospective athletes by formulating the best training and strengthening programs
- (iv) Ensuring regular warm ups before, and cool down after, training or competition

5.5 Recommendations for further study

Further research should be carried out to:

- (i) Determine the optimum weekly training distance for prospective marathon runners.
- (ii) The best and state of art orthotics that work for different environments and situations.
- (iii) Determine the injury prevention strategy for marathon runners



REFERENCE

- "IAAF Competition Rules for Road Races" (2009). International Association of Athletics Federations. *International Association of Athletics Federations*. Retrieved 1 November 2010.
- ACSM. (2014). ACSM's Guidelines for Exercise Testing and Prescription. Baltimore, MD: American College of Sports Medicine.
- Alberts, J.L., Hirsch, J.R., Koop, M.M., Schindler, D.D., & Kana, D.E. (2015). Using accelerometer and gyroscopic measures to quantify postural stability. *Journal of Athletic Training*, 50(6), 578-588.
- Alonso, J.M, Edouard, P., Fischetto, G., Adams, B., Depiesse, F. & Mountjoy, M. (2012). Determination of future prevention strategies in elite track and field: analysis of Daegu 2011 IAAF Championships injuries and illnesses surveillance. *British Journal of Sports Medicine*. 46:505-514.
- Alonso, J.M., Junge, A., Renstrom, P., Engebretsen, L., Mountjoy, M., & Dvorak, J. (2009). Sports injuries surveillance during the 2007 IAAF World Athletics Championships. *Clinical Journal of Sport Medicine*. 19 (1):26–32.
- Alonso, J.M., Tscholl, P.M., Engebretsen, L., Mountjoy, M., Dvorak, J., & Junge, A. (2009). Occurrence of injuries and illnesses during the 2009 IAAF World Athletics Championships. *British Journal of Sports Medicine*. 44 (15):1100–5.
- American Academy of Orthopaedic Surgeons (2013). Running the risk of injury: orthopaedic surgeons survey says more prevention and care needed. *The Journal of Musculoskeletal Medicine*, p 523(2).

- Andersen, M.K., Hall, S.J., & Martin, M. (2009). *Sports injury management*.(2nd edition). Lippincott Williams and Wilkins. Baltimore, Maryland. pp. 2-58.
- Andrish, J.T., Bergfeld, J.A., & Walheim, J. (1974). A prospective study on the management of shin splints. *Journal of Bone & Joint Surgery, America*, 56:1697-700.
- Bahr, R. & Krosshaug T. (2005). Understanding the injury mechanisms: a key component to prevent injuries in sport. *British Journal of Sports Medicine*; 39:324-329.
- Bahr, R. (2009). No injuries, but plenty of pain? On the methodology for recording overuse symptoms in sports. *British Journal of Sports Medicine*; 43:966-72.
- Ballas, M., Tytko, J., Cookson, D. (2007). Common overuse running injuries: diagnosis and management. *American Family Physician*, 55:2475-80.
- Bleakley, C., McDonough S. & MacAuley, D. (2009). The use of ice in the treatment of acute soft-tissue injury: a systematic review of randomized controlled trials. *American Journal of Sports Medicine*.32:251-261.
- Brannigan, G.P., Kerin, A.E. & McEntee, M.J. (2010). Gilmore's groin repair in athletes. *Journal of Orthopedic & Sports Physical Therapy*; 30 (6): 329-32.
- Brill PA, Macera CA. (2005). The influence of running patterns on running injuries. *Sports Medicine*; 20:365-8.
- Brukner, P., & Khan, K. (2013). *Clinical sports medicine*. (2nd edition) Sydney, McGraw- Hill. pp. 372-391.

- Buchbinder, R. (2009). Plantar fasciitis. *The New England Journal of Medicine*, 350(21), 2159-2166.
- Buist, I., Bredeweg, S.W., Van Mechelen W. (2008). No effect of a Graded Training Program on the Number of Running-Related Injuries in Novice Runners; A Randomized Control Trial. *The American Journal of Sports Medicine*, 36.1: p33(7).
- Burfoot, A. (2007). The history of the marathon. *Sports Medicine*, 37(4–5):284–287
- Butler, R. J., Davis, I. S., & Hamill, J. (2006). Interaction of arch type and footwear on running mechanics. *The American Journal of Sports Medicine*, 34(12), 2008-2005.
- Cameron, K.L. (2010). Commentary: time for a paradigm shift in conceptualizing risk factors in sports injury research. *Journal of Athletic Training*, 45(1):58–60. doi:10.4085/1062-6050-45.1.58
- Chartered society of physiotherapy (2013). <http://www.csp.org.uk/your-health/what-physiotherapy>: 11 February, 2013.
- Clement, D., Taunton J, Smart G, et al. (2011). A survey of overuse injuries. *Physician and Sports Medicine* 9:47–58.
- Clement, D.B. (1982). The practical application of exercise training principles in family medicine. *Can Family Physician* 28:929-32.
- Clement, D.B., Taunton, J.E., Smart, G.W., & McNicol, K.L. (1981). A survey of overuse running injuries. *Physician Sports medicine*; 9:47-58.
- Contreras, B. (2013). Knee valgus (valgus collapse), glute medius strengthening, band hip abduction exercises, and ankle dorsiflexion drills. The Glute Guy. Retrieved March 29, 2016.

- Davis, I.S. (2014). The re-emergence of the minimal running shoe. *Journal of Orthopaedic & Sports Physical Therapy*, 44(10), 755-783.
- Derrick, T.R. (2004). The effects of knee contact angle on impact forces and accelerations. *Medicine & Science in Sports & Exercise journal*, 36(5):832-837
- Dicharry, J. (2012). *Anatomy for Runners: Unlocking Your Athletic Potential for Health, Speed, and Injury Prevention*. [E-reader version].
- Fields, K. (2011). Running Injuries-Changing Trends and Demographics. *Current Sports Medicine Reports*, 10(5): 241-309.
- Fredericson, M.I. & Misra, A. K. (2007). *Epidemiology and aetiology of marathon running injuries*. *Sports Medicine*, 34(13), 929-938.
- Fuller, C.W., Ekstrand, J., Junge, A., Andersen, T.E., Bahr, R., & Dvorac, J. (2006). Consensus statement on injury definitions and data collection procedure in studies of football (soccer) injuries. *Scandinavian Journal of Medicine and Science in Sports*, 16, 83-92.
- Fyfe, I. & Stanish, W.D. (1992). The use of eccentric training and stretching in the treatment and prevention of tendon injuries. *Clinical Sport Medicine*; 11(3):601-25
- Garber, C.E., Blissmer, B., Deschenes, M.R., Franklin, B.A., Lamonte, M.J., Lee, I., Nieman, D., & Swain, D.P. (2011). Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Medicine & Science in Sports & Exercise*, 43(7), 1334-1359.

- Giandolini, M., Arnal, P. J., Millet, G. Y., Peyrot, N., Samozino, P., Dubois, B., & Morin, J. (2013). Impact reduction during running: Efficiency of simple acute interventions in recreational runners. *European Journal of Applied Physiology*, 113(3), 599-609.
- Gilum, S. (2013,). Why do People Run? [Web log post].
- Glover B, Shepherd J, Florence Glover S. The runner's handbook. New York: Penguin Books, 2006:554–78.
- Gonser, S. (2013). How should my foot land when running.[video file].
- Grimes, D.A. & Schulz, K.F. (2012).*Descriptive studies: What they can do and cannot do. Epidemiology series. THE LANCET. Volume 359.*
- Hahn, J.U. (2005). The perfect form. Runner's World. Retrieved March 29, 2016.
- Healthline Medical Team. (2015). Body Maps: Foot. Healthline. Retrieved Nov 5, 2015.
- Hesar, N.G.Z., Van Ginckel, A., Cools, A., Peersman, W., Roosen, P., De Clercq, D., & Witvrouw, E. (2009). A prospective study on gait-related intrinsic risk factors for lower leg overuse injuries. *British Journal of Sports Medicine*, 43, 1057-1061
- History of the Marathon.(2012). <http://www.baa.org/races/bostonmarathon/boston-marathon-history.aspx>. Accessed October 26, 2012.
- Hreljac, A., & Ferber, R. (2006).A biomechanical perspective of predicting injury risk in running. *International Sports Medicine Journal*, 7(2):98-108.
- Jacobsson, J. (2012). Linköping University Medical Dissertations No. 1308.*Towards prevention of athletic injuries: Use of clinical epidemiology for evidence based-injury prevention*; pg 6.

- Hreljac, A., Ferber, R. (2006). A biomechanical perspective of predicting injury risk in Jacobs, S., Berson B. (2006). Injuries to runners: a study of entrants to a 10,000-meter race. *American Journal of Sports Medicine*, 14:151–5.
- James, S.J., Bates, B.T., & Osternig, L.R. (1978). Injuries to runners. *American Journal of Sports Medicine*; 6:40-50.
- Johansson, C. (1992). Knee extensor performance in runners: differences between specific athletes and implications for injury prevention. *Sports Medicine Journal*; 14(2):75-81
- Johnston, C.A.M., Taunton, J.E., Lloyd-Smith, D.R., McKenzie, D.C. (2003). Preventing running injuries: Practical approach for family doctors. *Canadian Family Physician*, 49; 1101-1109.
- Jones, B.H., Knapik, J.J. (2009). Physical training and exercise related injuries: surveillance, research and injury prevention in military populations. *Sports Medicine*, 27:111–25.
- Junge, A. & Dvorac, J. (2009). Soccer injuries – A review on the incidence and prevention.
- Junge, A., Engebretsen, L., Mountjoy, M.L., Alonso, J.M., Renstrom, P.A. & Aubry, M.J. (2009). Sports injuries during the Summer Olympic Games 2008. *American Journal of Sports Medicine*; 37(11):2165–72.
- Konin, J.G. & Nofsinger, C.C. (2007). Physical therapy management of athletic injuries of the hip. *Operation Techniques in Sports Medicine*; 15: 204-16.

- Koplan, J.P., Powell, K.E., Sikes, R.K., Shirley, R.W., & Campbell, C.C. (1982). An epidemiologic study of the benefits and risks of running. *Journal of the American Medical Association*, 248(23), 3118-8121.
- Krivickas L. (2007). Anatomical factors associated with overuse sports injuries. *Sports Medicine*, 24:132–45.
- Kvist M. (2009) Achilles tendon injuries in athletes. *Sports Medicine*, 18:173–201.
- Larson, M., Pearl, A. J., Jaffet, R., & Rudawsky, A., (2006). In D.J. Caine, C.G. Lysholm, J., Wiklander, J. Injuries in runners. *American Journal of Sports Medicine*, 15(2):168–71.
- Lepers, R, Sultana, F, Bernard, T, Hausswirth, C., & Brisswalter, J. (2010). Age related changes in triathlon performances. *International Journal of Sports Medicine*, 31, 251-256.
- Lorimer, A.V., Hume, P.A. (2014). Achilles tendon injury risk factor associated with running. *Medicine*, 14(10), 1459-1472.
- Lovelace, C. (2011). Nationwide Insurance Columbus Marathon hitting its milestones. Columbus Business First. <http://www.bizjournals.com/columbus/printedition/2011/08/12/nationwide>.
- Macera C, Pate R, Powell K, et al. (2009). Predicting lower-extremity injuries among habitual runners. *Archives of Internal Medicine*, 149:2565–8.
- Macera, C. (2012). Lower extremity injuries in runners: advances in prediction. *Sports Medicine*, 13:50–7.
- Macera, C.A., Pate, R.R, Woods, J., Davis, D.R, Jackson, K.L. (1991). Post race morbidity among runners. *American Journal of Preventive Medicine*, 7(4):194–198

- Macera, C.A., Pate, R.R., Powell, K.E., Jackson, K.L, Kendrick, J.S. & Craven T.E. (1989). Predicting lower-extremity injuries among habitual runners. *Archives of Internal Medicine Journal*, 149:2565-8
- Macera, C.A., Pate, R.R., Powell, K.E., Jackson, K.L., Kendrick, J.S., & Craven, T.E. (1989). Predicting lower-extremity injuries among habitual runners. *Archives of Internal Medicine Journal*, 149:2565-8.
- Macera, C.A., Pate, R.R., Powell, K.E., Jackson, K.L., Kendricks, J.S., & Craven, T.E. (1989). Predicting lower extremity injuries among habitual runners. *Archives of Internal Medicine Journal*, 149(11), 2565-2568.
- Macintyre, J., Taunton, J., Clement, D., et al. (2011). Running injuries: a clinical study of 4,173 cases. *Clinical Journal of Sports Medicine*, 1:81–7.
- Maffey, L. & Emery, C. (2007). What are the risk factors for groin strain injury in sport? A systematic review of the literature. *Sports Medicine*; 37(10): 881-94.
- Magness, S., Ambegaonkar, J.P., Jones, M.T., & Caswell, S.V. (2011). Lower Extremity Stress Fracture in Runners: Risk Factors and Prevention. *Human Kinetics*, 16(4), 11-15.
- Magrum, E. & Wilder, R.P. (2010). Evaluation of the Injured Runner. *Clinical Sports Medicine*, 29, 331-345
- Malvankar, S. & Khan, W.S. (2011). Evolution of the Achilles tendon: the athlete's Achilles heel? *The Foot*, 21(4), 193-197.
- Marc, C. (2011). Elastic Recoil. In Natural Running Center. Retrieved April 24, 2015.
- Marcus, M.B. (2014). What Makes Kenya's Marathon Runners The World's Best?. In NPR. Retrieved April 17, 2015.

- Marti B, Vader J, Minder C. (2008) On the epidemiology of running injuries: the 2009 Bern Grand-Prix study. *American Journal of Sports Medicine*, 16:285–93.
- McCormick, F., Nwachukwu, B.U., & Provencher, M.T. (2012). Stress Fractures in Runners. *Clinical Journal of Sports Medicine*, 31, 291-306.
- McDougall, C. (2009). Born to run: A hidden tribe, superathletes, and the greatest race the world has never seen. New York, NY: Vintage Books.
- McGee, B. (2013). Run Transformation: How to Position your Upper Body While Running. [video file].
- McKean, K.A., et al. (2006). Musculoskeletal injury in the masters runners. *Clinical Journal of Sport Medicine*, 16, 149-54.
- McKinley, M. & O'Loughlin, V.D. (2012). Human Anatomy (3rd Ed.). New York, NY: McGraw-Hill.
- Moen, M.H., Tol, J.L., Weir, A., Steunebrink, M., & De Winter, T.C. (2009). Medial tibial stress syndrome: a critical review. *Clinical Journal of Sports Medicine*, 39(7), 523-546.
- Mugenda, O.M. & Mugenda, A.G. (2013). Research methods. Quantitative and qualitative approaches. Nairobi. Acts Press.
- Muscolino, J. E. (2014). Overpronation: Pronation and supination are normal healthy motions of the foot that occur between the tarsal bones.(EXPERT CONTENT: Body mechanics). *Massage Therapy Journal*, 53(3), 16.
- Neely F.G. (2008). Intrinsic risk factors for exercise-related lower limb injuries. *Sports Medicine*, 26:253–63.
- Nelson, N.G., Reid, J.P., Roberts, K.J., & McKenzie, L.B., (2012). Track-related injuries in children and adolescents treated in United States emergency

- departments from 2011 through 2008. *The Physician and Sports medicine*. *The Physician and Sports medicine*; 40(2):56–63.
- Nielsen, R.O., Buist, I., Sorensen, H., Lind, M., Rasmussen, S. (2012) Training errors and running related injuries: a systematic review. *International Journal of Sports Physical Therapy* 7(1):58–75
- Nigg, B.M, Emery, C., Hiemstra, L.A. (2006). Unstable shoe construction and reduction of pain in osteoarthritis patients. *Medicine & Science in Sports & Exercise*, 38(10):1701–1708 00005768-200610000-00003 [pii]
- Nigg, B.M. (2009). Biomechanical considerations on barefoot movement and barefoot shoe concepts. *Footwear Science*, 1(2):73–79
- Nigg, B.M. (2010). *Biomechanic of sport shoes, vol 1*. University of Calgary, Calgary
- Nigg, B.M., Baltich, J., Hoerzer, S., Enders, H. (2015). Running shoes and running injuries: myth busting and a proposal for two new paradigms: ‘preferred movement path’ and ‘comfort filter’. *British Journal of Sports Medicine*, 49(20):1290–1294. doi:10.1136/bjsports-2015-095054
- Nikooyan, A.A, Zadpoor, A.A. (2012). Effects of muscle fatigue on the ground reaction force and soft-tissue vibrations during running: a model study. *IEEE Transaction on Biomedical Engineering*, 59(3):797–804. doi:10.1109/TBME.2011.2179803
- Noakes, T. (2013). *The lore of running*. Leeds, UK: Human Kinetics.
- Ogon M, Aleksiev A, Pope M, et al. Does arch height affect impact loading at the lower back level in running? *Foot Ankle Int*2009;20:263–6.

- Ogwumike, O.O. & Adeniyi, A.F. (2010). *The SPLASH/ICPC integrity marathon in Ibadan, Nigeria: incidence and management of injuries and marathon-related health problems.*
- Olson, T.P., Taylor, B.J., Johnson, B.D. (2011). The two-hour marathon: the importance of breathing economy. *Journal of Applied Physiology* 110(1):291
- Paluska, S.A. (2005). *An Overview Of Hip Injuries In Running.* *Sports Medicine*; 35 (11): 991-1014.
- Parker, R. (2012). Record participation in monumental marathon. WIBC Indy's News Center. <http://www.wibc.com/news/story.aspx?ID=1809608>
- Parkkari, J. Taanila, H., Suni, J., Mattila, V. M., Ohrankämnen, O., Vuorinen, P., Kannus, P. & Pihlajamäki, H. (2011). Neuromuscular training with injury prevention counselling to decrease the risk of acute musculoskeletal injury in young men during military service: a population-based, randomised study. *BMC Medicine*, 9:35
- PegasusRunning. (2014, April 3). ESPN Sports Science: Pegasus and Meb. [video file]
- Perkins, K.P., Hanney, W.J., & Rothschild, C.E. (2014). The risks and benefits of running barefoot or in minimalist shoes: a systematic review. *Sports Health*, 6(6), 475-479.
- Peterson, D. (2010). Why do athletes train at high altitude? Livestrong. Retrieved April 17, 2015.
- Pharaoh, H. & Assuman, N. (2011). Factors influencing the implementation of soccer injury prevention strategies in Rwanda. *African Journal for Physical, Health Education, Recreation and Dance (AJPHERD)*, 17(1):96-102.

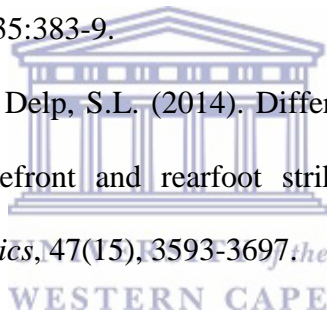
- Polit, D.F., Beck, C.T., Hungler, B.P (2011). *Essentials of Nursing Research: Methods, Appraisal, and Utilization* 5th edition. Philadelphia: Lippincott.
- Pontzer, H., Holloway, 4th, John H, Holloway, 3rd., John H, Raichlen, D. A., & Lieberman, D. E. (2009). Control and function of arm swing in human walking and running. *Journal of Experimental Biology*, 212(4), 523-534.
- Pope, R.P. & Herbert, R.D, Kirwan, J.D. (1998). Effects of flexibility and stretching on injury risk in army recruits. *Australian Journal of Physiotherapy*; 44:165-72
- Quinn, A. (2010). Hip and Groin Pain: Physiotherapy and Rehabilitation Issues. *The Open Sports Medicine Journal*, 4, 93-107.
- Race History. (2011). <http://www.chicagomarathon.com/press-center/race-history/>. Accessed October 28, 2012
- Rasmussen, C.H., Nielsen, R.O., Juul, M.S., Rasmussen, S. (2013). Weekly running volume and risk of running-related injuries among marathon runners. *Internal Journal of Sports Physical Therapy*, 8(2):111–120
- Rauh, M.J., Koepsell, T.D., Rivara, F.P., Margherita, A.J., Rice, S.G. (2005). Epidemiology of Musculoskeletal Injuries among High School Cross-Country Runners. *American Journal of Epidemiology*, Vol.163, No2: 151-159
- Rauh, M.J., Margherita, A.J., Rice, S.G. (2000). High school cross country running injuries: a longitudinal study. *Clinical Journal of Sports Medicine*, 10: 110-116

- Rebella, G.S., Edwards, J.O, Greene, J.J., Hussein, M.T, & Brousseau, D.C. (2008). A prospective study of injury patterns in high school pole vaulters. *American Journal of Sports Medicine*. 36 (5):913–20.
- REI staff, (2016). Running shoes: How to choose. REI, Retrieved April 4, 2016).
- running. *International Sports Medicine Journal*, Vol.7, No.2:98-108.
- Satterthwaite, P., Norton, R., Larmer, P., Robinson, E. (1999) Risk factors for injuries and other health problems sustained in a marathon. *British Journal of Sports Medicine*, 33(1):22–26
- Sewczak-Claude, G. (2016). (personal communication, March 29,2016)
- Shrier, I. (1999). Stretching before exercise does not reduce the risk of local muscle injury: a critical review of the clinical and basic science literature. *Clinical Journal of Sports Medicine*; 9:221-7
- Sultana, F., Brisswalter, J., Lepers, R., Hauswirth, C., & Bernard, T. (2008). Effects of age and gender on Olympic triathlon performances. *Science Sports*, 23, 130-135.
- Tanaka, H., & Seals, D.R. (2008). Endurance exercise performance in masters athletes: ageassociated changes and underlying physiological mechanisms. *Journal of Physiology*, 586(1):56-63.
- Taunton, J.E., Ryan, M.B., Clement, D.B. (2013). A prospective study of running injuries: the Vancouver Sun Run In Training clinics. *British Journal of Sports Medicine*, 37: 239-244.
- Taunton, J.E., Ryan, M.B., Clement, D.B., McKenzie, D.C, Lloyd-Smith, D.R., Zumbo, B.D. (2003). A prospective study of running injuries: the Vancouver Sun Run “In Training” clinics. *British Journal of Sports Medicine*, 37(3):239–244

- Taunton, J.E., Ryan, M.B., Clement, D.B., McKenzie, D.C., Lloyd-Smith, D.R., Zumbo, B.D. (2012). A retrospective case-control analysis of 2012 running injuries. *British Journal of Sports Medicine*, 36.2: p95(7).
- Taunton, J.E., Ryan, M.B., Clement, D.B., McKenzie, D.C., Lloyd-Smith, D.R., Zumbo, B.D. (2003). A prospective study of running injuries: the Vancouver Sun Run “In Training” clinics. *British Journal of Sports Medicine*, 37:239-44.
- Van der Worp, Maarten P, van der Horst, N., de Wijer, A., Backx, F. J. G., & Nijhuis-van der Sanden, Maria W. G. (2012). Iliotibial band syndrome in runners: A systematic review. *Sports Medicine Journal*, 42(11), 969-992.
- Van Gent, R.N., Siem, D., van Middelkoop M., van Os, A.G., Bierma-Zeinstra, S.M., Koes, B.W. (2007) Incidence and determinants of lower extremity running injuries in long distance runners: a systematic review. *British Journal of Sports Medicine*, 41(8):469–480. doi:10.1136/bjism.2006.033548 (discussion 480)
- Van Mechelen (2012). Running injuries: a review of the epidemiological literature. *Sports Medicine*, 14:320–35.
- Van Mechelen W. (2005). Can running injuries be effectively prevented? *Sports Medicine Journal*, 19:161–5.
- Van Mechelen, W., Hlobil, H., & Kemper H.C. (2012). Incidence, severity, aetiology and prevention of sports injuries. *A review of concepts. Sports Medicine Journal*, 14(2):82–99.
- Van Middelkoop M., Kolkman, J., van Ochten, J., Bierma-Zeinstra, S.M., Koes, B.W. (2007). Course and predicting factors of lower-extremity injuries after

- running a marathon. *Clinical Journal of Sports Medicine*, 17(1):25–30.
doi:10.1097/JSM.0b013e3180305e4d
- Van Middelkoop, M., Kolkman, J., Van Ochten, J., Bierma-Zeinstra, S.M.A., Koes, B.W. (2007). Prevalence and incidence of lower extremity injuries in male marathon runners. *Scandinavian Journal of Medical Science and Sports*, 18:140-144.
- Wallman, H.W. (2009). Introduction to observational gait analysis. Home health care management and practice, 22(1), 66-68.
- Walter, S.D, Hart, L.E, McIntosh, J.M., Sutton, J.R. (1989) The Ontario cohort study of running-related injuries. *Archives of Internal Medicine Journal*, 149(11):2561–2564
- Walter, S.D., Hart, L.E, McIntosh, J.M, et al. (2009). The Ontario cohort study of running-related injuries. *Archives of Internal Medicine journal*, 149:2561–4.
- Warner, G. (2013). How One Kenyan Tribe Produces The World's Best Runners. In NPR. Retrieved April 17, 2015.
- Warren, B.L, Jones, C.J. (1987) Predicting plantar fasciitis in runners. *Medicine & Science in Sports & Exercise*, 19(1):71–73
- Wehrlin, J.P., Zuest, P., Hallen, J., & Mari, B. (2006). Live high-train low for 24 days increases hemoglobin mass and red blood cell volume in elite endurance athlete. *Journal of Applied Physiology*, 100(6), 1938-1945.
- Wen, D., Puffer, J., Schmalzried, T. (2007). Lower extremity alignment and risk of overuse injuries in runners. *Medicine & Science in Sports & Exercise*, 29:1291–7.
- Wen, D.Y. (2007). Risk factors for overuse injuries in runners. *Current Sports Medicine Reports* 6(5):307–313

- Willems, T.M. & Ridder, R.D.; Rosen, R. (2012). The effect of fatigue on plantar pressure distribution during running in view of running injuries. *Journal of Foot & Ankle Research*, 5(Suppl 1). doi:10.1186/17571146-5-S1-P33
- Williams, 3rd, D S Blaise, Tierney, R. N., & Butler, R. J. (2014). Increased medial longitudinal arch mobility, lower extremity kinematics, and ground reaction forces in high-arched runners. *Journal of Athletic Training*, 49(3), 290-296.
- Yeung, E.W. & Yeung, S.S. (2001). A systematic review of interventions to prevent lower limb soft tissue running injuries. *British Journal of Sports Medicine*; 35:383-9.
- Yong, J.R., Silder, A., & Delp, S.L. (2014). Differences in muscle activity between natural forefoot and rearfoot strikers during running. *Journal of Biomechanics*, 47(15), 3593-3697.



APPENDICES

APPENDIX 1: QUESTIONNAIRE

INSTRUCTIONS:

- All information provided in the questionnaire will be kept confidential.
- Please be truthful and honest in completing the questionnaire.

Please select one or more responses by using a tick (✓).

Socio-Demographic data:

1. Age..... (yrs)

2. Gender.....

3. Weight..... (kg)

4. Height..... (ft)

5. BMI.....



Objective Assessment

1. Leg length: Left..... Right.....

2. ROM: Hip Flexion: Left..... Right.....

Extension: Left..... Right.....

Abduction: Left..... Right.....

Adduction: Left..... Right.....

Int. Rotation: Left..... Right.....

Ext. Rotation: Left..... Right.....

3. ROM: Knee: Flexion: Left..... Right.....

Extension: Left..... Right.....

Current Medical history:

1. Do you suffer from any chronic diseases?

- Yes No

2. If yes, please tick off the correct chronic diseases?

- High Blood Pressure Cholesterol Osteoarthritis
 Diabetes Kidney Failure Others.....

3. What was your reason to start running?

- To get healthy To lose weight or manage weight control To decrease stress levels
 To improve self-esteem and confidence To start a sport as running is affordable and convenient

Running history:

1. How long have you been running as a sport?

- Less than 1 year Less than 5 years
 Less than 10 years More than 10 years

2. How many days per week do you run?

- Everyday Three times per week Once a week

3. What is the normal running pace during your weekly training?

- Less than 3 min per km Between 3-5 min per km

- Between 5-7 min per km Between 7-10 min per km

4. What is the average distance that you run weekly?

- 0-32 km 32-50km 50-80km

- 80-100km more than 100km

5. Have you ever participated in a marathon?

- Yes No

If yes, please answer questions from 6 to 10 if applicable.

UNIVERSITY of the

6. In how many half (21.1 km) marathons did you participate annually?

.....

7. What is your average 21.1 km time?

.....

8. In how many 42.2 km marathons did you participate annually?

.....

9. What is your average 42.2 km time?

.....

10. What is your running pace during a race or marathon?

.....

11. What is your average running time during a training per week?

- 3-5 hours per week 5-7 hours per week
- 7-10 hours per week more than 10 hours per week

12. How often do you rest during your after training per week?

- Every second day Every third day Once a week

13. What type of training do you do?

- Alternate long and short distances on different days
- Almost the same distance every day
- Alternate days of high and low effort
- Lots of hills
- Interval training (multiple runs of short duration with little rest between bursts)
- Other



14. Do you regularly engage in a stretching programme especially during training?

- Only before training Before and after training Only after training
- Only when I have pain Never

15. If you stretch, how long do you hold each stretch?

- Less than 10 secs Less than 20 secs
- Less than 30 secs At least a minute Do not stretch at all

16. Do you engage in a regular strengthening programme?

- Yes No

17. If yes, how often do you engage in the strengthening programme?

- Once a week Twice a week Three times a week Everyday

Running environment:

1. What type of terrain do you practice and run on?

- Flat surfaces Uneven slopes and surfaces Mostly hills

2. What type of surface do you practice and run on?

- Grass Soft surfaces e.g. sea sand Hard surfaces e.g. gravel road,
 tar, Asphalt Artificial track

3. How long do you run in a pair of shoes?

- 3-6 months 6-12 months 12- 18 months 18-24 months More than

2 years

4. How many pairs of shoes do you buy per year?

- 1 pair 2 pairs 3 pairs 4 pairs

5. Do you use orthotics? (Shoe inserts used to correct foot alignment)

- Yes No

6. If yes, who prescribed the orthotics to you?

- Orthopaedic surgeon Physiotherapist Massage therapist
 Podiatrist/ foot specialist Others.....

7. How long are you wearing the orthotics?

- 0-6 months 6-12 months 12- 18 months 18-24 months
 Longer than 2 years

8. Do you have a deformity in your feet?

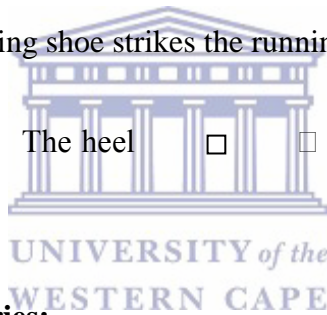
If yes, which of the following deformity do you have?

- Flat feet Normal arches High arches

9. What part of your running shoe strikes the running surface first?

- The whole foot The heel The toes and ball of foot

Others.....



History of running injuries:

1. Have you ever experienced pain during your running career?

- Yes No

2. If yes, in which areas of the body did you experience pain? Please tick appropriate box.

- Back Hip Groin Front thigh Back thigh ITB
 Knee Achilles tendon Ankle Foot Calf Buttock
 Shin bone

3. Have you ever sustained an injury during running?

Yes No

If you have sustained an injury during running, please answer questions from 4 to 12.

4. Which of the following injuries did you sustain during running?

Muscle strain Ligament sprain Muscle, ligament or meniscus tear
Stress fracture Fracture

5. How long does it take you to recover from the running injuries?

Few days 1-3 weeks 4-8 weeks more than 8 weeks

6. Does the running injury re-occur later in the training?

Yes No



7. Did you seek medical assistance for your running injuries?

Yes No

8.1 Who did you seek medical assistance from?

Doctor Physiotherapist Massage therapist Podiatrist/ foot specialist
 Orthopaedic surgeon Chiropractor

8.2 Did you have any operations due to running injuries?

Yes No

8.3 If yes, specify what body structure was operated?

.....

8.4 Do you have any metal implants inserted due to operations?

Yes No

9. What treatment works best for your injuries/symptoms?

Medication Electrotherapy (Ice and heat) and massage
 Stretching/Strengthening exercises Orthotics Change in
 training routine Reducing running distance Change in running
surfaces Change in running shoes Rest Other

10. Which of the following do you feel can be associated with any of your running injuries?

Excessive running distances Sudden change in training routine A
change in running surface Training on hills Race training/ too
 many races Interval training/ speed work Wrong shoes, new shoes,
Worn out shoes A biomechanical abnormality such as bow
legs, knock knees etc No cause that I could determine

11. Which type of pain do you experience when having the running injury?

Dull pain Sharp, intense pain Continuous pain Throbbing
pain
 Burning pain, numbness or pins and needles

12. Which of the following describes your pain?

Pain during workout but after warming up it subsides
 Pain before and after the training session

- Pain while sleeping and brings discomfort
- The pain is so bad that I cannot run at all or have to stop running
- Pain after running downhill



APPENDIX II (a): CONSENT FORM



UNIVERSITY OF THE WESTERN CAPE
Private Bag X 17, Bellville 7535, South Africa

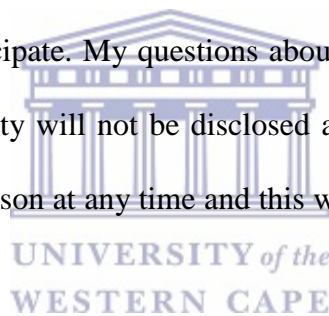
Tel: +27 21-9592542, Fax: 27 21-9591217

E-mail: mwarner@uwc.ac.za

Informed consent

Title of Research Project: **Factors associated with injuries among marathon runners in Eldoret, Kenya.**

The study has been described to me in a language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.



Participant's name.....

Participant's signature.....

Witness.....

Date.....

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: **Fred Kiplagat Chesergon**

Moi University, School of Medicine,

P.o. Box 4606-30100, Eldoret, Kenya.

Telephone: Tel: 254-(053)-2063013

Cell: +254 722808046

Fax: +254-053-33041

Email: fredsergon@gmail.com





CHUO KIKUU CHA WESTERN CAPE

SLP X 17, Bellville 7535, Afrika Kusini

Simu: +27 21-959 2542, Fax 27 21-959 1217

Baruapepe: mwarner@uwc.ac.za

APPENDIX 11 (b): FOMU YA UIDHINISHO

Jina la mradi wa utafiti: **Mambo yanayochangia majeraha kwa wanariadha wa masafa marefu wanaoishi na kufanya mazoezi karibu na mji wa Eldoret, Kenya.**

Utafiti umeelezewa kwangu katika lugha ambalo linaeleweka vizuri na nimekubali kushiriki kwa utafiti huu. Maswali yangu kuhusu utafiti yamejibiwa vilivyo. Nimeelewa kwamba kushiriki kwangu ni hiari na pia kuna uhuru wa kuchagua kuendelea au kutoka utafiti wakati wowote bila kutoa sababu na bila hofu ya matokeo mabaya au kupoteza faida. Nimeelewa kwamba utambulisho wangu hautakuwa wazi kwa mtu yeyote.

Jina la mshiriki.....

Sahihi ya mshiriki.....

Mshahidi.....

Tarehe

APPENDIX 1II (a): INFORMATION SHEET



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-9592542, Fax: 27 21-9591217

E-mail: mwarner@uwc.ac.za

INFORMATION SHEET

Project Title: Factors associated with injuries among marathon runners in Eldoret, Kenya.

What is this study about?

This is a research project being conducted by **Fred Kiplagat Chesergon** at the University of the Western Cape. We are inviting you to participate in this research project as a suitable candidate because you are one of the registered marathon runners training in one of the camps within Eldoret town. The purpose of this research project is to investigate the factors associated with injuries among marathon runners in Eldoret, Kenya, where marathon runners are dropping in large numbers every year because of injuries.

What will I be asked to do if I agree to participate?

You will be asked to complete a self- administered questionnaire regarding personal data, medical history, history of running injuries, running experience and running environment. Completion of this questionnaire will take approximately 25 minutes and will be conducted in your training camp. Each participant will be assisted by a research assistant to fill the questionnaire accordingly. A summary of the questions in

the questionnaire consists of medical history (Do you suffer from any chronic diseases?), history of running injuries (What are the types of injuries did you sustain during running?), running experience (How long have you been running in marathon?), running environment (What type of surface do you practice and run on?)

Would my participation in this study be kept confidential?

The researcher undertakes to protect your identity and the nature of your contribution. To ensure your anonymity, the researcher will do his best to keep your personal information confidential. To help protect your confidentiality, the questionnaire will not require you to disclose your names because participants will remain anonymous. The results will also be kept confidential as the researcher will be the only person to view them. If a report or article about this research project will be written, your identity will be protected to the maximum extent possible. The researcher will ensure that a code will be placed on the data forms and other collected data and a use of identification key to enable the researcher link your survey to your identity and to see that the researcher will have access to identification key.

To ensure your confidentiality, the researcher will keep the data in locked filing cabinets and storage areas using identification codes only on data forms and using password protected computer files.

What are the risks of this research?

There may be a number of risks from participating in this research study such as physical, psychological, social or emotional but where necessary, an appropriate referral will be made to a suitable professional for further assistance or intervention.

What are the benefits of this research?

The benefits to you include the acquiring of knowledge of various factors resulting in injuries in runners and this information will assist in designing a preventative programme to prevent future complications. This information will assist you to be independent in the management of future injuries.

It is the hope of the researcher that in the future, other people might benefit from this study through improved understanding of various factors resulting in running injuries among marathon runners.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify. If any participant sustains an injury during the study period, a referral to a health professional for further management will be done and an early termination of the subject's participation in the study will take effect if necessary.

What if I have questions?

This research is being conducted by **Fred Kiplagat Chesergon**, a master's physiotherapy student at the University of the Western Cape. If you have any questions about the research study itself, please contact:

Fred Kiplagat Chesergon

Moi University, School of Medicine

P.O Box 4606-30100

Eldoret, Kenya.

Cell phone: +254 722808046

Email: fredsergon@gmail.com

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Dr. Nondwe Mlenzana

Head of Department: Physiotherapy

University of the Western Cape

Private Bag X17

Bellville 7535

nmlenzana@uwc.ac.za

Prof José Frantz

Dean of the Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za This research has been approved by the University of the Western Cape's Research Ethics Committee. (REFERENCE NUMBER: HS 16/3/38)



CHUO KIKUU CHA WESTERN CAPE

SLP X 17, Bellville 7535, Afrika Kusini

Tel 27 21-959 2542, Fax 27 21-959 1217

Baruapepe: mwarner@uwc.ac.za

**APPENDIX 111 (b): KITAMBULISHO: KARATASI CHA TAARIFA
(TRANSLATED INFORMATION SHEET)**

Mradi: Mambo yanayochangia majeraha kwa wanariadha wa masafa marefu wanaoishi na kufanya mazoezi karibu na mji wa Eldoret, Kenya.

Utafiti huu unahusu nini?

Huu ni mradi wa utafiti unaofanywa na **Fred Kiplagat Chesergon** kutafuta shahada ya uzamili katika viungo vya mwili (MSc viungo vya mwili) katika Chuo Kikuu cha Western Cape, Afrika Kusini.

Ninakukaribisha ushiriki katika mradi huu wa utafiti kwa sababu wewe ni moja wa wanariadha wanaoshiriki kwa mbio za masaba marefu na unaishi na kufanya mazoezi karibu na mji wa Eldoret. Madhumuni ya mradi huu ni kuchunguza mambo yanayochangia majeraha yanayotatiza wanariadha wa masafa marefu.

Matokeo ya utafiti yataweza kutoa mapendekezo kwa Serikali ya Kenya kutekeleza kikamilifu vizuizi kwa mambo yanayochangia majeraha katika wanariadha wa masafa marefu.

Nitaulizwa kufanya nini nikikubali kushiriki?

Utaulizwa kushiriki katika mahojiano kwa kujibu maswali kuhuzu maisha yako, magonjwa mbali mbali, maisha yako kama mwanariadha wa masafa marefu na masingira unayofanyia mazoezi. Mahojiano yatachukua muda isiozidi dakika ishirini na tano (25) na yatafanyika katika kambi yenu.

Je, ushiriki wangu katika utafiti huu utawekwa siri?

Mtafiti mkuu ataweka maelezo yako binafsi kuwa ya siri. Kusaidia kulinda maelezo yako, hatua zifuatavyo zitachukuliwa; maswali na majibu yako ya siri hayatakuwa na majina yako, badala ya hiyo, alama ya siri itawekwa. Majibu yote yatakuwa chini ya ulinzi wa mtafiti mkuu; yeye pekee ataweka ufunguo ya mahali pa kuwekwa na nambari ya siri ya kufungua komputa.

Je, hatari ya utafiti huu ni nini?

Ikiwa hatari yeyote itatokea, kwa mfano mshiriki kuwa mgonjwa, kuzidiwa na ujungu ya majeraha au kusumbuka kiakili wakati anajibu maswali, yeye atatumwa kuona mshauri, daktari au mtaalamu anayehusika ili apate usaidizi au matibabu maalum.

Faida ya utafiti huu ni nini?

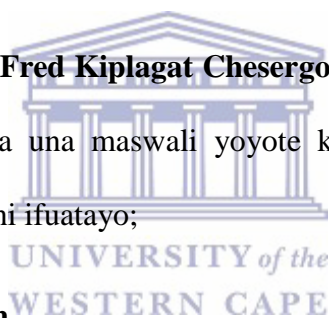
Matokeo ya utafiti huu yatasaidia mwanariadha binafsi kuelewa zaidi chanzo cha majeraha kwa wanariadha wa masafa marefu wanaoishi mji wa Eldoret na vitongoji vyake. Pia mwanariadha atapata elimu ya jinsi ya kujitibu na kuzuia majeraha hayo mwenyewe bila kusimamiwa na Kocha au daktari. Matokeo ya utafiti huu pia itawezesha serikali ya Kenya kuwa na mpango maalum ya kuzuia majeraha kupitia Kocha, madaktari na wote wanaohusika na mafunzo au matibabu ya wanariadha wa masafa marefu.

Je, ni muhimu nishiriki katika utafiti huu? na je, nikitaka kuacha nitakubaliwa wakati wowote ?

Ushirika wako katika utafiti huu ni hiari kabisa. Unaweza kuchagua kushiriki tangu mwanzo mpaka mwisho au unaweza kuondoka wakati wowote. Kuacha kushiriki haitasababisha adabu yoyote au hasara ya faida ambayo una haki yake. Uamuzi ni wako. Pia, kushiriki katika utafiti huu haitaharibu uhusiano wako wa sasa au baadaye na Chuo Kikuu cha Western Cape.

Nikiwa na maswali nitauliza nani?

Utafiti huu unafanywa na **Fred Kiplagat Chesergon** mwanafunzi katika Chuo Kikuu cha Western Cape. Kama una maswali yoyote kuhusu utafiti yenyewe, tafadhali wasiliana nami kwa anwani ifuatayo;



Fred Kiplagat Chesergon.

Chuo Kikuu cha Moi

Idara ya Viungo Vya Mwili na Matibabu

SLP 4606-00100, Eldoret

Baruapepe: fredsergon@gmail.com

Je, ukiwa na maswali yoyote kuhusu utafiti huu na haki zako kama mshiriki au kama unataka kujulisha matatizo yoyote, tafadhali wasiliana na;

Dr. Nondwe Mlenzana

Mkuu wa Idara ya Viungo Vya Mwili

Chuo Kikuu cha Western Cape

SLP X17

Bellville 7535

Baruapepe: nmlenzana@uwc.ac.za

Prof. Jose Frantz

Mkuu wa idara ya Afya na Masingira ya Jamii

Chuo Kikuu cha Western Cape

SLP X17

Bellville 7535

Baruapepe: chs-deansoffice@uwc.ac.za

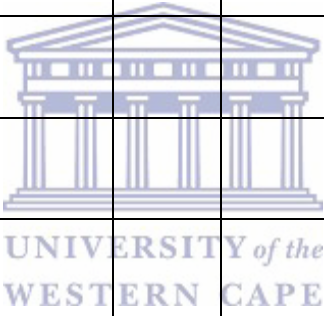


Utafiti huu umepitishwa na kamati inayosimamia utafiti katika Seneti na Kamati ya

Maadili ya Chuo Kikuu cha Western Cape.

APPENDIX v: INJURY REPORT FORM

| Date | Month | Initial injury | Recurrent injury | Type of injury | Mechanism of injury | Location of injury | T days missed | C days missed |
|------|-------|----------------|------------------|----------------|---------------------|--------------------|---------------|---------------|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |



KEYS

T days missed= Training days missed due to injury

C days missed= Competition days missed due to injury

APPENDIX XI: LETTER TO THE CAMP MANAGEMENT

The Manager,
Iten Athletic training camp,
P.O. Box 200-30100,
ELDORET.

Dear Sir,

RE: Requesting for permission to conduct a research study in your camp.

I am **Fred KiplagatChesergon**, a physiotherapist pursuing a Postgraduate Degree (Masters) in Physiotherapy at the University of the Western Cape, South Africa. The requirement of this postgraduate degree is to conduct and implement a research study in a field of special interest, and my study involves running injuries. The title of my study is **Factors associated with injuries among marathon runners training in five athletic training camps in Eldoret, Kenya.**

The purpose of this study is to investigate the various predisposing factors that are associated with injuries affecting marathon runners. The study will be of great significance to the athletic training camps because it will provide information to the runners, coaches and their medical team with adequate knowledge and guidelines to prevent running injuries and allowing each runner to be independent in the management of injuries.

I kindly request for your permission to conduct my research study. The information gathered from the participants will be kept strictly confidential and their identity will be anonymous.

Yours faithfully,

Fred KiplagatChesergon

fredsergon@gmail.com

APPENDIX XII: LETTER TO ATHLETICS KENYA FEDERATION

The Chairman, Athletics Kenya Federation,

P.O. Box 4622-00100 GPO Nairobi, Kenya

Dear sir,

RE: Requesting for permission to conduct a research study.

I am **Fred Kiplagat Chesergon**, a physiotherapist pursuing a Postgraduate Degree (Masters) in Physiotherapy at the University of the Western Cape, South Africa. The requirement of this postgraduate degree is to conduct and implement a research study in a field of special interest, and my study involves running injuries. The title of my study is **Factors associated with injuries among marathon runners training in five athletic training camps in Eldoret, Kenya**

The purpose of this study is to investigate the various predisposing factors that are associated with injuries affecting marathon runners. The study will be of great significance to the athletic training camps because it will provide information to the runners, coaches and their medical team with adequate knowledge and guidelines to prevent running injuries and allowing each runner to be independent in the management of injuries.

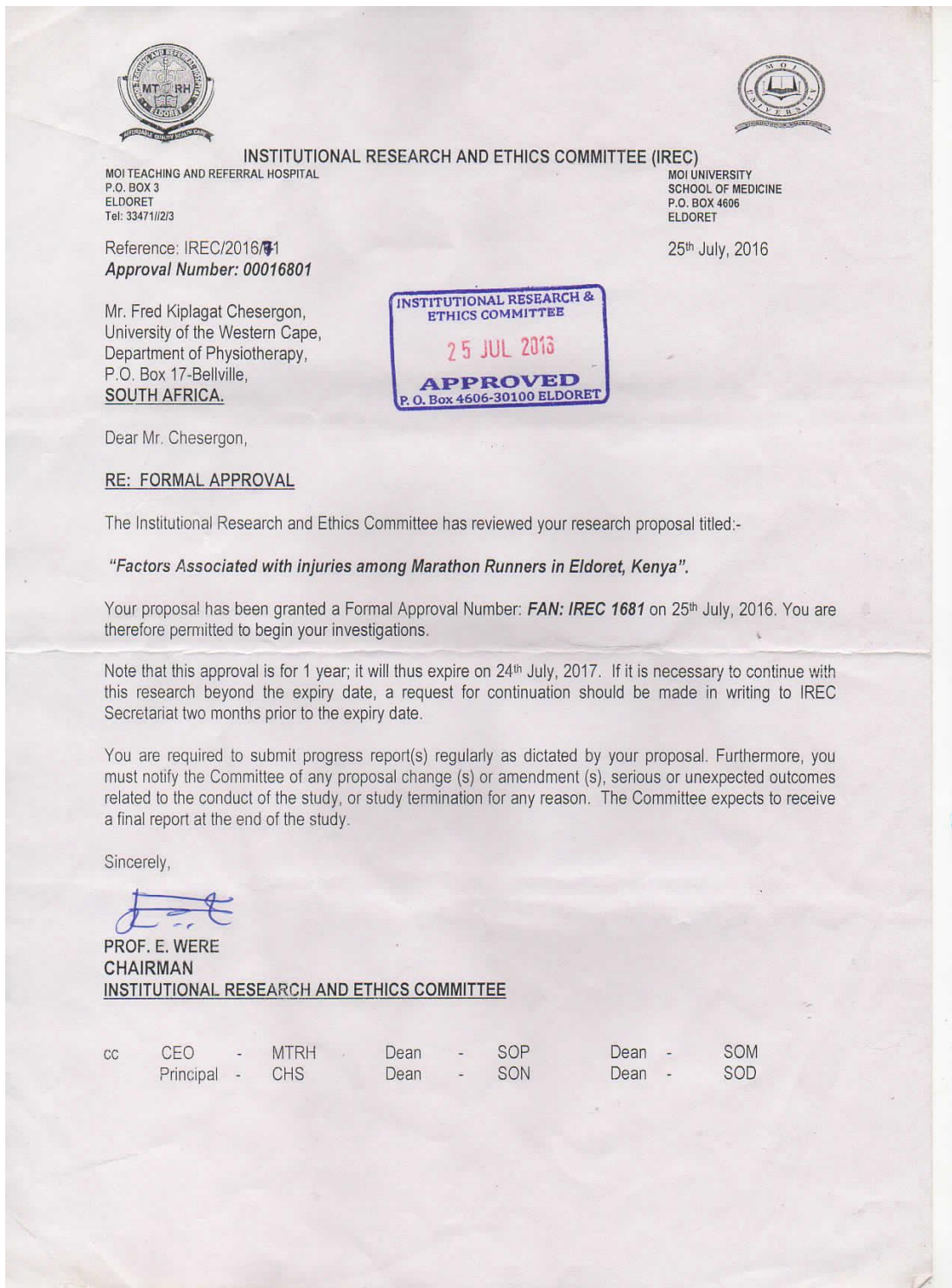
I kindly request for your permission to conduct my research study at the camps in Eldoret namely, High Altitude training camp (Iten), PACE Athletics camp (Kaptagat), Global sports camp (Chirchir), One for One Athletics camp (Chirchir) and Kiplombe-Kimumu camp (Eldoret). The information gathered from the participants will be kept strictly confidential and their identity will be anonymous.

Yours faithfully,

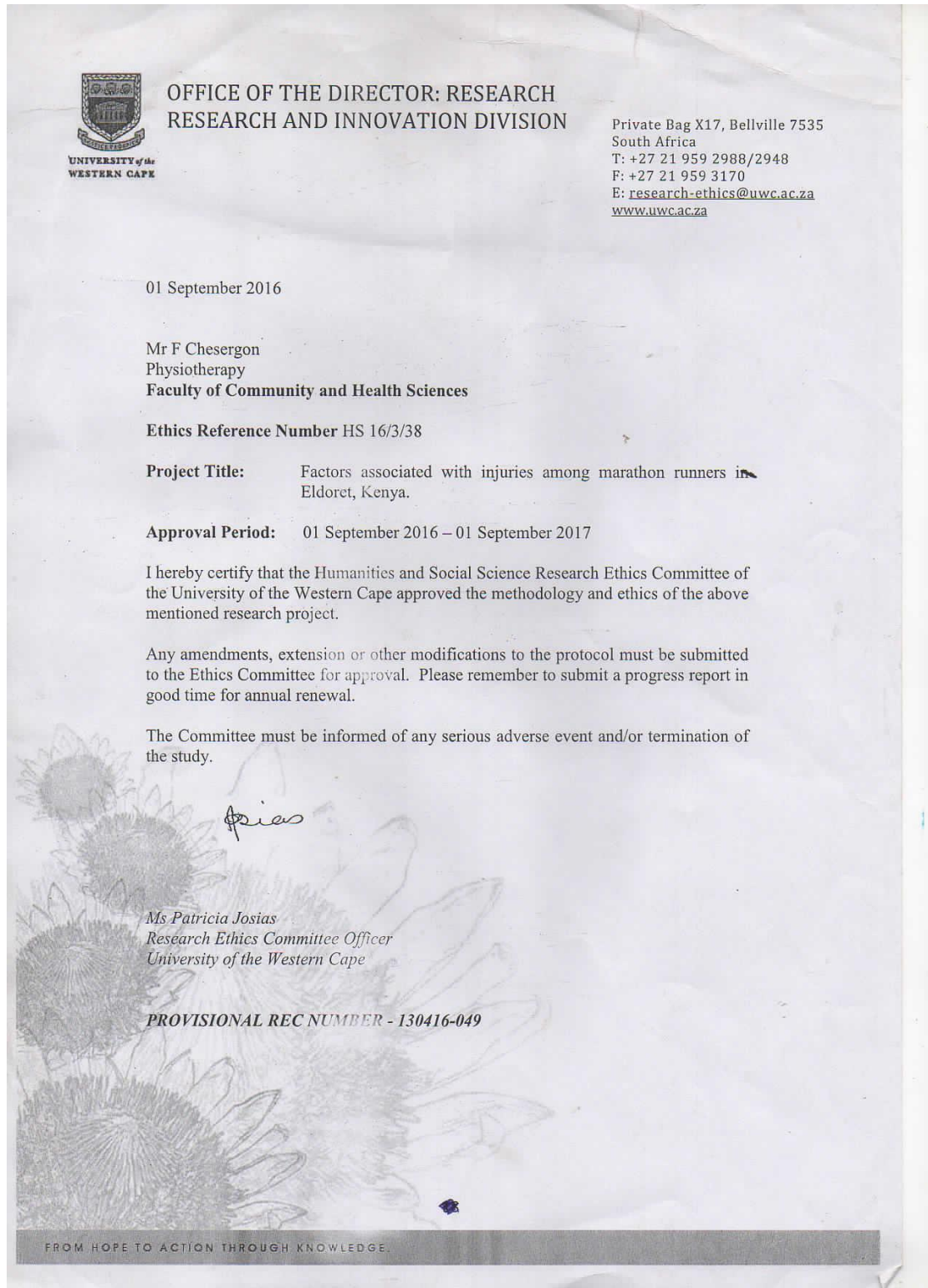
Fred Kiplagat Chesergon

fredsergon@gmail.com

APPENDIX VIII: Approval letter from Institutional research and ethics committee (IREC)



APPENDIX VIII: Approval letter from the office the director: Research and Innovation Division, University of the Western Cape.



Editing confirmation letter

RE: Editing of MSc thesis

Fred Chesergon (3419746)

To whom it may concern:

This is to confirm that the MSc thesis of Mr Fred Chesergon, **FACTORS ASSOCIATED WITH INJURIES AMONG MARATHON RUNNERS IN ELDORET, KENYA**, has been proofread and edited for submission to the University of the Western Cape.

Kind regards

Dr Michael Rowe

Associate Professor

Department of Physiotherapy

Faculty of Community and Health Sciences

University of the Western Cape

Bellville, 7535

tel: +27 21 959 2542

email: mrowe@uwc.ac.za

