THE POSSIBLE AETIOLOGIES FOR THE INCIDENCE OF RUGBY INJURIES AMONG TOP LEVEL GAUTENG RUGBY-PLAYING SCHOOLS

A dissertation submitted in partial fulfillment of the requirements for the Master's Degree in Technology: Chiropractic, in the Faculty of Health Sciences at the Technikon Witwatersrand

By

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Johannesburg 2004
DECLARATION

I, Clive Grobler declare that this dissertation represents my own work, both in conception and execution. It is being submitted for the Degree of Master of Technology at the Technikon Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other Technikon or University.

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DEDICATION

This dissertation is dedicated to my loving fiancée Tina Hollinshead, Rosemarie Hollinshead and my loving adopted family for all their patience, support and guidance throughout my Chiropractic studies, without which I would not have achieved excellence.
ACKNOWLEDGEMENTS

I would like to sincerely thank the following people for their support and assistance with dissertation:

Dr. M. Khoury for his guidance, advice and encouragement throughout my studies,

Dr. C. Yelverton for his guidance, advice and time,

Mr. Norris (St Johns Rugby Co-ordinator) for his time, dedication and encouragement throughout my research,

Mr. Erasmus (K.E.S. Rugby Co-ordinator) for his time, dedication and encouragement throughout my research,

The pupils of K.E.S and St Johns that gave their time and dedication to this study,

Tina Hollinshead for all her assistance, support and patience, and

Rosemarie Hollinshead for all her assistance, support and patience.
ABSTRACT

INTRODUCTION: Growing concern with regards to the dramatic number of catastrophic injuries occurring among schoolboy rugby-players has occurred. Recently a study has shown that players’ knowledge of techniques known to prevent rugby injuries is inadequate and too little attention is paid at the start of the rugby season to coaching techniques designed to reduce rugby injury risks. There is a growing concern as to the increasing number of injuries sustained by rugby players despite appropriate rule changes. Little South African epidemiological data exists as to the incidence and type of injuries that occur in rugby.

OBJECTIVE: The purpose of this study is to investigate the possible aetiologies for the high incidence of rugby injuries among two of the top rugby-playing schools in Gauteng in a given school term for the 2003 rugby season.

METHODS: King Edward VII School and St. John’s College, both in Houghton, were contacted and agreed to provide the necessary participants and coaches for this study. The rugby players were either between the ages of thirteen and fourteen (under fourteen age group), or between the ages of seventeen and nineteen years old (open age group). King Edward VII and St. John’s College rugby scholars and coaches formed the research participants. All participants were required to complete a subjective questionnaire once a week for the entire duration of the 2003 rugby season (March 2003 to June 2003).

RESULTS: A total of 1122 (76.85%) questionnaires were obtained, of which 586 were from the under eighteen age group, 511 were from the under fourteen age group and 25 were from coaches/managers of the various age groups.

The number of years playing rugby in the under fourteen age ranged from 0-6 years, with a mean of 2.7 playing years. The mean number of games played by the under fourteen age group was 19 for the 2003 season. A total of 19 (35%) previous injuries were recorded in the under fourteen age group. In this age group, there were a total of 144 injuries (28%) recorded throughout the 2003 season. Fifty-six players (93%) in the under fourteen age group used some form of protective gear. The mostly common injury site for the under fourteen age group was the head (concussion) in which 28 players (19%) suffered head (concussion) injuries during the season and 26 players (18%) suffered neck injuries. Among the under fourteen forwards, the position injured the most was the locks with 16 injuries during the season (11%) in which the most
commonly injured anatomical sites for locks were the cervical spine and the lower back, followed by the loose head prop with 15 injuries (10%).

The number of years playing rugby in the open age group range from 3-11 years, with a mean average of 5.92 playing years. The mean number of games played by the open age group was 24 for the 2003 season. A total of 35 (58%) previous injuries in the open age group were recorded. A total of 149 injuries (25%) were recorded throughout the 2003 season. 60 Open age group players did some form of pre-season training. The most common injury site for the open age group was the head (concussion) with 29 (20%) players suffering head (concussion) injuries, and 28 players (20%) suffering knee injuries.

In the under fourteen age group, 43% of coaches said winning was important, 21% said winning was not everything, 15% said winning meant the world to them, 14% said nothing at all and 7% stated other reasons. In the open age group, 63% of coaches said winning meant the world to them, 18% said winning was important, 9% said winning was not everything, 4% said nothing at all and 6% stated other reasons. In the under fourteen age group, the coaches’ rugby training skills ranged from a level 1 to a level 2, with the average coach having 7.89 years of experience in coaching rugby. In the open age group, the coaches’ rugby training skill level ranged from a level 1 to a level 3, with the average coach having 13.78 years of experience in coaching rugby.

**CONCLUSION**: The principal conclusions of this study are as follows:

There is high incidence of rugby injuries among schoolboy rugby players, in particular concussion injuries, and there is under-reporting of these to the authorities of the schools.
Schoolboy rugby injuries are more common during the early season in both age groups and after the mid-year winter recesses, mainly among the under fourteen.
Players in the open age group did pre-season training more frequently than the under fourteen age group.
Locks suffered the most injuries in both age groups among the forwards, while flyhalves and centres suffered the most injuries in both age groups.
Forwards suffered injuries during set phases, while backline players suffered injuries during the tackle ball phases.
Concussion was the most common injury suffered in both age groups, while the under fourteen age group suffered a great deal of cervical injuries.
# TABLE OF CONTENTS

DECLARATION____________________________________________________ ii  

DEDICATION____________________________________________________ iii  

ACKNOWLEDGEMENTS____________________________________________ iv  

ABSTRACT_______________________________________________________ v  

TABLE OF CONTENTS____________________________________________ vii  

LIST OF FIGURES________________________________________________ xi  

LIST OF APPENDICES____________________________________________ xiii  

CHAPTER ONE: INTRODUCTION______________________________________ 1  
1.1 General Introduction__________________________________________ 2  
1.2. Aim______________________________________________________ 2  

CHAPTER TWO: LITERATURE REVIEW________________________________ 4  
2.1 Introduction________________________________________________ 5  
2.2 Incidences Of Rugby Injuries__________________________________ 6  
2.3 Rate Of injuries____________________________________________ 14  
2.4 Student Chiropractic Sports Council Participation At Schoolboy Rugby Festivals, 2002____________________________________________ 15  
2.5 Concussion Assessments______________________________________ 15  
2.6 Spinal Injuries______________________________________________ 16  
2.7 Over-training Syndrome______________________________________ 17  
2.8 Conclusion________________________________________________ 19
CHAPTER THREE: METHODOLOGY

3.1 Patient Selection
3.2 Patient Allocation
3.3 Analysis Of Data

CHAPTER FOUR: RESULTS

4.1 Introduction
4.2 Players Questionnaire
  4.2.1 Previous Injuries
  4.2.2 Pre-season Training
  4.2.3 Protective Gear
  4.2.4 Training Methods
  4.2.5 First Aid Facilities
  4.2.6 Pre-game Warm Up And Post-game Warm Down
    4.2.6.1 Post-match Warm Up
    4.2.6.2 Post-match Warm Down
  4.2.7 Injuries
    4.2.7.1 Total Number Of Injuries
    4.2.7.2 Incidences Of Injuries At Different Anatomical Sites
    4.2.7.3 Head (Concussion) Injuries
    4.2.7.4 Cervical Spine Injuries
    4.2.7.5 Relationship Of Playing Position, Phase Of Play And Injured Anatomical Sites
      4.2.7.5.1 Playing Position And Sites Of Injury
      4.2.7.5.2 Phases Of Play In Which Injuries Occurred
    4.2.7.6 Incidence Of Injury During Different Phases Of The Game
    4.2.7.7 Incidence Of Injury During Different Periods Of The Season
  4.2.8 Medical Treatment
  4.2.9 Hospitalisation
  4.2.10 Return To Play
  4.2.11 Reason For Playing Rugby
  4.2.12 Encouragement
  4.3 Coaches Questionnaires
    4.3.1 Rugby Training Levels
4.3.2 First Aid Levels ___________________________ 51
4.3.3 Meaning Of Winning _________________________ 53
4.3.4 Training Methods And Perceived Exertion ________ 53

CHAPTER FIVE: DISCUSSION ____________________________ 56
5.1 Introduction _______________________________________ 57
5.2 Players Questionnaire _______________________________ 57
5.2.1 Previous Injuries _______________________________ 57
5.2.2 Pre-season Training ______________________________ 58
5.2.3 Protective Gear ________________________________ 58
5.2.4 Training Methods _______________________________ 59
5.2.5 First Aid Facilities _______________________________ 59
5.2.6 Pre-game Warm Up And Post-game Warm Down ______ 60
5.2.6.1 Pre-game Warm Up ____________________________ 60
5.2.6.2 Post-match Warm Down ________________________ 60
5.2.7 Injuries ________________________________________ 60
5.2.7.1 Incidence And Injury Types At Different Anatomical Sites _______ 60
5.2.7.2 Relationship Of Playing Position, Phase Of Play And Anatomical Sites ____________________________ 61
5.2.7.3 Incidences Of Injury During Different Phase Of The Game _____ 62
5.2.7.4 Incidences Of Injury During Different Periods Of The Season _____ 62
5.2.7.5 Reason For Playing ____________________________ 63
5.2.7.6 Encouragement _______________________________ 63

5.3 Coaches Questionnaires ______________________________ 64
5.3.1 Level Of Training Skills __________________________ 64
5.3.2 First Aid Levels ________________________________ 64
5.3.3 Meaning Of Winning ____________________________ 64
5.3.4 Training Methods And Perceived Exertion ____________ 65

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS _________ 66
6.1 Conclusion ________________________________________ 67
6.2 Recommendations __________________________________ 68
6.2.1 General Recommendations ____________________________ 68
6.2.2 Previous Injuries _______________________________ 68
6.2.3 Pre-season Training ______________________________ 68
6.2.4 Protective Gear .................................................. 68
6.2.5 Training Methods ............................................. 69
6.2.6 First Aid Facilities ............................................. 69
6.2.7 Pre-match Warm Up .......................................... 69
6.2.8 Injuries .......................................................... 69
6.3 Recommendations for Further Studies ...................... 70

REFERENCES ......................................................... 72
7.1. References ........................................................ 73

APPENDICES ......................................................... 75
LIST OF FIGURES

Figure 2.1: Figure Indicating Phases Of Play When Injury Is Likely To Occur 7
Figure 2.2: Figure Indicating Most Commonly Injured Body Sites 7
Figure 2.3: Figure Indicating Most Common Injuries 9
Figure 2.4: Figure Indicating Commonly Injured Positions 9
Figure 2.5: Figure Indicating Phases Of Play When Injuries Occurred 10
Figure 2.6: Figure Indicating Most Common Injuries 10
Figure 2.7: Figure Indicating Dietary Supplementation 12
Figure 2.8: Figure Indicating Protective Gear 12
Figure 2.9: Figure Indicating Anatomical Area Strapped 13
Figure 2.10: Figure Indicating Previous Injuries 13
Figure 2.11: Figure Comparing Injuries That Occurred At The KES And CBC Rugby Festivals In 2002 18
Figure 2.12: Figure Indicating Spinal Injuries 18
Figure 4.1: Figure Indicating Previous Injuries In Under Fourteen And Open Age Groups 25
Figure 4.2: Figure Indicating Pre-season Training In The Under Fourteen And Open Age Groups 27
Figure 4.3: Figure Indicating Protective Gear Used In The Under Fourteen And Open Age Groups 29
Figure 4.4: Figure Indicating Concussion Associated With Protective Gear 30
Figure 4.5: Figure Indicating Training Methods 31
Figure 4.6: Figure Indicating First Aid Facilities Available 33
Figure 4.7: Figure Indicating Pre Match Warm Up 34
Figure 4.8: Figure Indicating Anatomical Injury Sites 36
Figure 4.9: Figure Indicating Head Injuries / Concussions Among Forwards Players 38
Figure 4.10: Figure Indicating Head Injuries / Concussions Among Backline Players 39
Figure 4.11: Figure Indicating Spinal Injuries Among Forwards 40
Figure 4.12: Figure Indicating Spinal Injuries Among Backline Players 41
Figure 4.13: Figure Indicating Commonly Injured Positions Among Forwards Players 44
Figure 4.14: Figure Indicating Commonly Injured Positions Among Backline Players 45
Figure 4.15: Figure Indicating Phase Of Play In Which Injury Occurred 46
Figure 4.16: Figure Indicating Phases Of The Game In Which Injury Occurred 48
Figure 4.17: Figure Indicating Reasons For Playing Rugby 50
LIST OF APPENDICES

APPENDIX ONE: McGill Abbreviated Concussion Evaluation 76

APPENDIX TWO: Permission Letter from King Edward VII School 78

APPENDIX THREE: Permission Letter from St. John’s College 79

APPENDIX FOUR: Players’ Questionnaire 80

APPENDIX FIVE: Coaches Questionnaire 83

APPENDIX SIX: Informed Consent Form 84

APPENDIX SEVEN: Rugby Coaching Levels 85

APPENDIX EIGHT: First Aid Levels Of Coaches 89
CHAPTER ONE:
INTRODUCTION
1.1 General Introduction

Rugby is regarded as the most hazardous of contact sports, with a high incidence of catastrophic cervical spinal injuries (Upton, Roux, and Noakes 1996: 531-533).

There is a growing concern with the dramatic number of catastrophic injuries occurring among schoolboy rugby-players (Erasmus, Hugh, Meiring and Richards, 1999:32). A recent study has shown that players' knowledge of techniques known to prevent rugby injuries is inadequate and too little attention is paid at the start of the rugby season to coaching techniques designed to reduce rugby injury risks (Upton et al 1996: 531-553). There is a growing concern as to the increasing number of injuries sustained by rugby players despite appropriate rule changes. Little South African epidemiological data exists as to the incidence and type of injuries that occur in rugby (Erasmus et al 1999: 32).

More than 50% of injuries are directly related to scrumming and 90% are due to collapsing of the tight scrum. Despite the advocated measures to increase scrumming safety, limited research has been conducted to determine the effect of strength training to increase scrumming ability (Du Toit, Terblanche, Buys, and Venter 1999:24).

1.2 Aim

The purpose of this study was to investigate the possible aetiologies for the high incidence of rugby injuries among two of the top rugby-playing schools in Gauteng in a given school term for the 2003 rugby season.

The two schools used in this study were King Edward VII School and St. John's College, both situated in Houghton, Johannesburg.

Thirty rugby players between the ages of seventeen and nineteen years (open age group) and their respective coaches were utilised from each of the schools. Thirty rugby players between the ages of thirteen and fourteen years (under fourteen age group) and their respective coaches were utilised from each of the schools.
The research was conducted over eighteen weeks (March 2003 – June 2003). Three groups were created: Group A (under fourteen age group), Group B (open age group), and Group C (coaches/managers of the respective teams).

Each player and coach was required to complete a subjective questionnaire once a week for the entire duration of the study. The questionnaires were then analysed.

The results from this research may possibly indicate and explain the aetiologies for the high incidence of injuries on the playing fields of top Gauteng schools and prevent further catastrophic injuries, making the game safer in the future. This research may provide further insight into scant literature as related to this topic.
CHAPTER TWO: LITERATURE REVIEW
2.1 Introduction

There is an increasing incidence of rugby injuries in rugby players which warrants increasing concern (Erasmus et al 1999: 32). Rugby is strongly encouraged amongst high school boys, who may go on to club, professional or even national participation. This sport has increased in popularity over the years and so has the number of injuries among schoolboys (Calligaro, de Picciotto and Frijhof 2002: 22-29). Schoolboy rugby injuries are common, especially in country districts, where pressure to participate is greater due to a smaller number of pupils (Fischer, Meiring, and Richards 1999: 33).

In South Africa, rugby starts in the school system and continues up to professional and national levels, with vast sums of corporate and private money involved. Rugby has become increasingly popular among people of all ages, and involves strong sentiments of national pride (Calligaro et al, 2002: 22-29).

The notion of injury proneness is quite common in sport. There is also a common belief that susceptibility to injury has a psychological basis. Identifying the factors associated with injury vulnerability could be useful in the prevention of sports injuries. If there is a link between the occurrence of injury and psychological factors, for example life stress, risk taking, anxiety, attention seeking and self concept, then it is reasonable that there is also a relationship between personality type and the incidence of injuries. The possible relationship between locus of control as a personality disposition and the incidence of sports injuries has also received attention (Potgieter and Venter 2000: 26-28).

Locus of control deals with the degree to which an individual perceives life and the environment as being under personal control. An internal orientation is characterised by a belief that one's own actions control personal outcomes in life. It was once reported that rugby players with an internal locus of control reported fewer injuries than their teammates with an external locus of control. It is believed that self-concept affects the emotional, physical, social and cognitive life of an individual. It is found that the players with a stronger overall self-concept were fitter and stronger than the players who were consistently injured. It is argued that those with self-concept characteristics may have led the injured players to take more risks, leading to more situations that could result in injury (Potgieter and Venter, 2000: 26-28).
The relationship between sensation and injury occurrence seems to be a worthwhile direction of research in the quest for an understanding of the psychology of the injury. Sensation seekers may be at greater risk of injury because of their willingness to take chances, but alternatively they may be at lower risk because they are less likely to appraise extremely demanding situations as being stressful. More research is required in order to ascertain the role of sensation seeking in injury vulnerability (Potgieter and Venter 2000: 26-28).

The injury rate is unacceptably high (1 in 8.3 player hours in one Super 12 season). Most of the injuries are to the lower limb and head, especially among high school rugby-players where smaller numbers of pupils increases the pressure to participate (Fischer et al, 1999: 33).

Age, team level, playing position, time of season and phase of play have shown trends as to the incidence of specific injuries to specific players during predictable phases of the game (Roux, Goedeke, Visser, van Zyl and Noakes 1987: 307-313).

2.2 Incidence Of Rugby Injuries

In a study done in 1987, 145 serious injuries occurred in the 1987 schoolboy rugby season on the playing fields in South Africa. The study showed that injuries were more common during the first four weeks of the season and again in the same period after mid-season vacation. At all ages, A-team players suffered the greatest number of injuries (Roux et al, 1987: 307-313).

The safest playing positions are tight-forward positions and scrumhalves while the most dangerous are backline players excluding the scrumhalf and loose-forwards. Overall, the eighthman is the most often injured player. Of all the injuries, 55% occurred while the player was tackling, 16% while being tackled, 11% in scrums and 18% during loose scrums/mauls (Roux et al, 1987: 307-313).

Refer to Figure 2.1: Figure Indicating Phases Of Play When Injury Is Likely To Occur

The lower limb (37%), the head and neck (23%), lower back (20%) and the upper limb (20%) were the most commonly injured sites (Roux et al, 1987: 307-313).

Refer to Figure 2.2: Figure Indicating Most Commonly Injured Body Sites
Figure 2.1: Figure Indicating Phases Of Play When Injury Is Likely To Occur.


Figure 2.2: Figure Indicating Most Commonly Injured Body Sites

Fractures (27%), ligament/tendon injuries (25%) and muscle injuries (48%) were the most common injuries to occur (Roux et al 1987: 307-313).

Refer to Figure 2.3: Figure Indicating Most Common Injuries

Rugby showed specific trends with age, team, playing position, time of the season and phase of the game (Roux et al 1987: 307-313).

In 1990, 114 injuries were sustained in eight adult rugby teams in the Cape Province during that year’s rugby season. 85% occurred during matches and injuries were most prevalent during the first six weeks. Props (23%), hookers (19%), wings (15%), locks (13%), fullbacks (11%) and centres (10%) and 8th man (9%) were the players injured the most (Roux et al 1987: 307-313).

Refer to Figure 2.4: Figure Indicating Commonly Injured Positions

Injury occurred most commonly when the player was tackled (26%), during open play (21%), tackling (19%), scrums (17%) and during loose mauls (17%) (Clark, Roux and Noakes 1990: 559-562).

Refer to Figure 2.5: Figure Indicating Phases Of Play When Injuries Occurred

Fractures (35%), muscles (33%) and ligaments (32%) were the anatomical structure most often injured (Clark et al, 1990: 559-562).

Refer to Figure 2.6: Figure Indicating Most Common Injuries

Injury caused 35% of players to miss more than 35 days of rugby, 13% of injured players did not play again for the rest of the season and only 14% of injured players returned to rugby after seven days or less. Prolonged disability was associated with ligament injuries (57%), dislocation (17%) and fractures (10%) (Clark et al, 1990: 559-562).

In 1997, 101 serious injuries occurred during a twelve-week season in the Northern Cape country district. Muscle injuries were the most common (22%) followed by fractures (19%) and knee injuries (15%). Head and neck injuries accounted for 20% of the injuries with associated concussions in 12% of the cases.

The center and wing position accounted for 16% each of the injuries sustained. Tackling and loose mauls together accounted for 65% of the injuries. Most injuries occurred during match play (77%) rather than practice (23%), where injury was most likely to occur in the initial stages.
Figure 2.3: Figure Indicating Most Common Injuries


Figure 2.4: Figure Indicating Commonly Injured Positions

Figure 2.5: Figure Indicating Phases Of Play When Injuries Occurred


Figure 2.6: Figure Indicating Most Common Injuries

of the first half (32%) or late in the second half (27%). The first two months of the season yielded 45% of all injuries (Fischer et al 1999: 33).

In the 1999 Super 12 Competition, a pre-season assessment of South African players was conducted. Preparations for the Super 12 started in November 1998 and the competition ended in May 1999. The pre-season assessment consisted of seventy-four players from various provinces. A total of 74 questionnaires and examination forms were obtained, of which 29 were from one team, 28 from another team and 17 from the third participating team. The number of players in different positions studied were as follows: sixteen prop-forwards, four hookers, three locks, fifteen loose-forwards, seven scrumhalves, five flyhalves, nine centres, eight wings and seven fullbacks (Holtzhausen, Schwellnus, Jakoet and Pretorius 2002: 15-21).

Sixty players (81%) made use of dietary supplements, thirty-four (46%) took vitamins and mineral supplements, forty-five players (62%) made use of creatine supplementation and twenty players (38%) took protein supplements (Holtzhausen et al 2002: 15-21).

Refer to Figure 2.7: Figure Indicating Dietary Supplementation

Sixty-seven players (90%) used some form of protective gear. Fifty-four players (73%) used mouth guards during matches, forty-six players (62%) used shoulder pads, eleven (15%) wore ankle braces, eleven wore shin pads (15%), four players (5%) wore protective head gear, and 1 (1%) wore thermal pants. Forty-three players (58%) wore regular strapping of some kind; twenty-three players (31%) used ankle strapping, seventeen (23%) strapped fingers and three players (8%) wore knee strapping. Strapping was mostly used for protection of old injuries such as chronic ligament laxity or unloading of anatomical structures (Holtzhausen et al 2002: 15-21).

Refer to Figure 2.8: Figure Indicating Protective Gear

Refer to Figure 2.9: Figure Indicating Anatomical Area Strapped

A total of 348 previous injuries were recorded in 73 of the 74 players studied, thus indicating that an average of five previous old injuries per player was present. There were 68 (20%) previous episodes of concussions, fifty-four (16%) previous shoulder injuries, forty-five (13%) ankle injuries, forty-one (12%) knee injuries, fourteen (4%) previous neck injuries and fourteen (4%) previous back injuries. Forty (12%) of these chronic injuries were due to over use, while three hundred and eight of these injuries were acute traumatic injuries (Holtzhausen et al 2002: 15-21).

Refer to Figure 2.10: Figure Indicating Previous Injuries
Figure 2.7: Figure Indicating Dietary Supplementation


Figure 2.8: Figure Indicating Protective Gear

Figure 2.9: Figure Indicating Anatomical Area Strapped


Figure 2.10: Figure Indicating Previous Injuries

Forty-nine of all recorded injuries were still active at the start of the season, and prevented normal training. Sixty (17%) of the recorded injuries were treated surgically, while the others were treated conservatively (Holtzhausen et al 2002: 15-21).

From the study the following was concluded. The use of headgear provided limited protection from lacerations and abrasions, and the use of gum guards was effective in protecting against concussions and injuries to the cervical spine through repositioning the anatomical structures in the head and neck (Holtzhausen et al 2002: 15-21).

2.3 Rate Of Injuries

Rugby has a high injury rate as one injury occurs in every 8.3 playing hours. Thirty-two injuries per thousand player game hours were reported during the 1995 rugby world cup. During the 1992 season, sixty-two players per thousand playing hours reported first grade injuries. Most of the injuries occurred to the head and lower limbs, and shoulder injuries were also common. The high incidence of previous concussions is alarming, affecting 20% of players involved in the study. After recovery from concussion, a player’s chance of suffering another concussion may be four times as high as that of a player who never had a concussion, and repeated concussions could cause cumulative, permanent neurological damage (Calligaro et al, 2002: 22-29).

Upton et al (1996: 531-533) have shown that A-team players are significantly heavier and taller than those in lower teams in the same position in most age groups. Although A-team players are more likely to participate in pre-season endurance or strength training, fewer than 40% of players had inadequate pre-season training.

Less than thirty minutes are allocated to the practice of tackling and falling techniques prior to first contact matches. Coaches’ knowledge of different high-risk situations was inadequate (Upton et al 1996: 531-533).

An average incidence of three injuries per match occurred during the 1997 Northern Cape Country District season. Only one out of three players sought medical help, this often indicated players were still participating in contact games with severe injuries (Fischer et al 1999: 33).
Sport injuries can be caused by a variety of factors such as lack of skill, fatigue, equipment failure, environment factors (e.g. weather conditions and playing surfaces) and the nature of the sport (Potgieter and Venter 2000: 26-28).

2.4 Student Chiropractic Sports Council Participation At Schoolboy Rugby Festivals, 2002

In 2002, the Student Chiropractic Sports Council was invited to be part of the medical team at two schoolboy rugby festivals. These were the King Edward VII School (K.E.S) Centenary Rugby Festival in Gauteng, where the top rugby schools in South Africa participated, and the Christian Brother’s College (C.B.C) Festival in Gauteng where some of the medium rugby schools participated.

At the K.E.S Centenary Festival, held in March 2002, 285 injuries occurred during the three-day festival. Lower back and pelvic regions (20%) were the most commonly injured sites, followed by the neck (14%), knee (12%), thigh (11%), ankle (9%) and shoulder (8%), with no concussions/head injuries or deaths reported.

At the C.B.C festival held in May 2002, 317 injuries occurred during the three-day festival. Lower back and pelvic regions (16%) were the most commonly injured sites, followed by the neck (15%), knee (13%), shoulder (11%), ankle (6%), concussion/head injuries (8%) and one death was reported.

Refer to Figure 2.11: Figure Comparing Injuries That Occurred At The KES And CBC Rugby Festivals In 2002

2.5 Concussion Assessments

South Africa has been instrumental in setting in place guidelines for effective management of concussion and players returning to play after concussion. The South African Rugby Union’s guidelines for concussion were circulated to the fourteen provincial rugby unions. A cornerstone of these guidelines is neuropsychological testing, which assesses the functional deficits arising from concussion. Neurophysiological testing is an objective test preventing a player under-rating his symptoms in order to return to play (Calligaro et al, 2002: 22-29). Neurophysiological
tests (assessed by a McGill Abbreviated Concussion Evaluation) include the measurements of the following: memory, decision-making, and information processing planning and switch mental set. Tests include paper and pencil tests and computerised tests. Important in all these tests is a baseline test, which is recommended for all players at the beginning of the season (Calligaro et al, 2002: 22-29).

Refer to Appendix 1: McGill Abbreviated Concussion Evaluation

When a player is concussed during the season, he is assessed against his baseline results and this determines the level of concussion as well as the recommended rest period. Once his test has returned to the baseline level and there are no symptoms, he may return to play (Calligaro et al, 2002: 22-29).

2.6 Spinal Injuries

Between 1963 and 1989, 117 catastrophic neck injuries occurring in rugby players were admitted to the Spinal Cord Unit, Conradie Hospital, Cape Town. Nineteen of these players died from their injuries, eighty of these players fully recovered but were not able to return to the game and the other eighteen players were paralysed from their injuries (Kew, Noakes, Kettle, Goedeke, Newton, and Scher 1991: 56-58). The annual number of spinal injuries increased dramatically after 1976 with 57% of all injuries occurring during rucks and mauls. A further increase since 1984 contrasts with a falling incidence of these injuries in Britain, Australia and New Zealand. (Kew et al 1991: 56-58).

Increased risk of injury was related to the following factors, 98% of injuries occurred in matches and 81% were incurred by adults, 69% of spinal occurred in the A-team age-group of senior first team players, and 57% of injuries occurred in scrums, rucks and mauls. Hookers, centres and flyhalfs were playing positions at greatest risk of spinal injuries (Kew et al 1991: 56-58).

In 1990 rugby law changes, which targeted scrum laws, occurred in South African schoolboy rugby due to the fact that a number of schoolboys suffered paralysing spinal cord injuries (Noakes, Jakoet, and Baalbergen 1999: 540-545).

A study between 1990 and 1999 was conducted to see if the number of cervical injuries was refrained. There were sixty-seven spinal cord injuries in that time period. The majority of the
spinal injuries occurred at the vertebral levels of C4/C5 (32%) and C5/C6 (42%). Neck injuries due to the vertex impact of a tackler's head with an object, or due to illegal high tackling was the most common reason for neck injuries (52%). Neck injuries occurred in loose-rucks and mauls (25%) and in collapsed scrums (14%). The front row (37%), out of the entire forward pack, were susceptible to the most neck injuries while fly-halves (21%) were most susceptible to neck injuries out of the entire backline (Noakes et al 1999: 540-545).

Refer to Figure 2.12: Figure Indicating Spinal Injuries

Neck injuries are dangerous, and injuries to the spinal cord have been described as the most tragic of sporting injuries. Many studies have been published on the incidence of neck injuries occurring during high tackling, scrum engagement, 'popping of the scrum' and scrum collapse. At least half the neck injuries could have been prevented by elimination of high tackling and by more rigorous control of the scrum (Holtzhausen et al 2002: 15-21).

2.7 Over-training Syndrome

Despite careful planning by professionally educated coaches, over-training syndrome remains a common problem among competitive athletes. In a recent study, training plans designed by coaches and executed by athletes were used to test whether coaches were able to cause over-training syndrome as was commonly seen among those athletes tested (Foster, Heimann, Esten, Brice and Porcari 2001: 3-7).

The ability of athletes to adapt to training and improve performance is the cornerstone of contemporary sports medicine. Despite the generally good education level of contemporary coaches, and the effort they invest in designing training programs, the incidence of over-training syndrome remained high. Similarly, one only has to listen to the comments of coaches and athletes following unsuccessful games to recognise that inadequate training is frequently believed to be responsible for many injuries in top competitive athletes (Foster et al, 2001: 3-7).

Top athletes tended to undertrain on days that the coach intended to be quite difficult, and this may be equally important as a potential cause of suboptimal performance. Coaches are consistent with the concept that a common training mistake is the tendency for training strongly polar (hard days and easy days). Whether this represents a failure of the coaches to communicate with the athletes or not has proven to play a vital factor in players getting injured.
Figure 2.11: Figure Comparing Injuries That Occurred at the KES and CBC Rugby Festivals in 2002

From: Student Chiropractic Sports Council statistical data 2002

Figure 2.12: Figure Indicating Spinal Injuries

More fathers (84%) than mothers (64%) encouraged their sons to play rugby. Coaching errors, lack of knowledge on the basic training programs and poor understanding of the laws of the game are the greatest attributing factor, which predisposed players to injuries (Upton et al 1996: 531-533).

2.8 Conclusion

It is evident that a number of catastrophic injuries have increased dramatically due to a lack of pre-season training, coaching errors, players' perception of injury prevention, over-training syndrome and the lack of knowledge on treatment and management of injuries (Kew et al 1991: 56-58).

Research has shown a clear pattern of injury related to playing position, level of competition, the stage of the rugby season and the phase of play at time of injury, yet insufficient research has been investigated into what factors predispose players to injury throughout the season.

The majority of research done on rugby injuries has been retrospective and has only been reported by those seen at one location such as a medical facility at a rugby field or in general practice, and furthermore, in the number of studies done the accuracy of the survey methods is unknown (Roux et al 1987: 307-313).

Inconclusive research is available to explain why these catastrophic injuries are occurring during the game and what factors can prevent injuries. Research shows that certain positions are dangerous but fails to discuss or provide answers as to why this is so.
CHAPTER 3: METHODOLOGY
3.1 Patient Selection

King Edward VII School and St. John's College, both in Houghton, were contacted and agreed to provide the necessary participants and coaches for this study (see Appendices 2 and 3).

Thirty research participants and their relevant coaches, each from King Edward VII School and St John's College, were required to complete a questionnaire at the beginning of every week for the 18 week duration of the 2003 rugby season starting in March 2003 (Appendices 4 and 5).

The criteria for inclusion were the following:
- The rugby players were either between the ages of thirteen and fourteen years (under fourteen age group) or between the ages of seventeen and nineteen years (open age group)
- All coaches and managers were employees of King Edward VII School or St. John's College
- All rugby scholars and coaches/managers were required to complete a consent form (see Appendix 5)
- All open-age group players were required to have played at least two seasons of rugby

The criterion for exclusion was the following:
- Participants who presented with an injury at the start of the research.

3.2 Patient Allocation

The participants were divided into the following groups:
- Group A: under fourteen age group
- Group B: open age group.
- Group C: coaches/managers of the relevant group.

Each participant received a maximum of eighteen questionnaires over the eighteen-week period.

3.3 Analysis of Data

Each aspect of the questionnaire, i.e. each question on the questionnaire was quantitatively analysed by manually loading all the data onto Microsoft® Access as a database, and then
utilising Microsoft® Excel to determine means and averages as well as for the production of graphs.

Any injury indicated on the players questionnaire diagrams on the head area that involved an absence from training or the remainder of any matches longer than seven (7) days was defined as a concussion. A head injury was defined as an injury indicated on the players questionnaire diagram as on the head area that required no absence from training or the remainder of the match played and included lacerations and bruising to the head area.

No distinction was made between muscular injury and a more serious injury as may have resulted from playing rugby, i.e. both these injuries were classified as neck injuries when a neck injury was indicated on the players questionnaire diagram.

With regards to the back and lower back injuries, a back injury was referred to as any injury occurring to the thoracic spine or surrounding musculature, while a lower back injury referred to any injury occurring to the lumbar spine area and surrounding musculature.
CHAPTER FOUR: RESULTS
4.1 Introduction

A total of 1122 (76.85%) questionnaires were obtained from a possible total of 1460 questionnaires distributed, of which 586 were from the open age group, 511 were from the under fourteen age group and 25 were from coaches/managers of the various age groups.

The number of rugby-playing years in the under fourteen age ranged from 0-6 years, with a mean of 2.7 years. The number of rugby-playing years in the open age group ranged from 3-11 years, with a mean of 5.92 years. The mean number of games for the under 14 was 19 games for the 2003 season and the mean number of games for the open age group was 24 games for the 2003 season.

4.2 Players Questionnaires

4.2.1 Previous Injuries

A total of 19 (35%) previous injuries in the under fourteen age group were recorded. There were 5 previous episodes of concussion (26% of injuries), 4 previous episodes of shoulder injuries (20% of injuries), 3 previous episodes of knee injuries (16% of injuries), 3 previous episodes of ankle injuries (16% of injuries), 2 previous episodes of neck injuries (11% of injuries), 2 previous episodes of lower back injuries (11% of injuries). The scrumhalves (16%) and flyhalves (16%) had the highest episodes of previous injuries recorded, whereas the locks had no episodes of previous injuries recorded.

A total of 35 (58%) previous injuries in the open age group were recorded. There were 11 previous episodes of knee injuries (32% of injuries), 6 previous episodes of concussion (17% of injuries), 4 previous episodes of shoulder injuries (11% of injuries), 4 previous episodes of ankle injuries (11% of injuries), 4 previous episodes of lower back injuries (11% of injuries), 3 previous episodes of neck injuries (9% of injuries), 2 previous episodes of elbow injuries (6% of injuries) and 1 previous episode of wrist injury (3% of injuries). The props (17%), lock (14%) and flank (17%) positions had the highest incidence of previous injuries recorded, whereas the fullback position (3%) was the least injured position.

Refer to Figure 4.1: Figure Indicating Previous Injuries In Under Fourteen And Open Age Groups
Figure 4.1: Figure indicating previous injuries in the under fourteen and open age groups.
4.2.2 Pre-season Training

A total of 44 (73%) under fourteen rugby players did some form of pre-season training. The most common pre-season training done was fitness training (87%), followed by rugby training (57%), endurance training (25%) and finally weight training (21%). Of the players that did weight training, 67% did their own gym program, 22% had a gym program prescribed by a personal trainer and 11% had a program prescribed by their coach. A total of 38 injuries were recorded in the first four weeks of which 12 injuries (32%) occurred in players who participated in some form of pre-season training and 26 injuries (68%) occurred in players who did not participate in any form of pre-season training. No injuries occurred in players who participated in fitness training, endurance training, weight training and rugby training as pre-season training.

A total of 60 open age group rugby players did some form of pre-season training. The most common pre-season training done was fitness training (82%) and rugby training (82%), followed by weight training (78%) and the least was endurance training (55%). Of the players that did weight training, 54% did their own gym program, 44% had a program prescribed by a personal trainer and 2% had a program prescribed by a coach. A total of 18 injuries were recorded in the first four weeks of training of which 15 (83%) injuries occurred in players who did partial pre-season training and 3 (17%) injuries occurred among players who participated in fitness training, endurance training, weight training and rugby training as pre-season training.

Refer to Figure 4.2: Figure Indicating Pre-season Training In The Under Fourteen And Open Age Groups

4.2.3 Protective Gear

Fifty-six players (93%) in the under fourteen age group used some form of protective gear. Of these, 51 players (91%) used gum guards during matches, 22 (39%) players used shoulder pads, 16 (29%) players used scrum caps, 1 (2%) player used strapping of some sort and 1 (2%) player used nylon guards for either ankle or knee protection. A total of 28 concussions were reported during the season, and of the players who suffered from concussion, 15 (54%) wore no protection, 6 (21%) only wore gum guards, 3 (11%) wore both gum guards and scrum caps and 4 (14%) only wore scrum caps.

Fifty-seven players (95%) in the open age group used some form of protective gear. Of these 43 (75%) players used gum guards during matches, 34 (61%) players used scrum caps, 24 (42%)
Figure 4.2: Figure Indicating Pre-season Training In The Under Fourteen And Open Age Groups
used shoulder pads, 9 (28%) used strapping of some form and 1 (2%) used some form of nylon guard for either ankle or knee protection. A total of 29 concussions were reported during the season, and of the players who suffered concussion, 10 (34%) only wore gum guards, 15 (52%) wore no protection, 1 (3%) wore both a gum guard and scrumcap and 3 (10%) only wore scrumcaps.

Refer to Figure 4.3: Figure Indicating Protective Gear Used In The Under Fourteen And Open Age Groups

Refer to Figure 4.4: Figure Indicating Concussion Associated With Protective Gear

4.2.4 Training Methods

The average number of training hours per week for the under fourteen age group was 4.75 hours per week. The most common training methods used by coaches throughout the season were game patterns (84%), touch rugby (82%), contact bags (43%), tackling bags (28%), contact games (15%) and stretching and strengthening (8%).

The average number of training hours per week for the open age group was 6 hours per week. The most common training methods used by coaches throughout the season were game patterns (91%), touch rugby (83%), tackling bags (45%), contact bags (34%), contact games (25%) and stretching and strengthening (14%).

Refer to Graph 4.5: Graph Indicating Training Methods

4.2.5 First Aid Facilities

In the under fourteen age group, every player indicated that there were first aid facilities available. Netcare 911 Paramedics, together with school first aid (63%), were the main first aid facilities indicated, followed by Netcare 911 Paramedics only (17%), school first aid facilities only (8%), emergency numbers only (4%) and 8% of the players were unsure of the first aid facilities available.

In the open age group, every player indicated that there were first aid facilities available. Netcare 911 Paramedics, together with the school first aid (51%) were the main facilities available, followed by Netcare 911 Paramedics only (36%), school first aid facilities only (10%), emergency numbers only (2%) and 1% of players were unsure of the first aid facilities availability.
Figure 4.3: Figure Indicating Protective Gear Used In The Under Fourteen And Open Age Groups
Figure 4.4: Figure Indicating Concussion Associated With Protective Gear
Figure 4.5: Figure Indicating Training Methods
Refer to Figure 4.6: Figure Indicating First Aid Facilities Available

4.2.6 Pre-game Warm Up and Post-game Warm Down

4.2.6.1 Pre-game Warm Up

In the under fourteen age group, every player indicated that they warmed up before their matches, which ranged from ten to sixty minutes. Forty players (67%) indicated that they warmed up for thirty minutes, nine players (14%) indicated that they warmed up for fifteen minutes, four players (7%) indicated that they warmed up for twenty-five minutes, 3 (5%) players indicated that they warmed up for twenty minutes, 3 players (5%) indicated that they warmed up for ten minutes and one (2%) player indicated that he warmed up for sixty minutes.

In the open age group, each player indicated that they warmed up before their matches ranging from thirty to ninety minutes. Twenty-eight players (47%) indicated that they warmed up for sixty minutes, sixteen players (27%) indicated that they warmed up for thirty minutes, twelve players (20%) indicated that they warmed up for forty-five minutes and four players (6%) indicated that they warmed up for ninety minutes.

Refer to Figure 4.7: Figure Indicating Pre-Match Warm Up

4.2.6.2 Post-match Warm Down

In the under fourteen age group, only sixteen players (27%) did post match warm downs, while in the open age group, only twenty players (33%) did post match warm downs.

4.2.7 Injuries

4.2.7.1 Total Number Of Injuries

In the under fourteen age group, of the 511 questionnaires obtained, a total of 144 injuries (28%) were recorded for the 2003 season. In the open age group, of the 586 questionnaires obtained, a total of a 149 injuries (25%) were recorded for the 2003 season.
Figure 4.6: Figure Indicating First Aid Facilities Available
Figure 4.7: Figure Indicating Pre-Match Warm Up
4.2.7.2 Incidences And Injuries At Different Anatomical Sites

The most common injury site in the under fourteen age group was head (concussion) injuries where 28 players (19%) suffered head (concussion) injuries during the season. 26 Players (18%) suffered from neck injuries, 23 players (16%) suffered from knee injuries, 20 players (15%) suffered from lower back injuries, 19 players (14%) suffered from shoulder injuries, 14 players (9%) suffered from ankle injuries. 5 players (4%) suffered from rib injuries, 4 players (3%) suffered from wrist injuries, 2 players (1%) suffered from anterior thigh injuries, 2 players (1%) suffered from medial thigh injuries and 1 player (0.7%) suffered from an elbow injury.

The most common injury site in the open age group was the head (concussion) injuries where 29 (20%) players suffered head (concussion) injuries. 28 Players (20%) suffered from knee injuries, 26 players (17%) suffered from lower back injuries, 15 players (10%) suffered from neck injuries, 13 players (9%) suffered from shoulder injuries, 11 players (7%) suffered from ankle/foot injuries, 7 players (5%) suffered from wrist injuries, 4 players (3%) suffered from posterior thigh injuries, 3 players (2%) suffered from elbow injuries, 3 players (2%) suffered from medial thigh injuries, 2 players (1%) suffered from anterior thigh injuries and 1 player (1%) suffered from a rib injury.

Refer to Figure 4.8: Figure Indicating Anatomical Injury Sites

4.2.7.3 Head (Concussion) Injuries

Head/concussion injuries, head injuries were determined as lacerations or bruises if no specified time was spent off the field, while concussions were determined as such if time was spent off the field for longer than seven days.

In the under fourteen age group, a total of 28 head (concussion) injuries occurred. Among the backline players, this type of injury occurred most commonly among fullbacks (21%), followed by wings (14%), inside centres (14%), outside centres (10%), scrumhalves (4%) and no head/concussion injuries reported among the flyhalves. Among the forwards, this type of injury most commonly occurred among hookers (10%) and locks (10%), followed by props (4%), flanks (4%) and eighthman (4%).

In the open age group, a total of 29 head (concussion) injuries occurred. Among the backline players, this type of injury most commonly occurred among flyhalves (17%), followed by wings
Figure 4.8: Figure Indicating Anatomical Injury Sites
(14%), inside centres (10%), fullbacks (10%) and outside centres and scrumhalves suffered no concussions. Among the forwards, this type of injury most commonly occurred among eighthman (21%), followed by props (14%), hookers (7%), locks (7%) and flanks (3%).

Refer to Figure 4.9: Figure Indicating Head Injuries / Concussions Among Forwards Players
Refer to Figure 4.10: Figure Indicating Head Injuries / Concussions Among Backline Players

4.2.7.4 Cervical Spine Injuries

In the under fourteen age group, a total of 26 cervical spine injuries occurred. Among the forwards, this type of injury mostly occurred among props (46%), followed by locks (23%), hookers (12%), and no neck injuries occurred among flankers and eighthman. Among the backline players, this type of injury mostly occurred among flyhalves (8%), wings (4%), scrumhalves (4%) and fullbacks (4%), and no neck injuries occurred among centres.

In the open age group, a total of 15 cervical spine injuries occurred. Among the forwards, this type of injury mostly occurred among props (46%), hookers (20%), locks (20%), and no cervical injuries occurred among flankers and eighthman. In the backline, this type of injury mostly occurred among centres (7%), scrumhalves (7%) and no cervical injuries mostly occurred among flyhalves, wings, and fullbacks.

Refer to Figure 4.11: Figure Indicating Spinal Injuries Among Forwards
Refer to Figure 4.12: Figure Indicating Spinal Injuries Among Backline Players

4.2.7.5 Relationship Of Playing Position, Phase Of Play And injured Anatomical Sites

4.5.7.5.1 Playing Position And Sites Of Injury

In the under fourteen age group a total of 144 injuries were recorded during the season. Among the forwards, the position injured the most was the lock position. Sixteen injuries occurred in this position during the season (11%), where the most common anatomical sites injured were the cervical spine and lower lumber regions. The loose head prop was the next position that recorded the most injuries. Fifteen injuries (10%) occurred in this position in which the most common anatomical sites injured were the cervical spine and the lower lumber regions. Next, flanks recorded 13 (9%) injuries during the season in which the most common anatomical sites injured were the lower back, knees and shoulders. Next, the hookers recorded 8 (6%) injuries during the season in which the most common anatomical sites injured were the cervical spine
Figure 4.9: Figure Indicating Head Injuries / Concussions Among Forwards Players
Figure 4.10: Figure Indicating Head Injuries/Concussions Among Backline Players
Figure 4.11: Figure Indicating Spinal Injuries Among Forwards
Figure 4.12: Figure Indicating Spinal Injuries Among Backline Players
and lower lumbar region. The least injured positions this season were the tight head props with 7 (5%) injuries recorded in which the most common anatomical site injured was the head (concussion) and the cervical spine. The eigthman recorded 7 (5%) injuries in which the most common sites injured were the lower lumbar spine and knees.

Among the backline players, the position injured the most was the centres in which 28 injuries (19%) were recorded during the season, with the most common anatomical sites injured being the head (concussion), knees and ankles. The next position that reported the most injuries was the wings which recorded 20 injuries (14%), in which the most common anatomical sites injured were the head (concussion), knees and ankles. Next, fullbacks reported 13 (9%) injuries during the season in which the most common anatomical sites injured were the head (concussion) and shoulder. The least injured positions were scrumhalves in which only 2 (1%) injuries were recorded during the season, and the flyhalves in which 12 (8%) injuries were recorded during the season, and the most common anatomical site injured for both these positions was the knees.

In the open age group a total of 149 injuries were recorded. Among the forwards, the position injured the most was the locks. Twenty-five injuries (13%) were recorded during the season in which the most common anatomical sites injured were the lower lumbar spine and knee. The next position that reported the most injuries was the loose head props in which 16 (11%) injuries were recorded and the most common anatomical sites injured were the head (concussion), neck and shoulder. Next, the eigthman reported 12 (8%) injuries during the season and the most common anatomical sites injured were the lower back region and the head (concussion). Flankers reported 11(7%) injuries during the season in which the most common anatomical sites injured were knees and ankles. The least injured positions were the tight head prop with 7 (5%) injuries recorded during the season, in which the most common anatomical sites injured were the neck and lower back, and the hookers with 8 (5%) injuries recorded, in which the most common anatomical site injured was the head (concussion).

Among the backline players, the most commonly injured positions were the wing with 25 (17%) injuries recorded during the season, in which the most common anatomical sites injured was the head (concussion), ankle and medial thigh. The centers reported 23 (15%) injuries during the season, in which the most common anatomical sites injured were the lower lumbar spine, shoulder and posterior thigh. Next, the flyhalves reported 12 (8%) injuries during the season in which the most common anatomical sites injured were the head (concussion) and shoulders. The least commonly injured positions were the scrumhalf position with 9 (6%) injuries recorded
during the season, in which the most common anatomical sites injured were the wrist and shoulder, followed by the fullback with 11 (7%) injuries recorded during the season in which the most common anatomical sites injured were the anterior thigh, head (concussion) and lower lumber spine.

Refer to Figure 4.13: Figure Indicating Commonly Injured Positions Among Forwards Players

Refer to Figure 4.14: Figure Indicating Commonly Injured Positions Among Backline Players

4.2.7.5.2 Phases Of Play In Which Injuries Occurred

In the under fourteen age group, the phase of play in which players were injured the most was being tackled (28%), followed by loose mauls/rucks (25%), scrums (24%), tackling opponents (20%), lineouts (2%) and other (1%). Among the front row, the phase of play in which players were injured the most were scrums (71%), followed by being tackled (12%), tackling opponent (9%) and loose maul/rucks (8%). Among locks, the phase of play in which players were injured the most was loose maul/rucks (52%), followed by scrums (32%), lineouts (11%) and tackling opponents (5%). Among the loose forwards, the phase of play in which players were injured the most were loose mauls (76%), tackling (14%) and being tackled (10%). Among backline players, the phase of play in which players were injured the most was being tackled (46%), loose mauls/rucks (31%) and tackling (23%).

In the open age group, the phase of play in which players were injured the most was being tackled (35%), followed by tackling (23%), loose mauls (20%), scrums (16%), lineouts (5%) and others (1%). Among the front row, the phases of play in which players were injured the most were scrums (63%), loose mauls (20%) and tackling (17%). Among locks, the phases of play in which players were injured the most were being tackled (29%), lineout (29%), loose mauls/rucks (19%), tackling (14%) and scrums (9%). Among loose forwards, the phases in which players were injured the most were being tackled (43%), loose mauls (35%) and tackling (22%). Among the backline players, the phase of play which players were injured the most was being tackled (60%), followed by tackling (32%), loose mauls/rucks (6%) and other (2%).

Refer to Figure 4.15: Figure Indicating Phase Of Play In Which Injury Occurred

4.2.7.6 Incidence Of Injury During Different Phases Of The Game

In the under fourteen age group, most of the injuries occurred in the second fifteen minutes of
Figure 4.13: Figure Indicating Commonly Injured Positions Among Forwards Players
Figure 4.14: Figure Indicating Common Injured Positions Among Backline Players
Figure 4.15: Figure Indicating Phase Of Play In Which Injury Occurred
the second half (54%), followed by the first fifteen minutes in the second half (15%), the second fifteen minutes of the first half (9%), the first fifteen minutes of the first half (3%) and 19% of the players were unsure of when their injuries occurred.

In the open age group, most of the injuries occurred in the second fifteen minutes of the second half (48%), followed by the first fifteen minutes of the second half (14%), the first fifteen minutes of the first half (8%), the second fifteen minutes of the first half (10%) and 20% of players were unsure of when their injuries occurred.

Refer to Figure 4.16: Figure Indicating Phases Of The Game In Which Injury Occurred

4.2.7.7 Incidence Of Injury During Different Periods Of The Season

In the under fourteen age group, the incidence of injury was the highest for the 2-week period consisting of weeks 8 and 9 of which 24% of the injuries occurred after the St. John’s College vacation. This is followed by the 2-week period consisting of weeks 1 and 2 of which 15% of the injuries occurred at the beginning of the season. Finally the 2-week period consisting of weeks 5 and 6 of which 10% of the injuries occurred after the K.E.S vacation. The least amount of injuries occurred during weeks 7 and 10.

In the open age group, the incidence of injury was the highest for the 2-week period consisting of weeks 1 and 2 of which 27% of the injuries occurred at the beginning of the season. This is followed by the 2-week period consisting of weeks 9 and 10 in which 13% of the injuries occurred after the St. John’s College vacation. The least amount of injuries occurred during the 2-week period consisting of weeks 4 and 12.

4.2.8 Medical Treatment

In the under fourteen age group, 144 injuries were recorded during the season and a total of 73 (51%) players sought medical treatment.

In the open age group, 149 injuries were recorded during the season, and a total of 100 (67%) players sought medical treatment.
Figure 4.16: Figure Indicating Phases Of The Game In Which Injury Occurred
4.2.9 Hospitalisation

In the under fourteen age group, a total of 6 players were hospitalised, of which 4 players were hospitalised for concussion and 2 of the players were hospitalised for cervical spine injuries.

In the open age group, a total of 10 players were hospitalised, of which 3 of the players were hospitalised for shoulder injuries, 4 were hospitalised for cervical spine injuries and 3 were hospitalised for concussion.

4.2.10 Return To play

In the under 14 age group, a total of 28 head (concussion) injuries were reported. Only 11 (36%) players followed the International Rugby Board rules for a 21-day rest from contact sport after a first concussion. No players reported more than one concussion for the season.

In the open age group a total of 29 head (concussion) injuries were reported. Only 17 (59%) players followed the International Rugby Board rules for a 21-day rest from contact sport after a first concussion. No players reported more than one concussion for the season.

4.2.11 Reasons For Playing Rugby

In the under fourteen age group, as stated on the questionnaire, 67% of players stated that playing rugby for their school meant a lot to them, 23% stated that their school was their life as a reason for playing rugby for their school, 10% stated that playing rugby was social time with their friends. In the open age group, as stated on the questionnaire, 50% of players stated that their school was their life, 48% stated that playing rugby for their school meant a lot to them and 2% stated that playing rugby was social time with their friends.

Refer to Figure 4.17: Figure Indicating Reasons For Playing Rugby

4.2.12 Encouragement

In the under fourteen age group, 37% of the players were encouraged by their fathers to play rugby, 31% of players encouraged themselves to play rugby, 7% of the players were encouraged by their brothers to play rugby, 7% of players were encouraged by their coaches to play rugby, 5% of players were encouraged by their mothers to play rugby, 5% of players were encouraged
Figure 4.17: Figure Indicating Reasons For Playing Rugby
by their uncles to play rugby, 3% were encouraged by their headmasters to play rugby, 3% were encouraged by their cousins to play rugby and 2% were encouraged by friends to play rugby.

In the open age group, 52% of players were encouraged by their fathers to play rugby, 36% of players encouraged themselves to play rugby, 7% of players were encouraged by their brothers to play rugby and 5% were encouraged by their coaches to play rugby.

*Refer to Figure 4.18: Figure Indicating Encouragement To Play*

### 4.3 Coaches Questionnaires

#### 4.3.1 Rugby Training Levels

In the under fourteen age group, the rugby training skills ranged from a level 1 to a level 2 (refer to Appendix 7), with the coaches having an average of 7.89 years of experience in coaching rugby. These coaches all participated in some form of rugby, ranging from top school level to top club rugby.

In the open age group, the rugby training skill level ranged from a level 1 to a level 2 (refer to Appendix 7), with the coaches having an average of 13.78 years of experience in coaching rugby. These coaches all participated in some form of rugby, ranging from top school level, top club rugby and provisional level rugby.

#### 4.3.2 First Aid Levels

In the under fourteen age group, every coach had some form of First Aid skill, ranging from level 1 to level 3 training (refer to Appendix 8). 46% of coaches had level 2 training, 40% of coaches had level 1 training and 4% of coaches had level 3 training.

In the open age group, every coach had some form of First Aid skill, ranging from level 2 to level 3 training (refer to Appendix 8). 64% of coaches had level 2 training and 36% of coaches had level 3 training.
Figure 4.18: Figure Indicating Encouragement To Play
4.3.3 Meaning Of Winning

In the under fourteen age group, 43% of coaches said winning was important, 21% of coaches said winning is not everything, 15% of coaches said winning meant the world to them, 14% of coaches said nothing at all and 7% said winning meant other reasons.

In the open age group, 63% of coaches said winning meant the world to them, 18% of coaches said winning was important, 9% of coaches said winning was not everything, 4% of coaches said nothing at all and 6% of coaches stated other reasons for winning.

Refer to Figure 4.19: Figure Indicating The Meaning Of Winning

4.3.4 Training Methods and Perceived Exertion

The average number of training hours per week for under fourteen age group was 4 hours per week. The most common training methods used by coaches throughout the season were game patterns (84%), touch rugby (82%), contact bags (43%), tackling bags (28%), contact games (19%) and stretching and strengthening (7.7%).

The average number of training hours per week for the open-age group was 6 hours per week. The most common training methods used by coaches throughout the season were game patterns (91%), touch rugby (83%), tackling bags (45%), contact bags (34%), contact games (25%) and stretching and strengthening (14%).

In the under fourteen age group, 31% of coaches perceived their training sessions as 9/10, 31% perceived their training sessions as 6/10, 23% perceived their training sessions as 7/10 and 15% perceived their training sessions as 5/10. During weeks 1, 2, 8 and 9 the training sessions were rated as 9/10 and during weeks 11 and 13 the training sessions were rated as 5/10.

In the open age group, 46% of coaches perceived their training sessions as 9/10, 38% perceived their training sessions as 8/10 and 16% perceived their training sessions as 7/10. During weeks 1, 2, 6, 7, 8 and 11 the training sessions were rated as 9/10, and during weeks 4 and 13 the training sessions were rated as 7/10.

Refer to Figure 4.20: Figure Indicating Training Methods Utilised
Figure 4.19: Figure Indicating The Meaning Of Winning
Figure 4.20: Figure Indicating Training Methods Utilised
CHAPTER FIVE: DISCUSSION
5.1. Introduction

Rugby is fast becoming a professional sport at school, players are being bought and trained to excel only at rugby. Rugby is becoming more physical and greater pressure is placed on players to win. The players are expected to produce peak results week in and week out. This requires optimal fitness levels, optimal mental levels and optimal treatment or management of injuries. The aim of this research was to investigate what predisposes top Gauteng schoolboy rugby players to injuries by providing statistics on previous injuries, pre-season training, protective gear, first aid facilities pre- and post-game warm ups and present injuries.

The mean age of the under fourteen age group studied was 13.75 years, with a mean playing history of 2.7 years.

The mean age of the open age group studied was 17.57 years, with a mean playing history of 5.92 years.

5.2 Players' Questionnaire

5.2.1 Previous Injuries

The main aim for recording previous injuries was to establish the rate of injuries that occurred in the previous season or during pre-season training. The high incidence of previous injuries during the first week of training was a total of 19 previous injuries being recorded from the under fourteen age group and 35 previous injuries from the open age group. A high percentage of these injuries were concussion - 5 in the under fourteen age group (26%) and 6 in the open age group (17%). In the under fourteen age group, flyhalves recorded the highest percentage of previous concussions, and were most susceptible to concussion because in set phases - mainly scrums - the eightman of the opposing team breaks off the back of the scrum and charges the flyhalf channel, and the flyhalf is expected to tackle a man that is on the move. In the open age group, props recorded the highest percentage of previous concussions. Props may be most susceptible to concussion because of the physical contact of scrums and due to illegal scrummaging of the front row resulting in collapsing of the scrum.
5.2.2 Pre-season Training

This research has shown that only 73% of the under fourteen age group did pre-season training whereas every open player (100%) participated in some form of pre-season training. In the under fourteen age group, a total of 38 injuries were recorded in the first four weeks, 68% of these injuries occurred in players that did no form of pre-season training, whereas 0% occurred in players that participated in fitness training, endurance training, weight training and rugby training as pre-season training.

In the open age group, 18 injuries were recorded in the first four weeks, 83% of these injuries occurred among players who only did some form of pre-season training and 17% occurred in players that participated in fitness training, endurance training, weight training and rugby training as pre-season training.

Rugby at schoolboy level is very physical and players are expected to produce peak performances at the start of the season, but in order to perform, players must be optimally prepared. This research has shown adequately prepared players experience less injuries than those who have no or very little preparation, since prepared players are mentally and physically stronger than those who have little or no preparation.

5.2.3 Protective Gear

In this study, only 93% of the under fourteen age group wore some form of protective gear, whereas in the open age group, 95% of players wore protective gear. In the under fourteen age group, a total of 28 concussions were recorded through the season, of which 54% wore no form of protective gear and 46% wore some form of protective gear. A total of 29 concussions were recorded in the open age group, of which 48% of players wore no form of protective gear and 52% wore some form of protective gear.

This study has shown that the separate use of headgear and a gumguard in rugby offers protection from a range of impacts, but this is only limited protection because nearly half of the players that suffered concussion were wearing some form of protection. In both age groups, players wearing both gumguards and scrumcaps suffered minimal concussions.
Shoulder padding, as protective gear, was popular among the under fourteen and open age groups. This study has shown that players in the under fourteen age group who wore shoulder pads only had 37% of shoulder injuries, while in the open age group only 29% of players wearing shoulder pads suffered shoulder injuries. This indicates that shoulder padding does assist in reducing the number of shoulder injuries because it helps reduce the force of impact directly on the shoulder complex.

5.2.4 Training Methods

The under fourteen age group trained for an average of 4.75 hours per week whereas the open age group trained for an average of 6 hours per week. Most of the injuries during the season occurred during the tackling phases, and only 28% (in the under fourteen age group) and 45% (in the open age group) of training was spent on tackling bags. The overall impression is that insufficient time is emphasised on tackling practice, and that little time is spent on falling techniques resulting in players injuring themselves in the tackling ball phase because of their lack of knowledge on the correct methods of tackling and of falling correctly.

5.2.5 First Aid Facilities

In both age groups, every player indicated that first aid facilities were available, but 8% of under fourteen players and less than 1% of open players were unsure of the type of first aid facilities available.

Schools place a major emphasis on first aid facilities being available on match days by utilising Netcare 911 and school first aid pupils, but very little emphasis is placed on first aid availability on practice days. This reason may be because the schools believe most of the injuries occur on match days while according to Fischer et al (1999: 33) in their study 27% of injuries occurred during practices. The schools are not aware of this fact and believe it is vital to only have first aid facilities on match days.
5.2.6. Pre-game Warm Up And Post-game Warm Down

5.2.6.1 Pre-game Warm Up

Pre-game warm-up is a vital part in reducing injuries. Each player in both age groups indicated that they participated in pre-match warm up. Sixty seven percent of players in the under fourteen age group warmed up 30 minutes compared with 27% of open age players that warmed up for the same amount of time. Conversely, 47% of the players in the open age group warmed up for 60 minutes whereas only 2% of under fourteen age group players warmed up for this time. This could be because players in the open age group understood the importance of warming up and how vital stretches are in reducing injuries. This study has shown that the under fourteen age group had insufficient knowledge on stretching whereas the opens had a better knowledge and understanding of stretching.

5.2.6.2 Post-match Warm Down

Only 27% of players in the under fourteen age group and 33% of players in the open age group did some form of post-match warm down. This may be because many players do not know the importance of warming down after a match/practice, and also that the players are eager to get to the showers or watch their friends play in other matches.

5.2.7 Injuries

5.2.7.1 Incidence And Injury Types At Different Anatomical Sites

The most injured anatomical site among the under fourteen age group was the head (concussion) followed by cervical injuries. In the open age group, the anatomical site injured the most was head (concussion) followed by knee injuries. The rate of concussion among young players is alarming and the position in the under fourteen age most susceptible to concussions was hookers (among the forwards), and eigthman in the open age group (among forwards). Hookers are be most susceptible to concussion because of their role as a third loose forward in rucks / mauls and clashing of heads during scrumming. Eigthman is most susceptible to concussion because of their role in rucks/mauls and their charging of the opponent's flyhalf during scrumming. Fullbacks were most susceptible to concussion among the backline players, occurring in the under fourteen age while flyhalves were most susceptible in the open age group. Fullbacks may
be most susceptible because they are the last line of defense in tackling resulting in tackling of the man at full pace, and also due to the fullback taking up and unders while the opposing team is charging. Flyhalves are more susceptible because in set phases - mainly scrums - the eigthman of the opposing team breaks off the back of the scrum and charges the flyhalf channel and the flyhalf is expected to tackle a man bigger than him and on the move.

According to the International Rugby Board (IRB), any player suffering concussion for the first time is rested for 21 days from contact sport. Two concussions in a season requires a 6-week rest, and players suffering 3 concussions in one season are no longer allowed to participate in rugby for the remainder of the season (Kelley and Rosenberg, 1997).

One of the problems may be that the implementation of these IRB rulings by coaches is difficult since they have limited numbers of players and taking one off the field for a possible concussion reduces the number of replacement players available, and coaches may not be willing to rest their best players for the stated time. Secondly, coaches are not always aware that players have suffered a concussion because players know that if they are sidelined due to injury, especially concussion, they could lose their place in the team, and may thus tend to underplay the symptoms of concussions.

A total of 26 cervical injuries occurred in the under fourteen age group whereas 15 cervical injuries occurred in the open age group. This alarming difference could be due to the lack of knowledge on the correct method of stretching and strengthening of the cervical spine musculature. Props were most susceptible to cervical injuries in both age groups - mainly during scrumming but particularly when the scrums collapsed. In the under fourteen age group, flyhalves were more susceptible to cervical injuries whereas in the open age group centres were more susceptible to cervical injuries. Both these positions suffered cervical injuries during the tackle ball phase or during illegal high tackles.

5.2.7.2 Relationship Of Playing Position, Phase Of Play And Anatomical Sites

The front row was most susceptible to injuries during scrums. Locks were most susceptible to injuries during scrums and lineouts, while loose forwards were most susceptible during loose mauls/rucks and the tackling phases. In both age groups the locks were injured the most among the forwards and could be due to incorrect binding during the scrums, collapsing of the scrums,
and locks being tackled in the air during lineouts and having their legs taken out from underneath them.

The position most injured among the backline players was centres among the under fourteen-age group and wings among the open age group. Backline players were most susceptible to injuries during the tackling phases, which occurred at speed resulting in tackles at great velocity of with great force.

The anatomical sites injured the most by forwards were the head and spine because forwards are involved in the scrumming phases, while backline players had more extremity-related injuries because these players are more involved in tackle ball phases at high velocities.

5.2.7.3 Incidences Of Injury During Different Phases Of The Game

In both age groups, most injuries occurred in the second fifteen minutes of the second half, while the least amount of injuries occurred in the first fifteen minutes of the first half. This could possibly be that the majority of the injuries were fitness related. As players became tired, there is an increase in fatigue levels and a loss of concentration resulting in players not committing themselves correctly to the phases of play and thus predisposing themselves to a greater risk of injury.

5.2.7.4 Incidences Of Injury During Different Periods Of The Season

In the under fourteen age group, most of the injuries occurred during weeks 8 and 9 (at which time St. John’s College returned from their mid-winter break) and during weeks 4 and 5 (at which time K.E.S returned from their mid-winter break). This may indicate that mid-season training programs were not adhered to. In the open age group, most of the injuries occurred during weeks 1 and 2 and may show how important it is to follow a proper pre-season training program.

This study has shown that the open age group players do not suffer from injuries after mid-winter break because they continued to play rugby (i.e. during weeks 4 and 5 K.E.S were on a Cape Tour and St. John’s College continued to play rugby matches during weeks 8 and 9). However, due to the first teams going on tours and playing at festivals, a high proportion of
players may have suffered injuries due to fatigue and insufficient rest occurring mainly during weeks 9 and 10, when a large portion of injuries also occurred.

The average number of games played by the under fourteen age group was 19 games during a thirteen week season (an average of 1.5 games per week), whereas the open age group played 24 games during a thirteen week season (an average of 1.9 games per week) and may explain why open players experience more fatigue towards the end of the season.

5.2.7.5 Reason For Playing

In both age groups, players indicated that playing for their school was vitally important to them while less than 10% indicated that rugby was social time with their friends. This study has shown that at top schools, where tradition is important, from a young age the boys are passionate about their school therefore increasing their drive to win (personal experience). This may increase their risk of injury since they will do anything to achieve victory against their rival schools.

In first and second teams, at top traditional boy’s schools, winning is the ultimate goal, spurred on from behind by old boys (personal experience). These players put their bodies on the line to achieve victory over their arch rivals, will do what ever it takes even if that means playing with an injury, thus under-reporting their injuries, and from this perspective may predispose players to further serious injuries.

5.2.7.6 Encouragement

In both age groups, fathers encouraged their sons to play rugby more than their mothers did. This could be because the fathers played rugby as a child, or may be because of the physical nature of rugby associated with manhood.
5.3 Coaches Questionnaire

5.3.1 Level Of Training Skills

In the under fourteen age group, the rugby training skills of coaches ranged from a level 1 to a level 2 (refer to Appendix 7), with the average coach having 7.89 years of experience in coaching rugby. The coaches in this age group all participated in some form of rugby, ranging from top school level to top club rugby.

In the open age group, the rugby training skill ranged from a level 1 to a level 3 (refer to Appendix 7), with the average coach having 13.78 years of experience in coaching rugby. The coaches in this age group all participated in some form of rugby, ranging from top school level to top club rugby or provincial level.

5.3.2 First Aid Levels

In both age groups, every coach had some form of first aid training. In the under fourteen age group, the first aid skills ranged from a level 1 to a level 3 (refer to Appendix 8). In the open age group, the first aid skills ranged from a level 2 to a level 3 (refer to Appendix 8).

Although coaches have some form of first aid training, schools place a major emphasis on first aid facilities on match days by utilising Netcare 911 and school first aid pupils, but very little emphasis is placed on first aid on practice days. This may be because the schools believe most of the injuries occur on match days which is countered by Fischer et al. (1999: 33) in their study in which 27% of injuries occurred during practices. The schools are not aware of this study and only believe it vital to have first aid facilities on match days.

5.3.3 Meaning Of Winning

In the under fourteen age group, 43% of coaches said winning was important and in the open age group, 63% of coaches said winning meant the world to them.

In the under fourteen age group, coaches are usually old boys or physical education teachers. Pressure is not placed on these players to win, but it is encouraged, therefore the players can play and enjoy the game because they love it and not because they have to win. In the open age group
the meaning of the game has changed. Schools hire coaches whom are paid to coach, therefore pressure is placed on them to win. If the pressure is on the coaches to win then the pressure is transferred to the players to win. Teams are expected to win, coaches want their teams to win by all means, and the pressure placed on players at this age group is tremendous.

5.3.4 Training Methods And Perceived Exertion

The under fourteen age group trained for an average of 4.75 hours per week whereas the open age group trained for an average of 6 hours per week. Most of the injuries this season occurred during the tackling phases, and only 28% (in the under fourteen age group) and 45% (in the open age group) of training was spent on tackling bags. The overall impression is that insufficient time is emphasised on tackling practice, and that little time is spent on falling techniques resulting in players injuring themselves in the tackling ball phase because of their lack of knowledge on the correct methods of tackling. The perceived exertion for the under fourteen age group was 9/10 (0 being rest and 10 being maximal exertion) at the start of the season, while the remainder of the season was perceived as 6/10. The open age group’s perceived exertion was 9/10 throughout the season excepting for week 4 and 13 when it was perceived as 7/10. This could again explain why so many open players were injured towards the end of the season.
CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS
6.1. Conclusion

The principal conclusions of this study are as follows:

1. There is a high incidence of rugby injuries among schoolboy rugby players, in particular concussion injuries, and there is under-reporting of these to the authorities of the schools.
2. Schoolboy rugby injuries are more common during the early season in both age groups and after the mid-year winter recesses, mainly among the under fourteen.
3. Players in the open age group did pre-season training more frequently than the under fourteen age group.
4. Locks suffered the most injuries in both age groups among the forwards, while flyhalves and centres suffered the most injuries in both age groups.
5. Forwards suffered injuries during set phases, while backline players suffered injuries during the tackle ball phases.
6. Concussion was the most common injury suffered in both age groups, while the under fourteen age group suffered a great deal of cervical injuries.
7. Injuries most commonly occurred during the second fifteen minutes of the second half in both age groups.
8. Fathers were the main reason for scholars playing rugby in both age groups.

Factors that predispose players to injury include:

- Players lack of knowledge on the treatment and management of previous injuries.
- Inadequate pre-season training.
- Inadequate and lack of knowledge of strengthening programs.
- Players’ lack of knowledge on the importance of protective gear.
- Inadequate training time spent on tackling and falling skills.
- Over-training syndrome.
- Inadequate first aid facilities during practices.
- Insufficient warming up time.
- Players’ inadequate knowledge of position-specific stretching.
- Players not doing post-match warm down stretches.
- Players lack of knowledge of management of injuries.
- Players returning to rugby too soon after an injury.
• Players and coaches lack of knowledge on management of concussions.
• Pressure placed on players to win.

6.2. Recommendations

6.2.1 General Recommendations

There is a growing concern with the dramatic number of catastrophic injuries occurring among schoolboy rugby-players (Erasmus et al 1999: 32). At the start of this investigation this phrase was a mere sentence but by the end this phrase was a reality - too many injuries happen to young schoolboys. The following recommendations are proposed to gain a further understanding and knowledge of schoolboy rugby injuries.

6.2.2 Previous Injuries

It is recommended that coaches become aware of players who have suffered previous concussions, and if a player is to suffer two or more concussions in consecutive seasons, he is to be banned from playing rugby again. Also, the players that have suffered concussions should be made aware of the consequences of recurrent concussions.

6.2.3 Pre-season Training

Recommendations that coaches strongly encourage players to follow comprehensive and position-specific training programs which start in January. Coaches are to ensure that players participate in supervised gym programs, particularly the forwards that concentrate on programs involving the neck and lower lumbar and pelvic region.

6.2.4 Protective Gear

It is recommended that it be made compulsory for every player to wear a gumguard and scrumcap and that coaches and schools make it compulsory for players to wear some form of protective gear.
6.2.5 Training Methods

Recommendations that coaches spend more time on the importance of tackling correctly, falling correctly, educating players on the risks of dangerous tackles and emphasising the correction of tackling techniques rather than 'how far can you knock the opposition back' attitude.

6.2.6 First Aid Facilities

It is recommended that all coaches have a basic ambulance first aid level and that each age group have their own first aid bag available at each practice with the usual first aid available on match days.

6.2.7 Pre-match Warm Up

It is recommended that every player receive a position-specific stretching program at the start of the season and that coaches emphasise the importance of stretching correctly at the start and end of each practice as well as after each match day.

6.2.8 Injuries

Recommendations that school coaches or principals make it compulsory for players that have suffered any form of concussion be prevented from playing until a medical practitioner has cleared the player to play again. Referees should not allow players to continue if they have suffered any form of concussion (memory loss, blurred vision etc), and should make the player leave the field immediately and report any player that has suffered concussion to SARFU so the player's return to play can be monitored. Again, the consequences of recurrent concussions should be emphasised to the relevant players.

It is recommended that coaches make it compulsory for all forwards to participate in supervised neck strengthening programs and that no front-row forwards be allowed to scrum until the program has been completed.

Too many games are being played at this level and schoolboy rugby should follow the example of the ABSA CURRIE CUP, strength versus strength, to reduce the number of games played and injuries incurred.
Coaches should concentrate more on preventive measures to reduce injuries than the importance of winning.

It is recommended that coaches in the open age group emphasise to players the importance of enjoying themselves in rugby, the reason why they started playing rugby and that winning is not the means to all ends.

6.3 Recommendations for Further Studies

- A comparative study to compare two schools - one top school and one medium-playing school. To analyse their injury data and investigating whether the injury rate is higher at top schools or medium schools, and what factors predisposes them to injury.

- A comparative study between two top schools whereby one school undergoes comprehensive pre-season training, strengthening programs, stretching programs, injury assessment and treatment throughout the season, and the other school receives no professional guidance. The data is then analysed and compared.

- Analyse referees and their role in injury prevention, their knowledge on concussion assessment and injury assessment.

- The role of gumguards in the prevention of concussion.

- The role of shoulder pads in the prevention of shoulder injuries.

- A study investigating the type of muscle injuries occurring among backline players.

- A study investigating the effectiveness of pre-season training.

- A study investigating the effectiveness of pre- and post-match stretching in injury prevention.

- A study investigating the effectiveness of strapping in the treatment of rugby players.
• A study investigating the importance of cervical musculature strengthening in cervical injury prevention.

• A study to investigate the usefulness of chiropractic care in the prevention and treatment of sporting injuries as may occur in rugby.

• Educate players and coaches about the relevance and possible importance of chiropractic care in sports such as rugby.

• A study to determine the benefit of chiropractic care in rugby players that have received a cervical spine injury during rugby.

• Repeat the research and amend the questionnaire to include the type of medical treatment sought when injured, to determine if chiropractic care was of benefit during any of the injuries sustained.
REFERENCES
7.1 References


**McGill Abbreviated Concussion Evaluation (ACE)**

*This form is for the use of medical doctors, physiotherapists or athletic therapists.*

In order to maximize the information gathered from the form, it is strongly suggested that all athletes participating in contact sports complete a Baseline Concussion Questionnaire prior to the beginning of their competitive season.

Name: ___________________________ Position: ___________________________ Injury Date: ___________

Team/sport: ___________________________ Special Equipment: ___________________________ Mouth Guard: YES NO

**Ask questions exactly as they are written. Record correct answers as "Pass" and incorrect answers as "Fail"**

<table>
<thead>
<tr>
<th>Post Traumatic Amnesia Questions</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did you get injured?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the first thing that you recall after your concussion?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the last thing that you remember before your concussion?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Memory</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which team are we playing?</td>
<td></td>
<td></td>
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<tr>
<td>Which side scored the last goal?</td>
<td></td>
<td></td>
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<tr>
<td>Which team did we play last week?</td>
<td></td>
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<tr>
<td>Did we win last week?</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Orientation</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>What day of the week is it?</td>
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<td></td>
</tr>
<tr>
<td>What month is it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the date of the month?</td>
<td></td>
<td></td>
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<tr>
<td>What is the year?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What time is it now? (Within one hour)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which quarter/period is it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How far into the quarter/period is it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which field/arena are we at?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Immediate Memory**: Choose 5 words from the list provided. Place a check mark beside each choice. Avoid choosing related words such as "dark" and "moon" which can be recalled by means of word association.

<table>
<thead>
<tr>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td></td>
</tr>
<tr>
<td>Candle</td>
<td></td>
</tr>
<tr>
<td>Hard</td>
<td></td>
</tr>
<tr>
<td>Dark</td>
<td></td>
</tr>
<tr>
<td>Moon</td>
<td></td>
</tr>
<tr>
<td>Bottle</td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td></td>
</tr>
<tr>
<td>River</td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td></td>
</tr>
<tr>
<td>Window</td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td></td>
</tr>
<tr>
<td>Book</td>
<td></td>
</tr>
<tr>
<td>Ocean</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reverse Digits</th>
<th>Trial 1 Pass</th>
<th>Fail</th>
<th>Trial 2 Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruct the candidate to repeat a string of digits in reverse order. Give an example before beginning the test such as &quot;If I say 7-5-2, you say 2-5-7.&quot;</td>
<td>5-1</td>
<td></td>
<td>3-8</td>
<td></td>
</tr>
<tr>
<td>Read each number at the rate of one number per second</td>
<td>4-9-3</td>
<td></td>
<td>5-2-6</td>
<td></td>
</tr>
<tr>
<td>Begin with the first string from Trial 1, and then select the corresponding string from Trial 2 having the same number of digits. Record correct answers as &quot;Pass&quot; and incorrect answers as &quot;Fail&quot;</td>
<td>3-8-1-4</td>
<td></td>
<td>1-7-9-5</td>
<td></td>
</tr>
<tr>
<td>Stop after 2 consecutive fails for any string length</td>
<td>6-2-9-7-2</td>
<td></td>
<td>4-6-5-2-7</td>
<td></td>
</tr>
<tr>
<td>For example: If the candidate passes Trial 1 but fails Trial 2 of any given string length, continue with the next string length.</td>
<td>7-1-5-2-8-6</td>
<td></td>
<td>8-3-1-9-6-4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-7-3-9-1-2-8</td>
<td></td>
<td>8-1-2-9-3-6-5</td>
<td></td>
</tr>
</tbody>
</table>

Developed in consultation with the McGill Sport Medicine Clinic
## Months of the Year (In Reverse Order)

Ask the candidate to recite the months of the year in reverse order. Randomly select a starting month but do not choose December or January. Note the starting month on the form. Circle any months not recited in the correct sequence.

<table>
<thead>
<tr>
<th>June</th>
<th>May</th>
<th>April</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>February</td>
<td>January</td>
</tr>
<tr>
<td>December</td>
<td>November</td>
<td>October</td>
</tr>
<tr>
<td>September</td>
<td>August</td>
<td>July</td>
</tr>
</tbody>
</table>

## Delayed Recall (Approximately 5 minutes after Immediate Memory)

Ask the candidate to recall the 5 words you mentioned earlier. Do not repeat them again. Do this for only one trial. Record correct answers as "Pass" and incorrect answers as "Fail." The words must be repeated correctly but they do not have to be in the correct order. Give the candidate a total of 30 seconds within which to recall the words. For example, the candidate may pass words 1, 3, and 5, but fail words 2 and 4.

<table>
<thead>
<tr>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td></td>
</tr>
<tr>
<td>Word 3</td>
<td></td>
</tr>
<tr>
<td>Word 4</td>
<td></td>
</tr>
<tr>
<td>Word 5</td>
<td></td>
</tr>
</tbody>
</table>

## Post Concussion Signs

Ask the candidate directly about each of the listed signs. Record the severity of each sign on a scale of 0 to 6 where applicable.

<table>
<thead>
<tr>
<th>None</th>
<th>Moderate</th>
<th>Severe</th>
<th>None</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dizziness</td>
<td>0 1 2 3 4 5 6</td>
<td>Headache</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td>0 1 2 3 4 5 6</td>
<td>Vomiting</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance problems</td>
<td>0 1 2 3 4 5 6</td>
<td>Trouble falling asleep</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleeping more than usual</td>
<td>0 1 2 3 4 5 6</td>
<td>Drowsiness</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>0 1 2 3 4 5 6</td>
<td>Sensitivity to noise</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More emotional than usual</td>
<td>0 1 2 3 4 5 6</td>
<td>Irritability</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td>0 1 2 3 4 5 6</td>
<td>Nervousness</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Numbness or tingling</td>
<td>0 1 2 3 4 5 6</td>
<td>Feeling slowed down</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeling like &quot;in a fog&quot;</td>
<td>0 1 2 3 4 5 6</td>
<td>Difficulty concentrating</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty remembering</td>
<td>0 1 2 3 4 5 6</td>
<td>Other</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Neurological Screening

Trained medical personnel must administer this battery of tests. These individuals might include medical doctors, physiotherapists or athletic therapists.

<table>
<thead>
<tr>
<th>Pass</th>
<th>Fail</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Motion</td>
<td>Visual Field</td>
<td>General Facial Expression</td>
<td>Finger-Nose-Finger</td>
</tr>
</tbody>
</table>

## Exertional Provocative Tests

Complete after the candidate is completely asymptomatic. One minute maximal exertion test. The goal is for the athlete to be breathing heavily by the end of the exercise.

<table>
<thead>
<tr>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples</td>
<td>尼</td>
</tr>
<tr>
<td>Sprint back and forth (similar to the shuttle run)</td>
<td></td>
</tr>
<tr>
<td>Stationary bike maximal sprint for 1 minute</td>
<td></td>
</tr>
<tr>
<td>Sprint the length of field / ice surface and back for 7 minute</td>
<td></td>
</tr>
</tbody>
</table>

## Tests

- X-ray
- CT scan
- MRI
- Other

Signature (print) (sign)  
Dx/Follow Up

Developed in consultation with the McGill Sport Medicine Clinic
APPENDIX TWO: Permission Letter from King Edward VII School

KING EDWARD VII SCHOOL
44 ST. PATRICK ROAD
HOUGHTON,
JOHANNESBURG 2193
HEADMASTER TEL.: 648-1011
SECRETARY FAX: 648-3114
info@kesnet.co.za
www.kesnet.co.za

8 October 2002

Attention: Clive Grobler

Dear Clive

You have been granted permission to conduct your study at King Edwards next year. Please direct all further correspondence to Mr Hansen and he will pass it on to the new Sports Co-ordinator Mr Eugene Marx.

Regards,

[Signature]

Adrian Norris
Sports Co-ordinator
21 October 2002

To Whom It May Concern:

Please be advised that Clive Grobler has been granted permission to conduct a comparative study at St John's College to investigate the cause of the high incidence of schoolboy rugby injuries.

RDT Cameron
Headmaster
APPENDIX FOUR: Players’ Questionnaire

PLAYERS’ QUESTIONNAIRE: Group: ____________

Date: ________________ Week: ____________ School: ____________________________

1. Age: ____________ Stature: Small build Medium build Large build

2. Weight: ____________ Height: ____________ Position: _________________________

3. History:

3.1. Years of playing rugby: ________________

3.2. Previous rugby injuries: Yes ☐ No ☐

3.2.1. If yes, where did the injuries occur? ________________________________

3.3. Pre-season training: Weight training ☐ Fitness training ☐

Endurance training ☐ Rugby training ☐

None of the above ☐ Other __________________

3.4. Gym training: Prescribed by personal trainer ☐ Own ☐

Prescribed by rugby coach ☐ Other __________________

4. Number of hours of rugby practice this week: ________________

5. Number of games participated in to date: _________________________

6. Protective rugby gear worn: Gum guards ☐ Scrum caps ☐ Shoulder pads ☐

Strapping ☐ Nylon Guards ☐ Other __________________

None of the above ☐

7. Training methods this week: Stretch & strengthening program ☐ Touch rugby ☐

Tackling bags ☐ Contact bags ☐

Game patterns ☐ Contact games ☐

None of the above ☐ Other __________________

8. Are there any first aid facilities available? Yes ☐ No ☐

Netcare 911 ☐ Telephone numbers only ☐ Others __________________

9. What does playing rugby for your school mean to you?

Nothing at all ☐ Is not important ☐

Social time with my friends ☐ Means a lot to me ☐

My school is my life ☐ Other (specify): ________________________________

10. Pre-game warm-ups: Yes ☐ No ☐

10.1. If yes, for how long before the match? ____________________________

10.2. Indicate on the diagram the area that is warmed up before the match.
10.2. Indicate on the diagram the area that is warmed up before the match.

11. Do you warm down after the match?  Yes ☐  No ☐
If yes, what does this consist of? ____________________________________________

12. Injuries:
12.1. Did any injuries occur in your last match?  Yes ☐  No ☐
12.1.1. If yes, indicate where on the diagram the injury occurred.
12.1.3. During which phase of the game did the injury occur?
- First half
- First fifteen minutes
- Second half
- First fifteen minutes
- Second fifteen minutes

12.1.4. Did the injury make you leave the game then?
- Yes
- No

12.1.5. If yes, were you hospitalised?
- Yes
- No

What treatment did you receive for your injury?

12.2. Do you still continue to play rugby?
- Yes
- No

12.2.1. If no, how long are you not allowed to play rugby for?

13. Who encouraged you to play rugby?
- Father
- Mother
- Coach
- Headmaster
- Myself
- Other
APPENDIX FIVE: Coaches Questionnaire

1. Date: ____________ Week: ____________ School: ________________

2. Coach of: Under 14 ☐ Under 19/Opens ☐

3. Are you presently a member of the school staff? Yes ☐ No ☐

4. What level of rugby training skills have you received? __________________________

5. What level of rugby have you participated in? _________________________________

6. Are you up-to-date with the current rugby rulebook? Yes ☐ No ☐

7. Do you have any first aid training? Yes ☐ No ☐

7.1. If yes, what level of training have you received? ______________________________

7.2. When did you receive your training? _______________________________________

8. What does your team winning mean to you?
   - Nothing at all ☐
   - Winning is not everything ☐
   - Winning is important ☐
   - Winning means the world to me ☐
   - Other (specify): ______________________________

9. Training methods for the week:
   - Stretch & strengthening program ☐
   - Touch rugby ☐
   - Tackling bags ☐
   - Contact bags ☐
   - None of the above ☐
   - Other ______________________________

10. Session rating of perceived exertion during the week of practice (0 being rest and 10 being maximal exertion):

   0  1  2  3  4  5  6  7  8  9  10
APPENDIX SIX: Informed Consent Form

The possible aetiologies for the incidence of rugby injuries among top Gauteng rugby-playing schools.

Dear Prospective Participant

The aim of this study is to investigate and elucidate the possible aetiologies for the incidence of schoolboy rugby injuries among top South African schools in Gauteng. The two schools to be used in this study will be King Edward VII St. John’s College, both situated in Houghton, Gauteng. You will be involved in a chiropractic study investigating this and will be assigned to one of three groups. Group one will be the under fourteen age group. Group two will be the open age group. Group three will be the relevant coaches/managers of each age group. Each participant will be required to complete a weekly questionnaire for the duration of the 2003 rugby season (March-July 2003).

Participation in this study is voluntary and you are free to refuse participation or to withdraw your consent and to discontinue participation at any time. A signed copy of your consent form will be made available to you.

I have fully explained the procedures, and I have identified the procedures that are investigational and have explained their purpose. I have asked whether any questions have arisen regarding the procedure and have answered these questions to the best of my ability.

Date_________________________ Researcher ______________________________

I have been fully informed as to the procedures to be followed; including those that are investigational and have been explained their purpose. In signing this consent form I agree to this method of study and understand that I am free to withdraw my consent at any time during the study. I also understand that if I have any questions at any time, they will be answered.

Date_________________________ Participant ______________________________
APPENDIX SEVEN: Rugby Coaching Levels (Provided by Golden Lions Rugby Union)

Level 1 Coaching Includes The Following:

1. South Africa's Coaching Approach
2. The Coach
   - As educator and sports leader
   - Communication hints
   - The role of the coach
   - Weekly planning
   - Coach as selector
3. Terminology
4. Planning of practice sessions
   - Warming up
   - Individual skills development
   - Unit skills
   - Team skills
   - Example of a 4-day practice week
5. Systems
6. Special play
   - Kick-offs and drop-outs
   - Free-kicks and penalty kicks
   - The drop kick
   - The touch kick
   - The up and under kick
   - The rolling kick
7. Scrum
   - Fundamental coaching principles of the scrum
   - Training methods
   - Back-play from scrums
   - Breaking the contact line with the loose forwards
   - Defensive back-line play
   - Play from scrums in team context
8. Line-out
   - Fundamental coaching principles
   - Training methods
   - Back-line play from line-outs
   - Forward play from line-outs
   - Defensive pattern from line-outs
   - Play from line-outs in team context
9. Play between the set pieces
   - General individual skills
   - Catching and passing before contact
     - Swing pass
     - Flick pass
     - Torpedo pass
     - Scissors pass
     - Foot passes
10. Running skills
    - Side step
    - Swerve
    - Hand-off
    - Dummy
    - Drawing a man
    - Passes during contact
      - Two-handed pass
      - One-handed pass
      - Push-pass from chest
    - The maul and the ruck
    - Defensive skills
    - Support
    - Communication
10. Contact familiarisation exercises
    - Contact with the ground
    - Contact with the ground and other players
**Level 2 Coaching Includes The Following:**

**Warming Up**
1. Introduction
2. Warming up with different systems
   - 2.1. Grid system
   - 2.2. Channel system
   - 2.3. Circle system
   - 2.4. Line system
   - 2.5. Station system
3. Phase play
   1. Introduction
   2. Principles
   3. Goals
      - Direct goals for phase play
      - Indirect goals for phase play
   4. Ball retention
      - Passes before contact
      - Training methods
      - Passes in contact
      - Training methods
5. Rucks
   - Kinds of rucks
   - Key principles
6. Mauls
   - Kinds of mauls
   - Key principles
7. Driving mauls
   - Formation drive
   - Free rolling maul
8. Exercises for mauls
9. Attacking techniques
   - Goals
   - Attacking channels
   - Approach
   - Examples of attacks in channels
10. Technique development
11. Application

**Backline play**
1. Scrumhalf
   - Ball on the ground
   - Ball-in-hand
2. Flyhalf
   - Depth variations
   - Running lines
3. Channels and attacking areas
4. Aim on the attack
5. Tactical moves
   - The different moves
   - Passing-drills
6. Attacking moves

---

**Run-around**
- Scissors
- Cut
- Slip
- Swivel
- Combinations

7. Coaching backline moves
8. Issues to be taken into consideration when choosing attacking moves
   - Scrum
   - Line-outs
   - Creating second phase possession
   - Alignment of defenders
   - Potential of own players
   - Weather conditions

**Judgement**
1. Judgement is influenced by the following principles
2. Options
   - To play on his own
   - To kick
   - To pass
3. In contact
   - Ball carrier
   - Support
4. The purpose of judgement
5. Basic principles
6. Principles which will determine the options when the ball carrier:
   - Plays on his own
   - A kick is considered
   - A pass is considered
   - When he is going to make contact
7. Coaching exercises

**Defensive systems**
1. Objectives
2. Three key principles
3. Different types of defense
4. The different defensive lines
   - The lines from the scrum
   - The lines from the line-out
5. The different defensive systems
   - The scrum (from the left side of the field)
   - The scrum (from the right side of the field)
   - The line-out
6. Defense close to own goal line
   - From the line-out
From the left scrum
7. Defense from phase play
8. Practicing defense
9. Defense conditioning

Special play
1. Consists of:
   Kick-offs and drop-outs
      Launching attacks
      upon receipt of a
      kick-off or drop-out
      Doing kick-offs and
      drop-outs
   Free kicks and penalty kicks
      Awarded against your
      team
      Awarded to your side
2. Hints and thoughts on penalty kicks

Line-outs
1. Aim of the line-out
   General
   On attack
   On defense
2. Most important coaching principles
   Formation
   The ball thrower
   Type of throw
   The jumper
   The jump
   The catch
   Various deliveries
   Support
   Variation
   Calls
   Attacks
   Short line-outs
   Defense
   Training

Scrum
1. Positional responsibilities
   The tighthead prop
   The loosehead prop
   The hooker
   The locks
   The loose forwards
2. Important aspects going down to scrum
3. Advantages of the half-swung scrum
4. Hooking and channeling of the ball
5. Tactical scrumming
6. Attacking moves from the scrum
   To the tighthead side
   To the loosehead side
   From the centre scrum
7. Training methods

Counter attacks
1. Basic principles
   Approach
   Skills development
   Accelerating tempo of play
   Calculated risks
   Continuity
   Players’ approach
   Synergy
   Know each other
   Speed
   Work rate
2. Techniques to launch counter attacks
   Long-pass
   Scissors-moves
   Swivel-moves
   Run-around-moves
   Short-passes
3. Running skills
4. Training methods
   Draw-the-man
   The scissors-move
   The run-around-moves
   The swivel-moves
   Moves with long-passes
   Moves with short-passes
5. Application
6. Conclusion

Player profiles
1. Introduction
2. Drawing up a profile
3. That advantage of player profiles
   Fullback
   Wings
   Centre
   Flyhalf
   Scrumhalf
   Eighthman
   Flanker
   Locks
   Prop
   Hooker

Rugby nutrition
1. Introduction
2. Understanding the diet for rugby
3. Carbohydrates and food rich in carbohydrate
4. Protein and food rich in protein
5. Fat and food rich in fat
6. Fluid
7. Alcohol
8. Meal planning
9. Snack options
10. Eating out choices
11. Match eating
12. Recovery
13. Supplements
14. What about creatine?

Level 3 Coaching
This is no longer available to school or outside interests. It is only covered internally to coaches belonging to the Golden Lions Rugby Union (Mr. W. Vermeulen, Personal Correspondence).
APPENDIX EIGHT: First Aid Levels Of Coaches (Provided by The Department Of Labour)

LEVEL ONE COURSE:
1. Minimum Compulsory Content
   a) Principles of first aid and safety; Emergency scene management.
   b) Artificial respiration.
   c) One-rescuer CPR.
   d) Choking.
   e) Wounds and bleeding.
   f) Shock, unconsciousness and fainting.
   g) Fractures.
   h) Burns.
   i) Head and spinal injuries.
2. Minimum Duration
   a) 16 Hours training
   b) 2 Hours evaluation
   Total 18 Hours

LEVEL TWO COURSE:
1. Minimum Entry Requirements
   a) 30 Hour Course or
   b) 22 Hours Course plus valid level one certificate.
2. Minimum Compulsory Content
   a) Principles of first aid and safety; Emergency scene management.
   b) Artificial respiration.
   c) Choking.
   d) Wounds and bleeding.
   e) Shock, unconsciousness and fainting.
   f) Fractures.
   g) Head and spinal injuries.
   h) Joint and injuries and rescue carries.
   i) Chest injuries.
   j) Hand injuries.
   k) Eye injuries.
   l) Multiple injury management.
   m) One and two rescuer adult CPR.
   n) Pelvic and abdominal injuries.
   o) Child and infant resuscitation.
   p) Environmental illnesses and injuries.
   q) Burns.
   r) Poisoning, bites and stings.
   s) Chest pain and paralysis.
   t) Fits.
   u) Management of foreign objects.
   v) Soft tissue injuries.
   w) Elementary and applied anatomy and physiology.
3. Minimum Duration
   a) 22 Hours (participant in possession of a valid level one certificate).
   b) Alternatively, 32 hours (to include level one course content).
LEVEL THREE COURSE:

1. Minimum Entry Requirement
   a) Standard 7 education level or equivalent; PLUS
   b) A valid level two certificate.

2. Minimum Compulsory Content
   a) Principles of first aid and safety; Emergency scene management.
   b) Artificial respiration.
   c) Choking.
   d) Wounds and bleeding.
   e) Shock, unconsciousness and fainting.
   f) One and two rescuer adult CPR
   g) Child and infant resuscitation
   h) General principles of fractures and the threatened limb
   i) Specific fractures.
   j) Head and spinal injuries.
   k) Joint and injuries and rescue carries.
   l) Chest injuries.
   m) Hand injuries.
   n) Eye injuries.
   o) Multiple injury management / Emergency scene management.
   p) Pelvic and abdominal injuries.
   q) Burns.
   r) Poisoning, bites and stings.
   s) Chest pain and paralysis.
   t) Fits, breathlessness and skin reactions
   u) Environmental illnesses and injuries
   v) Emergency child birth
   w) Behavioral emergencies
   x) Water accidents.
   y) Anatomy and physiology.
   z) Ethics related to emergency care.
   aa) In depth knowledge, skills and evaluation of all of the above.

3. Minimum Course Duration (Excluding Evaluation)
   a) 20 Hours.