# A profile of horse riding injuries in adult horse riders registered with the Kwa Zulu Natal Horse Society.

**By**

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*Dissertation submitted in partial compliance with the requirements for the Master's Degree in Technology: Chiropractic at Durban University of Technology.*

**I, Jo-Anne Carrie Catlin ,do declare that this dissertation is representative of my own work both in concept and execution.**

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## DEDICATION

To my parents - you have encouraged me, suffered with me and supported me through many years. For all your love and understanding I dedicate this research to you.

## ACKNOWLEDGEMENTS

It's been a very long journey, with many twists and turns. So I would like to thank the following people for helping me make it to the end. Without your help, it would not have been possible.

- To all the DUT staff that endured the tough, and hopefully enjoyed some of the good, times, thank you for your part in making me the chiropractor I am today.
- To my supervisor, Dr Garrick Haswell and HOD Charmaine Korporal, many thanks for your guidance and help through the whole research process.
- To all the special friends I've made at DUT and outside DUT, there have been many memorable moments which have made my journey so special.
- To a truly great friend, Taryn Murgatroyd, the many hours at the studying table are all over now. We have shared many a laugh and a few tears on the way, and I look forward to many more.
- To my Aunty Viv, siblings Gary, Kim and Robyn and their families, your support from the beginning has been unbelievable and I couldn't have chosen a better family.
- Ouma and Uncle Ken, I hope you are looking down and cheering,
- Eric and Michelle van Eyssen and their 4 legged family members, you have been truly amazing friends and I am blessed that you have made some of my dreams come true which has kept me sane through these years.
- To all those graceful, noble creatures that have taught me so much and given me so much pleasure.
- Lastly, to Leonard Bentley, you have been an amazing support through these years. Thanks for standing by me through the lows as well as the highs. It's time to enjoy the future now.

# Abstract

## Introduction:

Equestrian sport as a competitive sport first began in 1868 at the Royal Dublin Horse Show [1]. Injuries, especially minor injuries, are seldom reported, and there are no regulatory requirements anywhere that compel formal injury notification of this sport [2].

## Objectives:

The objectives were to describe a profile of horse riding injuries, to determine the association between the type of equestrian activity and location and mechanism of injury, the association between use and type of equipment and location of injury and to determine anthropometric and history variables associated with location of horse riding injuries. As well as determining if non riding related injuries were associated with riding related injuries in the same sites.

Therefore, for the purpose of this study, the following information was gathered in order to build up an injury profile:

- Anthropometric values (age, height, weight, gender, ethnicity, dominant hand and medical aid) of competitive horse riders in KwaZulu-Natal, South Africa,
- The participants horse riding history,
- Their record of any past or current injuries,
- Factors associated with previous and current injuries were also investigated,
- Equipment and facilities used

## Methods:

This study was a quantitative descriptive design, which was questionnaire based and was administered by the researcher at various competitions in KwaZulu Natal or sent via email to those not present at the competitions.

The study was limited to adult members of the KwaZulu Natal Horse Society that competed in on the Olympic disciplines of dressage, show jumping and eventing.

**Results:**

There were 176 respondents to the study. The average age was 36.3 years. The vast majority of participants were White (99.4%) females (81%). The overall prevalence of injury was 90.3%. Muscle strains were the most common type of injury. The head was the most commonly injured site (46.4%), the lower back was the site most likely to be injured many times. Forceful falls were ranked as the most severe type of injury mechanism. Most injuries occurred whilst jumping (63.8%). Use of protective equipment was associated with injury prevention and protection.

Muscle strains due to riding were significantly less common in those who presently did regular exercise. Having no medical problems was associated with not having any riding injuries. There was no significant association between riding and non riding related injuries.

**Keywords:** equestrian, injuries, profile

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## Definitions

**Anterior:**

The front surface of the body.

**Artificial aid**:

A means by which signals by the rider are conveyed to the horse, e.g. whip, spur.

**Bit:**

A device, normaly of metal or rubber, attached to the bridle and placed in the horse's mouth in order to control the pace and direction of the horse and to regulate the position of the head.

**Chambon:**

A type of martingale which is used for schooling purposes to maintain a correct position for the horses head. The main strap from the girth divides into two long arms, which passes through a ring at the top of the horses head (poll) and then clipped to the bit ring.

**De Gogue:**

A modification of the chambon in which the arms, instead of being attached to the bit rings, are passed through the rings and attach to clips on the reins.

**Double bridle**:

The most severe form of bridle, having two bits (a snaffle and a curb bit), which are separately attached and can be operated independently.

**Dressage saddle:**

A deep seated saddle designed for use in dressage.

**Gag:**

A bit used to raise the horses head. It has 2 holes in each bit ring, and through this the bridle passes and joins directly to the reins.

**General purpose (GP) saddle**:

A type of saddle designed for general use and characterized by a deep seat, sloped-back head and forward supporting rolls for the thighs.

**Hacking:**

Taking the horse on a ride outside the confines of the property, this can include roads, farm land, forest etc.

**Jumping saddle:**

A modified form of the general purpose saddle designed for use in show jumping.

**Market Harborough:**

A device used, like the martingale, to regulate the position of the horses head. It consists of a strap which is fixed to the girth and splits into 2 straps, which pass through the bit rings and attach to the reins by means of a buckle.

**Pelham:**

A bit designed to reproduce the action of the double bridle, that is to produce with only one mouth piece the combined effects of a snaffle bit and curb bit. This allows pressure to be applied to the corners of the mouth and on the poll (top of the horses head) and curb groove.

**Running martingale:**

A device used to keep a horse's head down, thus giving the rider greater control by making the horse take hold of the bit. It attaches to the girth and divides into two arms, each terminating in a ring, through which the respective rein is passed.

**Schooling:**

To train a horse for whatever purpose it may be required in an enclosed area.

**Snaffle bit:**

The oldest and simplest form of bit, consisting principally of a single bar with a ring at each end to which one pair of reins is attached. Some variations have a jointed mouth piece, which produces a nutcracker effect on the mouth.

**Stirrup:**

A loop, ring or similar device made of metal, suspended from a saddle to support a rider's foot.

**Web rein:**

A type of riding rein made of web, usually with leather finger-slots. It is very hard wearing and gives a good grip.

*** and above:**

Is part of the grading system used for eventing, it goes from welcome (smallest) through to intermediate, then * to **** which is the highest level.

## Abbreviations

| | | |
|---|---|---|
| **KZNHS** | - | KwaZulu Natal Horse Society |
| **N** | - | Sample Size |
| ***p* value** | - | Probability value (if <0.05 then significant) |

# Chapter 1

# Introduction to the study

## 1.1 Introduction

This chapter deals with explaining the rationale behind this study and includes the aims, objectives, hypotheses and limitations of the study.

### 1.1.1. Background of horse riding

Although there is controversy over the exact date horses were domesticated and when they were first ridden, the best estimate is that horses were first ridden in approximately 4,500 BC. The horse played an important role throughout human history all over the world, both in warfare and in peaceful pursuits such as transportation, trade and agriculture (Wikipedia, 2009).

The role of equestrians has changed through the centuries but it still holds that aura of nobility that it once enjoyed in medieval times. Equestrian sport is the embodiment of a healthy, family lifestyle. It is the only sport where girls and boys; men and women compete against each other on equal terms (KwaZulu Natal Horse Society, 2009).

Equestrian sport as a competitive sport first began in 1868 at the Royal Dublin Horse Show. Enthusiasm for the sport then quickly spread to Europe and North America. By the late 1800s horse shows were regular international events that attracted much notice. Show jumping was part of the Olympic Games of 1900, but the full program of Dressage, Show jumping and Eventing was only introduced in 1912. Though techniques have changed through the years, show jumping as a sport has remained much the same as when it first took place, whereas dressage and eventing have had some rule and regulation changes over the years (History of Equestrian Events, 2009).

It is estimated that in the USA alone, 23 billion dollars are spent annually in the horse industry (Carrilo, Varnagy, Bragg, Levy and Riordan, 2007). A horse weighs up to 500kgs, moves at speeds of up to 65km/h, elevates the rider three meters above the ground and kicks with a force of nearly a ton. A horse is also more unpredictable than either a motorcycle or racecar (Ball, Ball, Kirkpatrick and Mullory, 2007). According to Ball et al. (2007) hospital admission rate is 0.49/1000 hours of horse riding compared to motorcycle ridings 0.14/1000 hours.

McCrory and Turner (2005) state that horse riding as a sport is mainly amateur, variably supervised and apart from limited competitions, is not subject to administrative control that would enable the compilation of injury data. Injuries, especially minor injuries, are seldom reported, and there are no regulatory requirements anywhere that compel formal injury notification of this sport (McCrory and Turner, 2005). This highlights the lack of detailed information in a sport that is popular in most Western countries.

## 1.1.2. Aim of the study

The aim of this study was to determine a profile of injuries in adult competitive horse riders in KwaZulu-Natal, South Africa, in order to determine if any relationships exist between risk factors identified and horse riding injuries highlighted in this study and to compare these results to limited International data.

Therefore, for the purpose of this study, the following information was gathered in order to build up an injury profile:

- Anthropometric values (age, height, weight, gender, ethnicity, dominant hand and medical aid) of competitive horse riders in KwaZulu-Natal, South Africa,
- The participants horse riding history,
- Their record of any past or current injuries,
- Factors associated with previous and current injuries were also investigated,

- Equipment and facilities used.
- Participation in other activities and if this affected or predisposed injuries in equestrian activities.

## 1.2. Objectives and Hypotheses

1.2.1. To describe the profile of injuries – type, locations and mechanisms.

1.2.2. To determine the association between the type of equestrian activity and location and mechanism of injury.

It was hypothesised that the type of equestrian activity would not have a significant impact on the injury.

1.2.3. To determine the association between use and type of equipment and location of injury.

It was hypothesised that type of equipment used would not determine the injury location.

1.2.4. To determine anthropometric and history variables associated with location of horse riding injuries.

It was hypothesised that there would not be a significant relationship between the anthropometric variables (demographics, age, weight, height, ethnicity, gender, dominant hand and medical aid) and the profile of horse riding injuries.

It was hypothesised that there would not be a significant relationship between the riding history variables (number of years riding and competing, time spent riding per session, number of horses ridden, instruction received and other activities) and the profile of horse riding injuries.

1.2.5. To determine if non riding related injuries are associated with riding related injuries in the same sites.

It was hypothesised that non riding related injuries would not be associated with riding related injuries in the same sites.

## 1.3. Rationale behind the study

- Horse riding is a popular sport that apart from limited competitions is not subjected to administrative control that would enable the compilation of injury data (McCrory and Turner, 2005).
- McCrory and Turner (2005) state in 2005 that there was no information surrounding chronic musculoskeletal injuries related to horse riding, or the situation, action or activity done which precipitated the injury.
- Pilato, Shifrin and Bixby-Hammet (2007) study found that back pain in horse riders was three to five times more prevalent than in the general population, which emphasized the physical toll placed on equestrian athletes. In all sports there are certain factors that may either promote or prevent injuries and if these enabling factors or detracting factors are enhanced or reduced respectively the resultant injuries can be reduced.
- By investigating these factors and management protocols, risk factors associated with horse riding can be identified, the reasons behind the risks found out and thus see if a chiropractor or other health professional may play a role in the reduction or modification of these factors.

## 1.4. Limitations of the study

A study such as this requires the participant's willingness to participate in the study. It also requires that the participants answer the questionnaire with honesty, based on the condition that their responses remain anonymous.

In addition to the above it is also noted that the lifetime incidence of injuries under study may well be an under estimation when compared to the reality experienced by the horse rider. It has been suggested by Mouton (1996) that the principle reason for this is 'memory decay'.

## 1.5. Conclusion

No studies have been found regarding the profile of injuries in adult competitive horse riders in South Africa, or with particular reference to KwaZulu Natal. Therefore the aim of this study was to determine a profile of injuries in adult competitive horse riders in KwaZulu-Natal, South Africa, in order to determine if any relationships exist between risk factors identified and horse riding injuries highlighted in this study and to compare these results to limited International data.

In this chapter an introduction to horse riding and a background to the sport and the reason for study were provided. In Chapter Two, a definition of horse riding will be provided, as well as an explanation of the different disciplines involved in equestrian sports. Relevant information and results from related studies, pertaining to horse riding injuries and potential risk factors are then discussed. In Chapter Three, the materials and methods used in this study are discussed and explained. The process of statistical analysis will also be included in this chapter. Chapter Four deals with the results obtained in the study, as well as a discussion of each result. In Chapter Five, conclusions are drawn from this study, and recommendations for future studies are made. In Chapter Six the conclusions and recommendations drawn in Chapter Five are summarized.

# Chapter 2

# Literature Review

## 2.1. Introduction

This chapter provides a definition of horse riding and provides more information on horse riding as a sport. Shamus and Shamus (2001) state that understanding the sport in which an athlete participates, contributes greatly to accurate diagnosis and treatment of injuries. Therefore, the biomechanics related to the sport and a discussion on the injuries suffered by horse riders will also be discussed.

## 2.2. Definition of horse riding

The sport of sitting on the back of a horse while controlling its movements (Definition of horseback riding, 2009).

For the purpose of this study, the focus is on the Olympic disciplines of dressage, show jumping and eventing.

## 2.3. Biomechanics of horse riding

According to Wanless (1998) to be an effective rider, you need to find a state of relaxed concentration; a calm but alert mind, and muscles, which have just sufficient tone to hold the body in balanced equilibrium, without it sagging or being overly tense. The riders control of his/her body and centre over the horse's centre of gravity provides the optimal pathway for communication and cooperation between horse and rider (Apatow, 2000).

According to Apatow (2000) rider analysis consists of the following points;

- The weight is distributed evenly over the centre line of the foot on or behind the stirrup. The position of the foot is rotated to the same plane as the femur (approximately 30 degrees) to accommodate patella tracking over the centreline of the ankle and foot. This alignment allows the correct usage of the leg muscles and contact of the lower leg on the horse.
- The rotation of the femur from the hip joint accommodates the position of the upper leg to the saddle. Contact of the lower leg combined with balanced control of the upper leg and deep pelvic-hip muscles facilitate the control of the lower extremity.
- Contraction of the abdominal and erector muscles controls the connection of the upper and lower extremities.
- Correct shoulder alignment is established when the shoulder complex is held back and down with concurrent contracture of the pectoral and latissimus dorsi musculature. The shoulders and hips should remain aligned in the same plane for maximum stability.
- The head is brought back so that the base of the skull is aligned over the shoulder complex. The major muscle group controlling movement here is the sternocleidomastoid muscles in the front of the neck.
- The foundation of correct alignment and muscle control combined with flexibility provides the rider with the capacity to execute precision control of the human frame and centre of gravity. Joint range of motion of the spine and extremities is essential to a rider's capacity to establish correct alignment.

## 2.3.1. Muscles important for riding

According to Schusdziarra and Schusdziarra (2004) basic knowledge of human anatomy used in riding is needed in order to succeed as a rider.

The gluteus maximus, medius and minimus are important for the rider's seat; they support the thigh by the gluteus maximus rolling the thigh out and gluteus

medius and minimus rolling the thigh in. These actions are necessary in going with the horses movements and staying in the correct position. When the gluteus maximus is flexed it hinders the pelvis from tipping forward, which is important in maintaining the correct position on the horse (Schusdziarra and Schusdziarra, 2004).

**Table 2.1. Muscles used in the riders seat** (Moore and Dalley, 1999; Travell and Simons, 1999; Sutherland, 2008)

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Gluteus muscles**<br>• Gluteus maximus | Ilium posterior to the posterior Gluteal line, dorsal surface of the sacrum and coccyx and sacrotuberous ligament | Iliotibial tract that insert on the lateral condyle of the tibia. Other fibres insert on the Gluteal tuberosity of the femur. | Extends thigh, lateral rotation of the thigh. |
| • Gluteus medius | External surface of the ilium, between the anterior and superior Gluteal lines | Lateral surface of greater trochanter of the femur. | Abducts and medially rotates thigh |
| • Gluteus minimus | External surface of the ilium, between the anterior and inferior Gluteal lines | Anterior surface of the greater trochanter of the femur. | Abducts and medially rotates thigh |

In the thigh, the sartious, semitendinosus, semimembranosus and biceps are needed in order to maintain a correct riding position. They all bend the lower leg; they draw the lower leg back and up against the thigh and are helpful in tipping the pelvic girdle backward. These muscles act like a pulley in that they form a direct connection from the pelvic girdle to the two lower legs. This enables the rider to use the pelvis and two lower legs together, against each other or independently as needed. The adductors function on the inside of the thigh is to exert a strong squeezing force on to the saddle. In addition they also stabilize the pelvis (Schusdziarra and Schusdziarra, 2004).

**Table 2.2. Muscles used in the riders thigh** (Moore and Dalley, 1999; Travell and Simons, 1999; Sutherland, 2008)

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Hamstring**<br>• Semitendinosus | Ischial tuberosity. | Medial surface of the superior part of the tibia. | Extends thigh; flexes leg and rotates it medially when the knee is flexed. When the thigh and knee are flexed, these muscles can extend the trunk. |
| • Semimembranosus | Ischial tuberosity. | Posterior part of the medial tibial condyle, lateral to the femoral condyle. | Extends thigh; flexes leg and rotates it medially when the knee is flexed. When the thigh and knee are flexed, these muscles can extend the trunk. |
| • Biceps Femoris | Long head: Ischial tuberosity<br>Short head: linea aspera and lateral supracondylar line of the femur. | Lateral aspect of the fibula head. The tendon splits at this site by the fibular collateral ligament of the knee. | Flexes the leg and rotates it laterally when the knee is flexed. Extends the thigh. |
| **Adductors**<br>• Adductor Longus | Body of the pubis inferior to the pubic crest | Middle 3rd of linea aspera of the femur | Adducts the thigh. |
| • Adductor Brevis | Body and inferior pubic ramus | Pectineal line and superior part of the linea aspera of the femur | Adducts and flexes the thigh. |
| • Adductor Magnus | Adductor part: pubic ramus and ramus of the ischium<br><br>Adductor part: Ischial tuberosity. | Adductor part: Gluteal tuberosity, linea aspera and supracondylar line<br><br>Hamstring part: adductor tubercle of the femur. | Adducts the thigh<br>Adductor part: flexes the thigh.<br><br>Hamstring part: Extends the thigh. |

In the lower leg, the extensor muscles found on the anterior of the lower leg raise the foot, thereby indirectly lowering the heel, which produces the foot position required in riding. When the knee bends the calf muscles (gastrocnemius and soleus) on the posterior of the leg tense, i.e. become taut, provided the heel is deep and the ankle stays in the same position (Schusdziarra and Schusdziarra, 2004).

**Table 2.3. Muscles used in the riders lower leg** (Moore and Dalley, 1999; Travell and Simons, 1999; Sutherland, 2008)

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Tibialis Anterior** | Lateral condyle and body of the tibia. | Medial and plantar surfaces of the medial cuneiform bone and first metatarsal base. | Foot dorsiflexion at the talocrural joint and supination at the subtalar and tarsal joints. |
| **Peroneal muscles**<br>• Peroneus longus | Fibular and adjacent intermuscular septum. | Passes behind the lateral malleolus, runs from lateral to medial across the foot sole to the first metatarsal and medial cuneiform bones | Plantarflexes and pronates the foot. |
| • Peroneus brevis | Fibular and adjacent intermuscular septum. | Curves behind the lateral malleolus and ends on the fifth metatarsal tuberosity. | Plantarflexes and pronates the foot. |
| • Peroneus tertius | Fibular and adjacent intermuscular septum. | Passes in front of the lateral malleolus and ends on the proximal fifth metatarsal. | Assists in eversion, and dorsiflexes the foot. |
| **Gastrocnemius** | Lateral head: lateral aspect of the lateral femoral condyle.<br>Medial head: popliteal surface of the femur superior to the medial femoral condyle. | Posterior surface of the calcaneus via the calcaneal tendon | Plantarflexes the ankle when the knee is extended. Raises the heel during walking and flexes the leg at the knee joint. |
| **Soleus** | Posterior aspect of the fibula head and medial border of the tibia | Posterior surface of the calcaneus via the calcaneal tendon | Plantarflexes the ankle independent of the knee position and steadies the foot |

The outer and inner oblique's and rectus abdominus are the focus in the anterior abdominal wall musculature. Their function is mainly to compress a section of the abdominal wall and to close the abdominal cavity. This muscle panel arranged in a special pattern is especially important for movements between the pelvic girdle and the lower edge of the rib cage (Schusdziarra and Schusdziarra, 2004).

**Table 2.4. Muscles used in the riders abdomen** (Moore and Dalley, 1999; Travell and Simons, 1999; Sutherland, 2008)

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| Outer oblique | External surface and inferior borders of the lower 8 ribs | Joins the abdominal aponeurosis | Bilaterally to increase abdominal pressure and flex the vertebral column<br>Unilaterally to bend the vertebral column to the same side and to assist vertebral column rotation |
| Inner oblique | Superiorly the last 3 or 4 rib cartilages, medial to the linea albea through the rectus sheath | Laterally all fibres converge onto the lateral half of the inguinal ligament, the anterior two thirds of the iliac crest and lower portion of the lumbar aponeurosis | Bilaterally to increase abdominal pressure and flex the vertebral column<br>Unilaterally to bend the vertebral column to the same side and to assist vertebral column rotation |
| Rectus abdominus | Cartilages of the $5^{th}$ to $7^{th}$ ribs | Crest of the pubic bone | Prime mover for spinal flexion and increases abdominal pressure |

The various deep back muscles are especially important in the movement and stabilisation of the spine, ribcage and pelvis (Schusdziarra and Schusdziarra, 2004).

**Table 2.5. Muscles used in the riders back** (Moore and Dalley, 1999; Travell and Simons, 1999; Sutherland, 2008)

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Latissimus dorsi** | Spinous processors of inferior 6 thoracic vertebrae, Thoracolumbar fascia, iliac crest and the inferior 4 ribs. | Intertubercular groove of the humerus. | Extends, adducts and internally rotates the humerus. |
| **Trapezius** | Medial 1/3 of superior nuchal line, external occipital protuberance and spinous processors of C7- T12 vertebrae. | Lateral third of the clavicle, acromion and the spine of the scapula. | Elevates, retracts and rotates the scapula. |
| **Rhomboid** | Minor: nuchal ligament, spinous processors of C7 and T1<br>Major: spinous processors of T2-T5. | Medial boarder of the scapula. | Retracts scapula and rotates it to depress the glenoid cavity. |

| | | | |
|---|---|---|---|
| **Quadratus lumborum** | Illiocostal: medial half of the 12th rib<br>Illiolumbar: L1 – L4 transverse processes<br>Lumbocostal: 12th rib. | Uppermost posterior crest of the ilium<br>Crest of the illium.<br><br>Lumbar transverse processes | Controls side bending, lumbar spine stabilization, extends lumbar spine and unilaterally as a lateral flexor of the spine. |
| **Iliopsoas**<br>• Psoas major | T12-L5 vertebra and discs, transverse processors of all lumbar vertebra. | Lesser trochanter of the femur. | Flex thigh at hip joint and stabilize hip joint. |
| • Psoas minor | T12-L1 vertebra and discs. | Pectineal line. | Flex thigh at hip joint and stabilize hip joint. |
| • Iliacus | Iliac crest, iliac fossa, sacrum and anterior sacroiliac ligaments. | Psoas major tendon, lesser trochanter and distal femur. | Flex thigh at hip joint and stabilize hip joint. |

## 2.3.2. Biomechanics of the specific disciplines

### 2.3.2.1. Dressage

This discipline tests the ability of horse and rider to perform, in a pre-determined manner, paces natural to the horse. Specified movements are performed by horse and rider for a panel of judges who score each movement out of a maximum of 10 marks. The horse achieving the highest score wins (KwaZulu Natal Horse Society, 2009).

According to Tait (1993) in dressage it is important that the rider should develop a deep seat and sit well into and around the horse, so that the combination of horse and rider should become one and therefore work in harmony. The entire weight of the rider should be as evenly distributed over the horse's sense of balance as possible. Subsequently the upper body should be upright immediately above the seat with the legs stretched long directly beneath the upper body. The rider should always be relaxed, not stiff or tense. There should be two imaginary lines; one that runs vertically through the body, dissecting the ear, shoulder, hip and heel; and another that runs horizontally dissecting the elbows, hands and horses mouth.

Figure 2.1. Dressage

Photo by: Michele Van Eyssen, 2009

#### 2.3.2.2. Show jumping

Show jumping is competitive precision riding over a set course of obstacles, which although perhaps solid in appearance, are easily knocked down. Each knock or refusal incurs penalties, which are marked against the competitor. The winner is the rider, who can jump the course clear, and then jump at least part of it again, raised and this is timed against the clock, to be clear and faster than any other rider (KwaZulu Natal Horse Society, 2009).

The same principles for riding apply in show jumping, but the centre of balance shifts slightly more forward as the horses movement becomes less collected and so does the riders position. As the horses stride opens up, and to accommodate the horses jumping effort, the rider's stirrups' need to be shortened in order to support the rider so that they won't get left behind the horse's movement. The rider must change to a light seat, finding security in the lower leg instead of the seat. The upper body should remain at an angle of roughly 45 degrees with the weight well down into the heels and the seat light (Tait, 1993).

Figure 2.2. Show jumping

Photo by: Michele Van Eyssen, 2009

#### 2.3.2.3. Eventing

This competition is divided into three phases; dressage, cross-country and show jumping. Eventing tests the horse's schooling, stamina and its accuracy, as well as his trust in its rider. Penalties are given for mistakes or faults at each phase, and the horse and rider combination with the lowest number of penalties at the end of all three phases is the winner (KwaZulu Natal Horse Society, 2009).

The same position applies for the dressage and show jumping, but the position is different for the added cross country phase. The cross country position is similar to that of the show jumping. The stirrup length will be further shortened, due to the increase in speed and the centre of balance will have moved forward again. The increased angle of the knee allows the rider to absorb the variations in terrain and still feel secure. The lower leg is also moved fractionally forward on take off to counteract the possibility of a sudden check of the forward movement should a slight mistake be made by the horse. When going across cross country it is better to be slightly behind the movement, so the shoulders are more upright and should not interfere with the horse’s movement. The impact of landing should always be taken on the stirrup and not on the horses back (Tait, 1993).

Figure 2.3. Cross country phase of Eventing

Photo by: Michele Van Eyssen, 2009

## 2.4. Mechanism of Injuries

Williams (1980) defined an injury as occurring as a result of the application to the body, or part of the body; forces which exceed the body's ability to adjust to them. These forces may be applied instantaneously (acute) or over a considerable period (chronic). In agreement with this Peterson and Renstrom (2001) state that varying degrees of trauma cause injuries and thus divided injuries into acute/traumatic injuries, caused by large forces (macrotrauma), and chronic/overuse injuries, caused by repetitive microtrauma.

Horse riding injuries are either traumatic, when the rider falls off the horse or horse and rider fall or from overuse, where chronic micro trauma occurs.

According to Ball et al. (2007), Abu-Zidan and Rao (2003), Moss, Wan and Whitlock (2002) and Paix (1999) retrospective studies, a fall from a horse was the most common mechanism of injury. Although most patients have minor uncomplicated injuries that do not need hospitalization (Abu-Zidan and Rao, 2003) most of the studies focus on severe injuries needing hospitalization.

## 2.5. Risk Factors for Injuries

Intrinsic risk factors relate to the individual participating in the sport and their individual physical and psychological characteristics. Extrinsic risk factors relate to the type of sport the participant is involved in; their training regime; the equipment they use as well as the environmental conditions the participant is exposed to (Lysens, de Weerdt and Nieuwboer, 1991).

### 2.5.1. Intrinsic Factors

According to research conducted by Alexis, Newton and Nelson (2005) the demographic profile of those injured indicated that their ages ranged from 2 to 77 years and that 35% were experienced and 70 % were riding as a recreational pursuit. Carrillo et al. (2007) retrospective review of 23 trauma centres in South Florida, USA found the mean age of riding injuries to be 36, and Abu-Zidan and Rao (2003) retrospective study which found the mean age of horse related injuries to be 34.1. Sorli (2000) and Silver (2002) showed that more women are injured, although that may just be a reflection that more women ride compared to men. This is unlike research by Abu-Zidan and Rao (2003) who states neither sex, age nor profession has an effect on injury severity.

### 2.5.2. Extrinsic Factors

Alexis, Newton and Nelson (2005) noted that all the injuries were related to rider inexperience, equipment problems and unpredictable horse behaviour. Thus the conclusion to the study indicated that 38% of these traumatic injuries were preventable. Abu-Zidan and Rao (2003) also found that a good knowledge of horses, their behaviour and increasing age of the horse was associated with less risk of injury. This is further emphasised by Willams and Ashby (1995) who found that older, smaller horses have a decreased risk of causing an injury. An explanation by Silver (2002:264) for the high percentage of injuries is that “the horse rider is trying to control an animal that is less

intelligent than a dog though, under some circumstances, the horse may be more intelligent than the rider!"

Paix (1999) and Abu-Zidan and Rao (2003) results also showed that the highest injury rates were amongst those competing at the highest levels and doing more advanced exercises and tasks.

The conclusion to Sorli's (2000) five-year study was that head injuries and other serious traumatic injuries occur with equestrian activities and the use of appropriate safety equipment, including helmets should be promoted. Abu-Zidan and Rao (2003) found that those with a helmet had significantly less incidence of intracranial injuries than those not wearing one and Fantus and Fildes (2007) found a fourfold greater mortality for the non-helmeted rider compared to those wearing a helmet.

Of all the horse riding activities, according to Silver (2002) and Paix (1999) jumping is most likely to produce an injury, and according to Paix (1999), the cross country phase of eventing is more than 70 times as dangerous as horse riding in general, with an overall injury rate of one per 14 hours of cross country riding.

A study by Carlson, Hootman, Powell, Macera, Heath, Gilchrist, Kimsey and Kohl (2006) found that moderate physical activity and cardiorespiratory fitness may impart some protection against injuries. The gains in neuromuscular control, balance, and muscle strength and other benefits derived from participating in physical activity may help in decreasing an adult's risk for sustaining a musculoskeletal injury related to any activity. People who are physically active may also be able to respond differently to a potentially injurious situation than their inactive peers. However they also found that regular physical activity, especially vigorous exercise and sport, is associated with an increased incidence of activity related injury. Injury incidence during certain activities, such as sports and recreation, may differ by physical activity

level because of differences in the amount of exposure to these activities (Carlson et al. 2006).

Previous research has shown that there are differences in people partaking in physical activities compared to those not and therefore getting injured (Carlson et al. 2006). This is supported by Soprano and Fuchs (2007) who reported that there has been an overall increase in injuries in young athletes over the past 20 to 30 years. This is thought to be due to many factors including, participation on multiple teams in different sports. Different sports have different risks factors for injuries and there is little knowledge on whether these differences influence each other.

## 2.6. Location of Horse Riding Injuries

In a study done by Sorli (2000) to determine the demographics of hospital admissions and mortality associated with equestrian activities in the 33 000 riders in British Columbia, he found that the mean number of yearly admissions was 390, with head injury the most common cause of hospital admission (20%).

Silver's (2002) research shows that traumatic head injuries outnumber spinal injuries by five to one and in contrast to many other sporting injuries there are more traumatic thoracic and lumbar than cervical injuries. This is supported by Moss, Wan and Whitlock (2002), whose study was conducted between February 2000 and February 2001 at the A&E Department of the Royal Surrey County Hospital. They showed that 10.8% of patients had thoracolumbar injuries, 5% presented with isolated pelvis injuries, 29.2% had isolated upper limb injuries and 22.3% had isolated lower limb injuries.

The above findings (Silver, 2002 and Sorli, 2000) are further supported by Thomas, Annest, Gilchrist and Bixbey-Hammet (2006), who estimated that there were 102,904 persons with non-fatal traumatic related horse injuries (35.7 per 100,000 population) that were treated in American emergency departments each year between 2001 and 2003 inclusively. The study found

that the head/neck region (23.2%) was the most often injured followed by lower extremity (22.2%) and upper extremity (21.5%). For each year, an estimated 11 502 people sustained traumatic brain injuries from horse related incidents (Thomas et al. 2006). This is also supported by Paix (1999) research that shows that head and neck injuries predominate, followed by lower limb fractures.

In Pilato, Shifrin and Bixby-Hammett (2007) study, ongoing joint pain with emphasis on the shoulder and spine was reviewed. Due to riding being a seated activity, it was postulated that poor posture on the horse could affect the future health of the spine. The study found that at least one bout of shoulder pain without a fall was present in 46% of the sample, with a fairly even split between younger and older riders. Back and neck pain was also very common, with 79% having experienced back pain, of which 28% had ongoing back pain and 70% had experienced neck pain, with 14% having had experienced ongoing neck pain. A full 79% of the riders had experienced lower extremity pain. This study was done on recreational riders, where other factors, such as work, caring for the horse and other recreational factors were not taken into consideration.

Carrillo et al. (2007) study of hospitalisations due to horse riding injuries found that multiple severe injuries occurred in 89% of patients, of which 85% occurred during pleasure riding. Abu-Zidan and Rao (2003) found that the majority of injuries due to riding horses involved the upper extremities (32%) and head (27%) and were associated with fractures. This is similar to Williams and Ashby (1995) collection of medical records from five public hospitals in Victoria, Australia where it was found that the upper limb was the most commonly injured (34%) with fractures also the most common type of injury, followed by soft tissue injuries (29%) and sprain and strains (15%)

## 2.7. Conclusion

As can be seen from the above literature, horse riders are at a high risk of injury and there is a need to investigate ways of reducing this risk by profiling injuries, however unlike the studies noted above by Carrillo et al. (2007), Thomas et al. (2006), Newton and Nelson (2005), Abu-Zidan and Rao (2003), Moss, Wan and Whitlock (2002), Silver (2002), Sorli (2000) and Paix (1999) these studies should not be limited to traumatic injuries, but also repetitive strain injuries (RSIs). It has been found in skiing that excessive fatigue for a variety of reasons (too much activity, incorrect equipment) may actually be a predisposing factor in more serious injuries (Meyers, Laurent, Higgins and Skelly, 2007). These issues have been explored for the horses within the equestrian world, in order to limit the effect of RSIs on the long term performance and injury profiles of horses (Stephen, White, McCormick, Cowles, and Corley, 2003 and Foreman, 1998); however there is very little literature surrounding RSIs in horse riders. As the rider and horse work as a team within the various equestrian disciplines it is imperative that such a profile be created in order to allow for the development of strategies to prevent these RSIs and potentially more life threatening injuries for the rider, as the rider is ultimately responsible for the horse and its care (Simpson, 2000). In addition such a profile would assist in the development of strategies that could be implemented to reduce the number of injuries (both RSIs and traumatic) encountered in the equestrian world.

While there is limited knowledge of injury demographics or the efficacy of prevention countermeasures in this field, it is likely that injuries will continue to occur (McCrory and Turner, 2005). Therefore this research aims at identifying injuries (RSIs and traumatic) as well as identifying risk factors in order to determine possible associations between these factors within the context of injury prevention.

# Chapter 3

# Material and Methods

## 3.1. Introduction

This chapter discusses the research methodology and data collection used in this study. Statistical analysis is also discussed.

### 3.1.1. Study Design

A quantitative descriptive design, which was questionnaire based and was administered by the researcher or via email.

The data was collected by means of a self-administrated (Salant and Dillman, 1994) questionnaire (Appendix A), which was completed by the participants at various competitions in KwaZulu Natal or sent via email to those not present at the competitions.

No advertising was required for this study.

Based on the above design this research was approved by the Faculty of Health Sciences Research and Ethics Committee indicating that the research complied with the Declaration of Helsinki and the principles it espouses in terms of Ethical conduct and patient protection principles (Johnson, 2005).

## 3.2. Allocation of the participants

### 3.2.1. Sampling

A total sample method was used, as the entire population of competitive horse riders registered with the KwaZulu Natal Horse Society (KZNHS) were invited to participate in the study.

## 3.2.2. Sample Size

The entire adult population of competitive horse riders registered with KZNHS that compete in show jumping, dressage and eventing were invited to participate in this study. This population size included four hundred and ninety eight (N= 498) horse riders over 18 years of age that fitted the inclusion criteria (Smith, 2009).

The response rate required prior to statistical analysis was defined as a minimum response rate of 35%, thus a sample of one hundred and seventy five (n= 175) competitive horse riders was required to make this study's statistics generalisable to the population. An attempt was made to recruit as many participants as possible in order to improve the response rate. In a similar study on competitive swimmers by Sutherland (2008), a minimum response rate of 25% was required, which still yielded statistically reliable valid data.

# 3.3. Criteria for Participation in the Study

## 3.3.1. Permission required for the study

### 3.3.1.1. Location

Permission to conduct the research process was obtained from the KZNHS prior to the commencement of the study. The Letter of Permission (Appendix B) was given prior to the study commencing. This approval was not required for Faculty of Health Sciences Research and Ethics Review Board, but was required as part of the study design.

### 3.3.1.2. Participants

Each participant was required to read a letter of Information (Appendix C). By filling in the questionnaire the participant acknowledged the terms and conditions of the research process, therefore the participants were not required to also complete an informed consent form.

In line with the design of this study and according to the Nuremberg code (1947): cited in Alderson (2007) consent is defined as; “The voluntary consent of the human subject is absolutely essential. This means that the person involved should be situated as to be able to exercise free power of choice, without the intervention of any elements of force, fraud, deceit, duress, overreaching, or ulterior form of constraint or coercion.”

### 3.3.2. Inclusion Criteria

The inclusion criteria for the participants were as follows:

- They were required to be registered with KZNHS and compete in any of the following disciplines; dressage, show jumping and or eventing.
- They were required to be over 18 years of age.

### 3.3.3. Exclusion Criteria

The exclusion criteria for the participants were as follows:

- Participants were excluded if they had participated in the focus group and pilot testing of the questionnaire.
- Riders registered with KZNHS that compete solely in the non-Olympic sports of vaulting, due to the gymnastic nature of the discipline; showing, as the emphasis is on the horse; equitation, which is a childrens and juniors discipline and or driving, which does not involve riding the horse.

## 3.4. Data Collection Procedure

Once permission was received from the KZNHS, the researcher approached the horse riders at the various competition venues and informed them of the study. (as per section 3.3.1.2 discussed above).

The researcher then distributed a Letter of Information (Appendix C) to the prospective participants. Participants meeting the criteria for inclusion in the study received a questionnaire to complete.

The questionnaires were handed out in a semi-supervised manner, in a group environment. The participants all received the same instructions and questions or queries were handled in a similar manner.

The participants were asked to write their names on a separate page to ensure that each participant only filled in one questionnaire and to ensure confidentiality.

Participants filled out the questionnaire with respect to:
Participant's anthropometric information including age, gender, Body Mass Index (BMI), occupation, dominant hand, ethnic group and medical aid cover.
Information on the participant's riding history, including the number of years experience, number of hours training, number of minutes spent on the horse, number of horses ridden and amount of formal instruction received.
Information on the horse and equipment used, including horse breed and size, type of saddle, stirrup, rein, bit, artificial aid, facilities and protective equipment used.
Information on the participants' involvement in other sports.
Information related to injuries obtained during horse riding and injuries not related to horse riding.
Factors relating to the injuries:

- Location of past and current injuries;
- Number of times injured;
- Detail of injury;
- Effect of past and current injuries on training and competitions;
- Mechanism of injury;
- Length of time for which horse riding was prevented as a result of these injuries;
- Treatment received for past or current injuries;
- Continuing to ride whilst injured; and
- The use of analgesics to continue riding.

The KZNHS then emailed the letter of information and questionnaire to all the adult members of the society and asked those who had not filled in a

questionnaire at various show venues to return it via email to the researcher. This was printed without the members name to ensure confidentiality.

The data collected from each questionnaire was then used for data capturing purposes. An analysis was performed to determine the profile of horse riding injuries in adult horse riders registered with the KZNHS.

## 3.5. Development of the Questionnaire

### 3.5.1. The Initial Questionnaire

The questionnaire was developed by using an existing questionnaire (Appendix D) designed by Sutherland (2008) for competitive swimmers. A letter of Permission (Appendix E) from Sutherland was obtained prior to commencing the study, allowing the researcher to utilize The Competitive Swimmers Injury Questionnaire. By using an existing questionnaire, construct validity was incurred (Bernard, 2000).

A number of parameters included in the horse rider's questionnaire were as a result of recommendations from the Focus Group (see section 3.6.4.).

The questionnaire was then validated, by means of a focus group and a pilot study. These processes were used to confer validity, where validity refers to establishing the accuracy and trustworthiness of an instrument, data and findings in the research thereby ensuring that future research utilizing that particular tool is accurate (Bernard, 2000).

In order to understand the processes utilised in this study, it is imperative to understand the different types of validity. Validity in questionnaire based research can be divided into face validity, content validity, construct validity and criterion validity (Mouton, 1996), where:

Face validity: this is the simplest type of validity, which determined by the agreement between the researcher and those with an interest in the questionnaire (Bernard, 2000). Thus at 'face value' the questionnaire appears valid, unambiguous and easy to interpret by a lay person.

Content validity: an instrument has content validity when the content of the questionnaire is considered to be effective, and appropriate enough to be able to assess a particular concept (Bernard, 2000).

Construct validity: measures the degree of closeness between the construct being measured and the actual observation made with the instrument, how accurately answers to the questions in a scale of reflected theoretical prediction of a particular construct (Bernard, 2000).

Criterion validity: is measured when a particular tool produces similar results when compared with another tool already known to be trustworthy. This is also referred to as concurrent validity by Mouton (1996). This type of validity was not to be addressed as part of this current research and has only been included for completeness in discussing validity.

In order to achieve these validities, a focus group and pilot study were completed, which are discussed below.

## 3.5.2. The Focus Group

This was achieved by having a focus group representative with specific areas of expertise related to the research being conducted as well as the respondent representation. The focus group was conducted, in order to attain face validity and content validity (Bernard, 2000).

A focus group provides a means of discussion between the researcher and individuals with an interest in the topic. It also ensures the development of ideas and understanding on the topic. A focus group also aids the researcher in finding and accessing the relevance and appropriateness of the questions

used in the development of the questionnaire (Morgan, 1998). As well as modifying the questions it increases the questionnaires face validity.

According to Morgan (1998) a focus group should consist of 6 – 8 participants. These participants are selected because of their similarities to the participants that will ultimately complete the questionnaire with regards to knowledge, age and possible language barriers (Fink and Kosecoff, 1985; Morgan, 1998).

In this focus group participants were invited by the researcher, with six participants agreeing to participate in the focus group. The group consisted of two equestrian instructors (South Africa National Equestrian Federation qualified and competitive riders), one human and equine physiotherapist, two master chiropractic students with competitive equine experience, one qualified chiropractor and the researcher.

Prior to commencing the focus group, each participant was required to sign an Informed Consent Form (Appendix F) as well as a Code of Conduct (Appendix G) and a Confidentiality Agreement (Appendix H). In the Focus Group each participant was given a copy of the questionnaire (Appendix I) and Letter of Information (Appendix C).

Comments were requested from each of the participants on how the questionnaire could be modified and improved so that it could be used to accurately assess competitive horse riders injuries in the context of this study, the questionnaire was discussed to determine the accuracy of the content relating to horse riding injuries.

The questions were discussed in numerical order. If there were any queries or changes proposed the question was discussed until an agreement was reached. At the end of the discussion, time was given for any further comments on the questionnaire. A transcript of the proceedings, of which the participants' identity is protected, is available (Appendix J).

Suggestions for changes were taken into account, and relevant changes were made to the questionnaire. (Appendix K).

The participant's discussion from the Focus Group was kept confidential. This was ensured as each member of the focus group was made to sign a Confidentiality Agreement (Appendix H).

Therefore, the Focus Group was conducted to attain face validity and content validity (Bernard, 2000) for the purposes of data collection in this study.

## 3.5.3. The Pilot Study

A Pilot Study followed the Focus Group. This procedure included three participants that completed the questionnaire (Appendix A) as though they were responding to the actual questionnaire. After the completion of the questionnaire the Pilot Participants completed a pre-research questionnaire evaluation sheet (Appendix L) which isolated problems/ errors or omissions with respect to grammar, sentence structure, ease of answering the questions and clarity of instructions, ambiguity as well as problems relating to logistics (e.g. time).

The researcher was also able to familiarize herself with the questionnaire and the possible questions that participants may ask.

According to Fink and Kosecoff (1985) the purpose of a pilot study is to answer the following questions
Will the questionnaire provide the necessary information?
Are certain questions in the questionnaire redundant or misleading?
Are the questions appropriate for the individuals who will be participating in the survey?
Will the information that the researcher collects enable him to use the survey forms properly?
Are the procedures standardized?
How consistent is the information obtained by the survey?

How accurate is the information obtained by the survey?

A Pilot Study was completed to further verify construct validity of the questionnaire, where construct validity measures the degree of closeness between the construct being measured and the actual observation made with the instrument, how accurately answers to questions in a scale of reflected theoretical predictions of a particular construct (Bernard, 2000).

No changes were made by the Pilot study to the pre-research questionnaires (Appendix A).

## 3.5.4. The final questionnaire

The original questionnaire (Appendix I) was derived from the questionnaire in Sutherland (2008) study and from factors in the literature as well as the researchers knowledge of the subject. This original questionnaire was then reviewed by the focus group and changes were made which led to a post focus group questionnaire being formulated (Appendix K). This modified questionnaire was then discussed in two further meetings (Chiropractic Departmental meeting and Ethics Faculty meeting) that reviewed the whole research proposal. A pilot study was then carried out. From these meetings and pilot study, the final questionnaire was formulated (Appendix A).

The specific changes done at each point were as follows:

**From the original (Appendix I) to the post focus group questionnaire (Appendix K),**

**Part A:**

No changes were made.

**Part B:**

- Question 3, “on average” was added to how many hours in total do you ride per week.
- Question 8, the wording was changed and “more than 4 times a month” was added.

**Part C:**

- The spelling was corrected of Thoroughbred in question 1.
- 2 questions were added, “how is your horse to ride” and “how often do you check stirrup length”, as well as the relevant answer tables.
- “Other” was added to rein type for question 5.
- Question 6, type of bit, “Pelham” replaced double jointed snaffle.
- For question 8, “on average” was added.

**Part D:**

- Question 3 “and give brief detail” was added with extra columns added to the table.
- Question 5, the word “riding” replaced training sessions and a 0 column was added.
- Question 6, “specialist” was added to the table and the word “therapist” added to sports massage.

**From the post focus group (Appendix K) to the final questionnaire (Appendix A),**

**Part A:**

- Question 1, the table was removed and a line added for age.
- “For statistical purposes” was removed from question 2 and “other” replaced Asian.
- Question 7, was added on dominant hand.
- Question 8, (previously 7) further medical aid options were added to the table.

**Part B:**

- For all the tables the unit was removed from inside each column and the numbers were altered so that there was no overlapping.
- Question 3, about the number of years competing was added.
- Question 4, (previously 3) the words “training and competition” were added in brackets.

- Question 5, (previously 4) the word “training” was added.
- The wording in the brackets was changed in question 6 (previously 8).
- The wording was changed in question 8 (previously 7).
- Question 9, (previously 8) the wording was changed and “sprint or long distance” added to running.

**Part C:**

- The question order was altered.
- The wording for question 3 (previously 10) was changed to “rate how you find your horse”.
- Question 6 (previously 5) and 10 (previously 9) the wording was altered.
- Question 9, (previously 7) the rating was reversed to most used (8) to least used (1).

**Part D:**

- Question 1, medical conditions, the following were added; “asthma, arthritis, proprioception problem and none of the above”.
- Question 2, the options were changed.
- Question 3, asking if riding aggravated the condition or injury was added.
- Question 4, (previous 3) the wording in the table was changed as well as some extra rows were added to separate the back into mid, low or neck.
- The rating was again reversed in question 5 (previous 4) as well as the options changed.
- Question 6, (previously 4) “on activity resulting in most severe injury was added”.
- Question 7, (previously 5) on sessions missed, the wording was altered.
- GP was changed to medical practitioner in question 8 (previously 6).
- Question 9 and 10 on riding whilst injured and a reason was added.
- The wording was altered in question 11 (previously 7).

The Competitive Horse Riders Questionnaire is a quantitative questionnaire with closed-ended questions (Appendix A). The Competitive Horse Riders Questionnaire is divided into four sections; Identification, Rider Information, Horse and Equipment Information and History of Injury.

Section A Identification, included questions pertaining to the horse riders age, gender, BMI, occupation, hand dominance, medical aid cover and ethnic group.

Section B Rider Information, involved questions on the number of years riding and competing and the level of competition. It also looked at the number of hours per week and minutes per session spent on a horse, as well as the number of horses ridden, amount of formal instruction received and participation in other activities.

Section C Horse and Equipment Information, included questions pertaining to horse breed, size and difficulty to ride, type of tack, artificial aids, facilities and safety equipment used.

Section D History of Injury, involved questions on medical conditions, injuries related and not related to horse riding and the number of times injured with detail of the injury as well as the mechanism of the injury. It also included questions on previous treatment received, missed sessions due to injury, riding whilst injured and or on medication.

## 3.6. Frequency of administration of the Questionnaire

The Competitive Horse Riders Questionnaire was administered one per participant.

## 3.7. Statistical Analysis

SPSS version 15.0 (SPSS Inc., Chicago, Illinois, USA) was used for data analysis. A p value <0.05 was considered as statistically significant. Descriptive statistics such as mean standard deviation and range was used to summarise quantitative variables, while frequency tables were used to describe categorical variables. Associations between variables were assessed using Pearson's chi square tests in the case of categorical variables, and t-tests for numerical variables. A p value <0.05 was considered as statistically significant.

# CHAPTER 4

# Results

## 4.1. Introduction

This chapter reveals the results obtained from the statistical analysis of the data collected. For continuity of flow only the tables and graphs of statistically relevant data have been included in this chapter. Non-statistical data will be discussed with tables relating to this data included in appendix N.

## 4.2. Outline of the Objectives of the Study

The first objective was to describe the profile of injuries – type, locations and mechanisms.

The second objective was to determine the association between the type of equestrian activity and location and mechanism of injury.

The third objective was to determine the association between use and type of equipment and location of injury.

The fourth objective was used to determine anthropometric and history variables associated with location of horse riding injuries.

The fifth objective was to determine if non riding related injuries are associated with riding related injuries in the same sites.

# 4.3. Data

### 4.3.1. Primary data

In this study the primary data was collected using a self-administrated, quantitative descriptive design questionnaire (Mouton, 1996).

### 4.3.2. Secondary data

In this study secondary data was collected from the following sources: journal articles, books, through personal communication with relevant people, focus group and pilot study participants.

# 4.4. Abbreviations used in this Chapter

**N** - Sample Size

**p value** - Probability value (if <0.05 then significant)

**Std. dev** - Standard Deviation

# 4.5. Results

## 4.5.1. Response Rate for this Study

The sample consisted of the entire population of adult competitive horse riders registered with KZNHS which compete in dressage, show jumping and or eventing which was four hundred and ninety eight (N= 498) (Smith, 2009).

Questionnaires were given to each of the 498 members, who fit the inclusion criteria.

A total of 176 questionnaires were returned (questionnaire completion rate= 176) and 5 declined participation citing superstition or time factors. The remaining KZNHS members did not respond. Therefore the response rate was 181 (36.34%). This met the requirement of a 35% response rate, set by the Faculty of Health Sciences Research and Ethics Committee (Chapter 3 section 3.2.2).

### *4.5.2. Objective 1: To describe the profile of injuries – type, locations and mechanisms.*

## 4.5.2.1. Demographics: Part A

#### 4.5.2.1.1. **Age, weight and height** (Q1, Q3 and Q4)

There were 176 participants in the study. Their average age was 36.3 years (Std dev 12.5 years) and range from 18 to 76 years. Their mean weights and heights are shown in table 4.1.

**Table 4.1: Descriptive statistics for age, weight and height of participants**

| | | Age | Height | Weight |
|---|---|---|---|---|
| N | Valid | 176 | 176 | 176 |
| | Missing | 0 | 0 | 0 |
| Mean | | 36.33 | 1.6952 | 65.66 |
| Std. Deviation | | 12.508 | .08832 | 12.082 |
| Minimum | | 18 | 1.53 | 39 |
| Maximum | | 76 | 1.98 | 126 |

**4.5.2.1.2. Ethnicity** (Q2)

The vast majority of participants were White (99.4%) as table 4.2 shows.

**Table 4.2: Ethnicity of participants**

| | Frequency | Percent |
|---|---|---|
| Black | 1 | .6 |
| White | 175 | 99.4 |
| Total | 176 | 100.0 |

**4.5.2.1.3. Gender** (Q5)

As Figure 4.1 illustrates, only 19% of the sample were males.

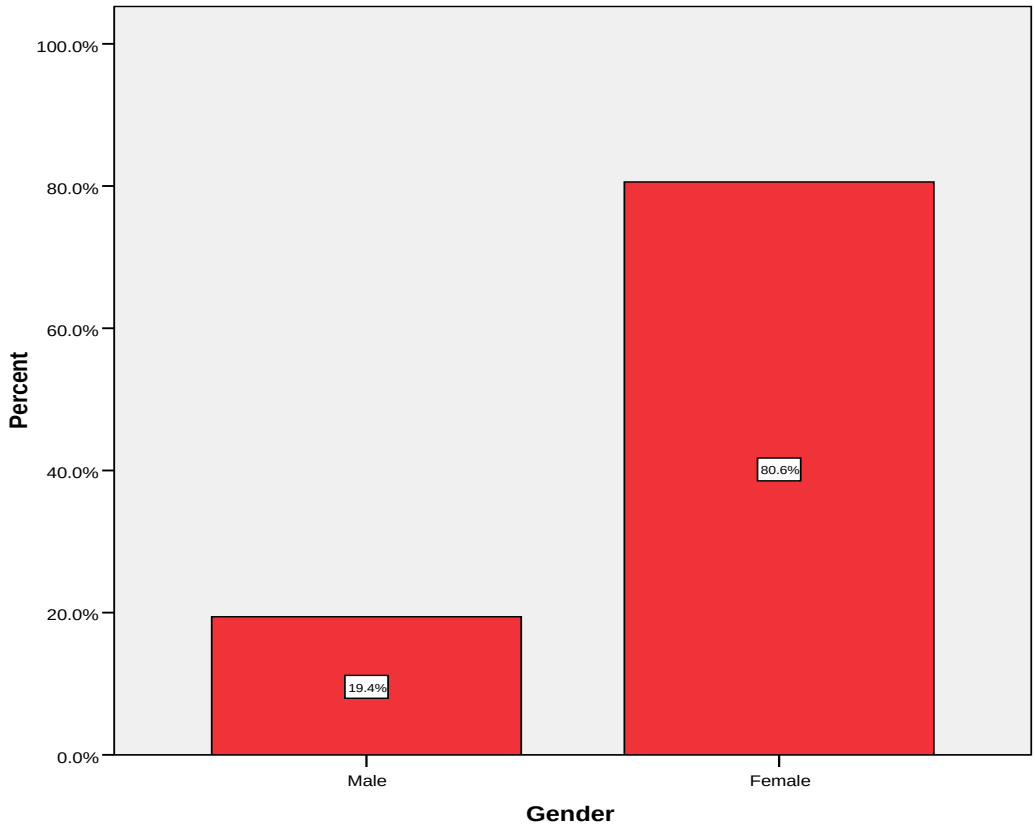


**Figure 4.1: Gender of participants (n=175)**

### **4.5.2.1.4. Occupation** (Q6)

The participants' occupations are shown in Table 4.3, with student being the most common occupation at 14.2%.

**Table 4.3: Occupations of participants**

| | Frequency | Percent |
|---|---|---|
| Accountant | 6 | 3.4 |
| Accounts | 1 | .6 |
| Admin | 3 | 1.7 |
| Administrator | 1 | .6 |
| Analyst | 1 | .6 |
| Artist | 2 | 1.1 |
| Assistant | 1 | .6 |
| Attorney | 2 | 1.1 |
| Banker | 1 | .6 |
| Beautician | 1 | .6 |
| Bookkeeper | 5 | 2.8 |
| Broker | 2 | 1.1 |
| Business owner | 1 | .6 |
| Consultant | 2 | 1.1 |
| Dealer | 1 | .6 |
| Decorator | 1 | .6 |
| Designer | 1 | .6 |
| Doctor | 1 | .6 |
| Educator | 1 | .6 |
| Engineer | 1 | .6 |
| Equine therapist | 1 | .6 |
| Facilitator | 1 | .6 |
| Farmer | 4 | 2.3 |
| Farrier | 1 | .6 |
| Finance | 1 | .6 |
| Groom | 1 | .6 |
| Homeopath | 1 | .6 |
| Housewife | 13 | 7.4 |
| Instructor | 7 | 4.0 |
| Insurance broker | 1 | .6 |
| IT | 1 | .6 |
| Manager | 16 | 9.1 |
| None | 11 | 6.3 |
| Nurse | 2 | 1.1 |
| Occupational therapist | 1 | .6 |
| Office assistant | 2 | 1.1 |
| Owner | 1 | .6 |
| Personal trainer | 1 | .6 |
| Rep | 1 | .6 |
| Retail | 1 | .6 |
| Retired | 5 | 2.8 |

| | | |
|---|---|---|
| Rider | 4 | 2.3 |
| Sales | 5 | 2.8 |
| Sales manager | 2 | 1.1 |
| Secretary | 3 | 1.7 |
| Self employed | 18 | 10.2 |
| Student | 25 | 14.2 |
| Teacher | 4 | 2.3 |
| Trainer | 2 | 1.1 |
| Trainer/Rider | 1 | .6 |
| Veterinarian | 3 | 1.7 |
| Total | 176 | 100.0 |

**4.5.2.1.5. Hand dominance** (Q7)

Table 4.4 shows that 91.5% were right hand dominant.

**Table 4.4: Dominant hand**

| Frequency | Percent | |
|---|---|---|
| Right | 161 | 91.5 |
| Left | 15 | 8.5 |
| Total | 176 | 100.0 |

**4.5.2.1.6. Medical Aid** (Q8)

Figure 4.2 shows that 56% of the participants had full medical aid, while 10.9% had none; the rest had a hospital plan with or without savings.

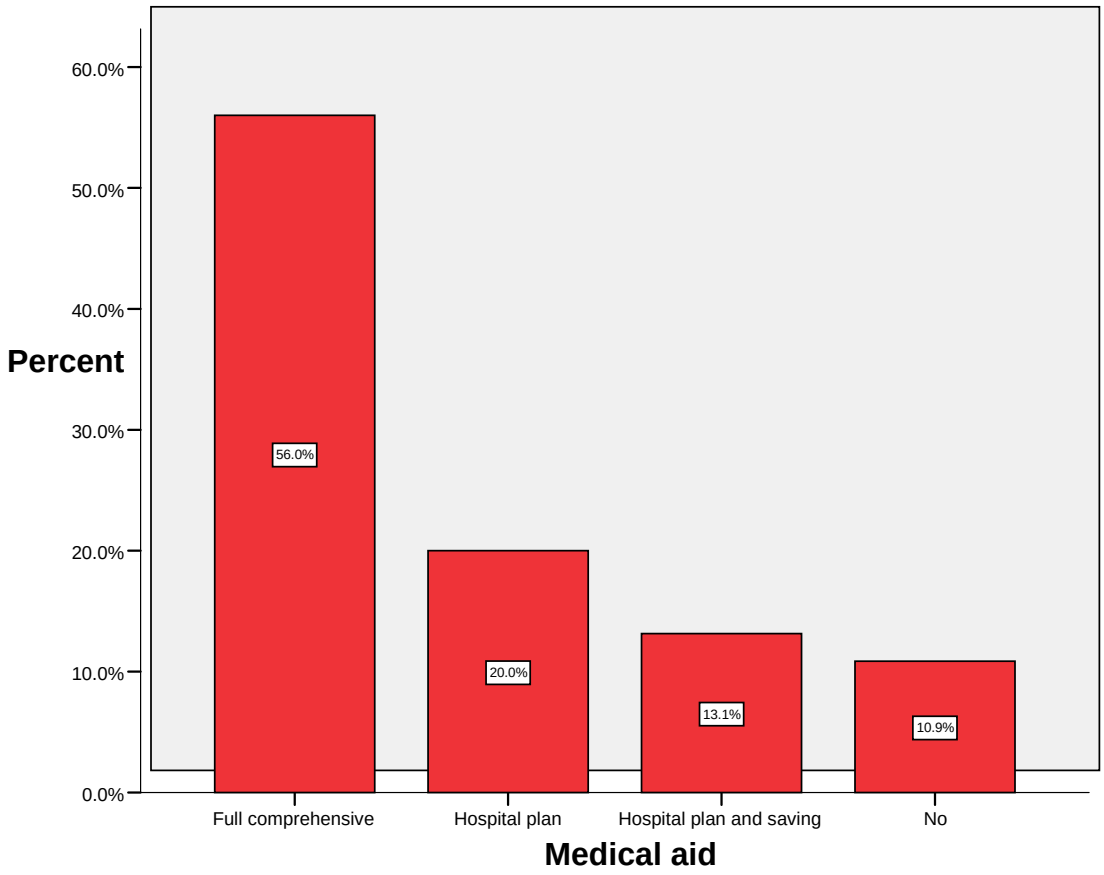


**Figure 4.2: Medical aid of participants (n=175)**

## 4.5.2.2. History of Injury: Part D

### 4.5.2.2.1. Type of injury (Q2)

Injuries due to riding were very prevalent. Table 4.5 illustrates that muscle strains were the most common type of injury (62.5%), while fractures were also common (50.6%). The overall prevalence of injury was 90.3% as only 9.7% had not had an injury due to riding.

## Table 4.5: Type of injury

| | Count | % |
|---|---|---|
| Concussion due to riding | 81 | 46.0% |
| Fractures due to riding | 89 | 50.6% |
| Muscle strains due to riding | 110 | 62.5% |
| Tendons due to riding | 63 | 35.8% |
| None due to riding | 17 | 9.7% |

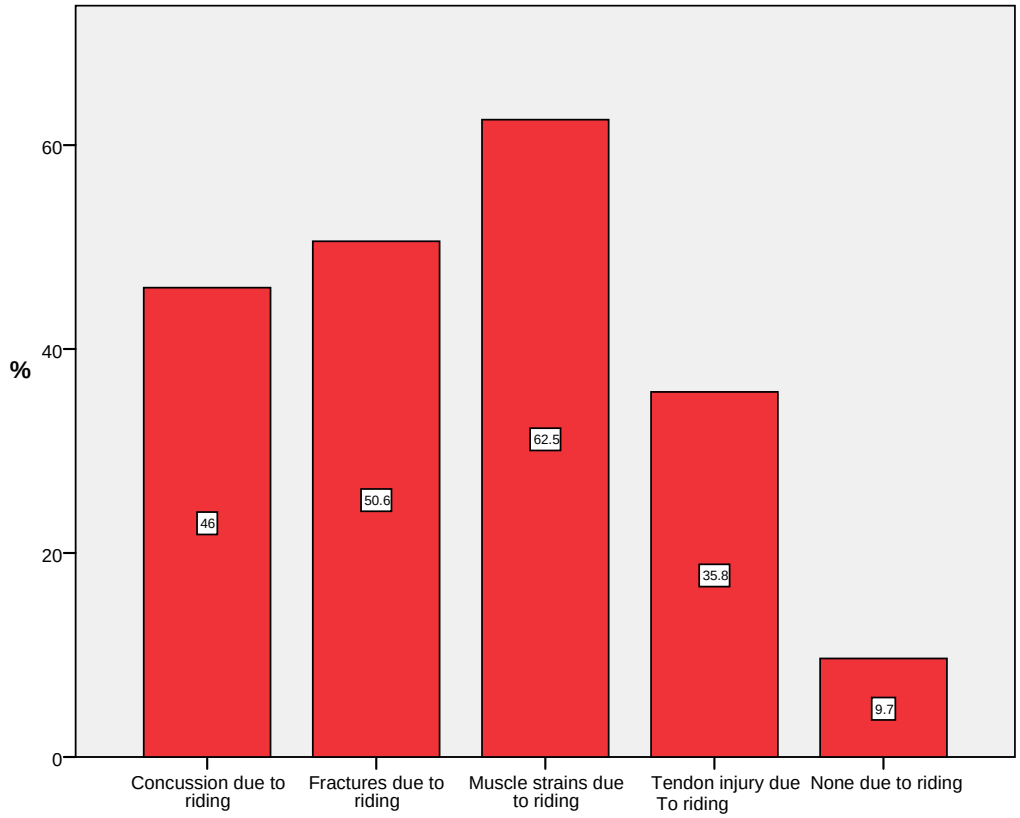


**Figure 4.3: Frequency of each type of injury in the sample**

#### 4.5.2.2.2. Locations of injuries (Q4)

Four hundred and forty six riding related sites of injury were reported as ever having been injured in 151 of the 176 (85.8%) participants, with most participants reporting multiple sites. The head was the most commonly injured site, with 46.4% of participants reporting any head injury, followed by lower back with 43.7%. The shoulder was also commonly injured. This is shown in table 4.6.

**Table 4.6: Injury location**

| | | Responses | | Percent of cases |
|---|---|---|---|---|
| | | N | Percent | |
| Sites of riding injuries(a) | Wrist | 53 | 11.9% | 35.1% |
| | Elbow | 13 | 2.9% | 8.6% |
| | Shoulder | 62 | 13.9% | 41.1% |
| | Head | 70 | 15.7% | 46.4% |
| | Knee | 28 | 6.3% | 18.5% |
| | Chest | 16 | 3.6% | 10.6% |
| | Genital | 4 | .9% | 2.6% |
| | Foot | 46 | 10.3% | 30.5% |
| | Neck | 46 | 10.3% | 30.5% |
| | Mid back | 26 | 5.8% | 17.2% |
| | Low back | 66 | 14.8% | 43.7% |
| | Hip | 16 | 3.6% | 10.6% |
| Total | | 446 | 100.0% | 295.4% |

The number of times each site was injured in a riding accident is shown in table 4.7. The low back was the site most likely to be injured many times, as 14.2% of low back injuries happened >= 5 times. The other sites were most likely to be injured only once.

**Table 4.7: Number of times each site was injured due to riding**

| | None | | Once | | 2-4 times | | >= 5 times | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| Wrist injury times related to riding | 123 | 69.9% | 39 | 22.2% | 10 | 5.7% | 4 | 2.3% |
| Elbow injury times related to riding | 163 | 92.6% | 12 | 6.8% | 1 | .6% | 0 | .0% |
| Shoulder injury times related to riding | 114 | 64.8% | 40 | 22.7% | 16 | 9.1% | 6 | 3.4% |
| Head injury times related to riding | 105 | 59.7% | 59 | 33.5% | 9 | 5.1% | 3 | 1.7% |
| Knee injury times related to riding | 148 | 84.1% | 21 | 11.9% | 5 | 2.8% | 2 | 1.1% |
| Chest injury times related to riding | 160 | 90.9% | 12 | 6.8% | 4 | 2.3% | 0 | .0% |
| Abdomen injury times related to riding | 176 | 100.0% | 0 | .0% | 0 | .0% | 0 | .0% |
| Genital injury times related to riding | 172 | 97.7% | 4 | 2.3% | 0 | .0% | 0 | .0% |
| Foot injury times related to riding | 130 | 73.9% | 35 | 19.9% | 11 | 6.3% | 0 | .0% |
| Neck injury times related to riding | 130 | 73.9% | 26 | 14.8% | 11 | 6.3% | 9 | 5.1% |
| Mid back injury times related to riding | 150 | 85.2% | 12 | 6.8% | 7 | 4.0% | 7 | 4.0% |
| Low back injury times related to riding | 110 | 62.5% | 31 | 17.6% | 10 | 5.7% | 25 | 14.2% |
| Hip injury times related to riding | 160 | 90.9% | 13 | 7.4% | 2 | 1.1% | 1 | .6% |
| Other injury times related to riding | 176 | 100.0% | 0 | .0% | 0 | .0% | 0 | .0% |

**4.5.2.2.3. Mechanisms of injuries** (Q5)

The median severity ranking of each mechanism is shown in table 4.8. Forceful falls were ranked as the most severe type of injury mechanism with a median ranking of eight, followed by rider and horse fall (median =6) and being trampled (5) as well as other (5) which were listed as an accident involving a bicycle and being kicked by another horse. Surprisingly accidents involving motor vehicles only averaged a ranking of two.

**Table 4.8: Mechanism of injury**

| | Median |
|---|---|
| Forceful fall off the horse (thrown off) | 8 |
| Fall off the horse onto own feet | 3 |
| Dislodged from saddle (not touching ground) | 4 |
| Accident involving motor vehicle whilst riding | 2 |
| Rider and horse fall | 6 |
| Dragged on ground while attached to the horse | 4 |
| Trampled on by the horse | 5 |
| Other (please specify) | 5 |

**4.5.2.2.4. Activity** (Q6)

Table 4.9 shows that most injuries occurred whilst jumping (63.8%) and the least occurred during flatwork (10.3%).

**Table 4.9: Riding activity causing most severe injury**

| | Frequency | Percent |
|---|---|---|
| Hacking | 45 | 25.9 |
| Flatwork | 18 | 10.3 |
| Jumping | 111 | 63.8 |
| Total | 174 | 100.0 |
| Missing | 2 | |
| Total | 176 | |

**4.5.2.2.5. Treatment received** (Q8)

As table 4.10 shows, 150 (85.2%) of respondents had been treated for their riding injuries. The most common type of treatment was physiotherapy (58.7%) followed by chiropractic (54.7%) of cases.

**Table 4.10: Treatment received for riding injuries**

| | | Responses | | Percent of Cases |
|---|---|---|---|---|
| | | N | Percent | |
| Treatment for riding injuries | Biokineticist for riding injury | 9 | 2.5% | 6.0% |
| | Chiropractor for riding injury | 82 | 22.8% | 54.7% |
| | Paramedic for riding injury | 32 | 8.9% | 21.3% |
| | GP for riding injury | 59 | 16.4% | 39.3% |
| | Physiotherapist for riding injury | 88 | 24.5% | 58.7% |
| | Self treatment for riding injury | 50 | 13.9% | 33.3% |
| | Sports therapist for riding injury | 37 | 10.3% | 24.7% |
| | Other for riding injury | 2 | .6% | 1.3% |
| Total | | 359 | 100.0% | 239.3% |

### 4.5.2.2.6. Competitions missed due to injury

Thirty-one percent of participants had missed more than eight competitions due to riding injuries, whereas only 17% had missed more than eight competitions due to non riding injuries. This is illustrated in figure 4.4.

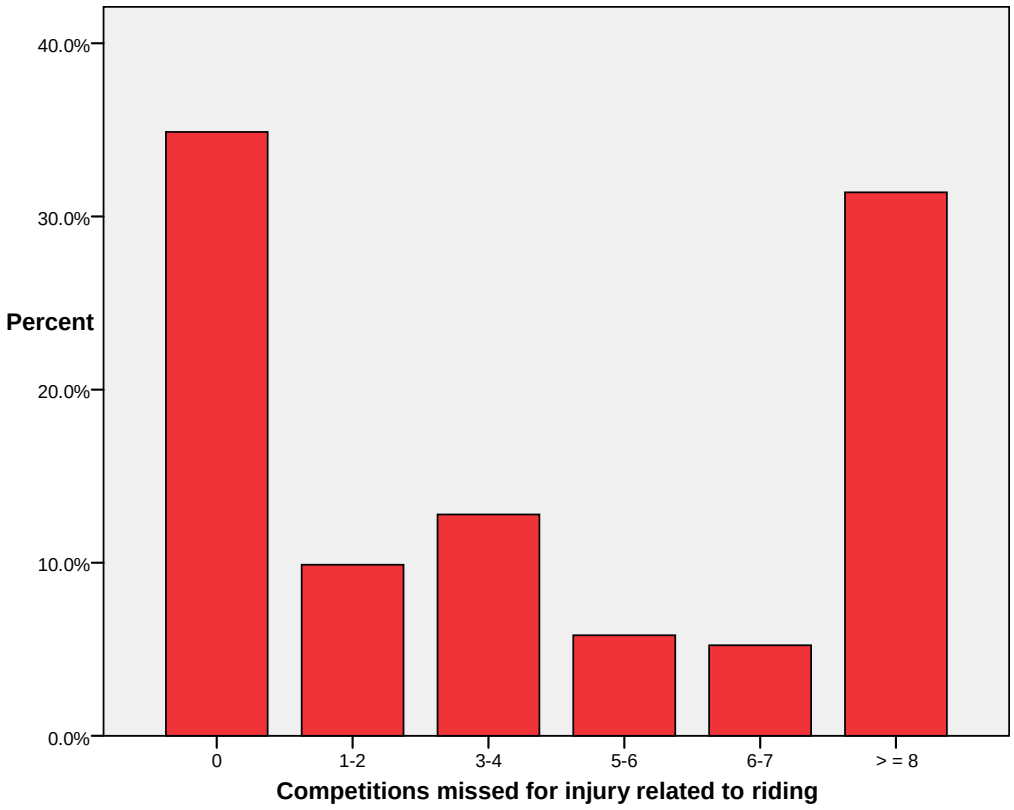


**Figure 4.4: Number of competitions missed for riding injuries**

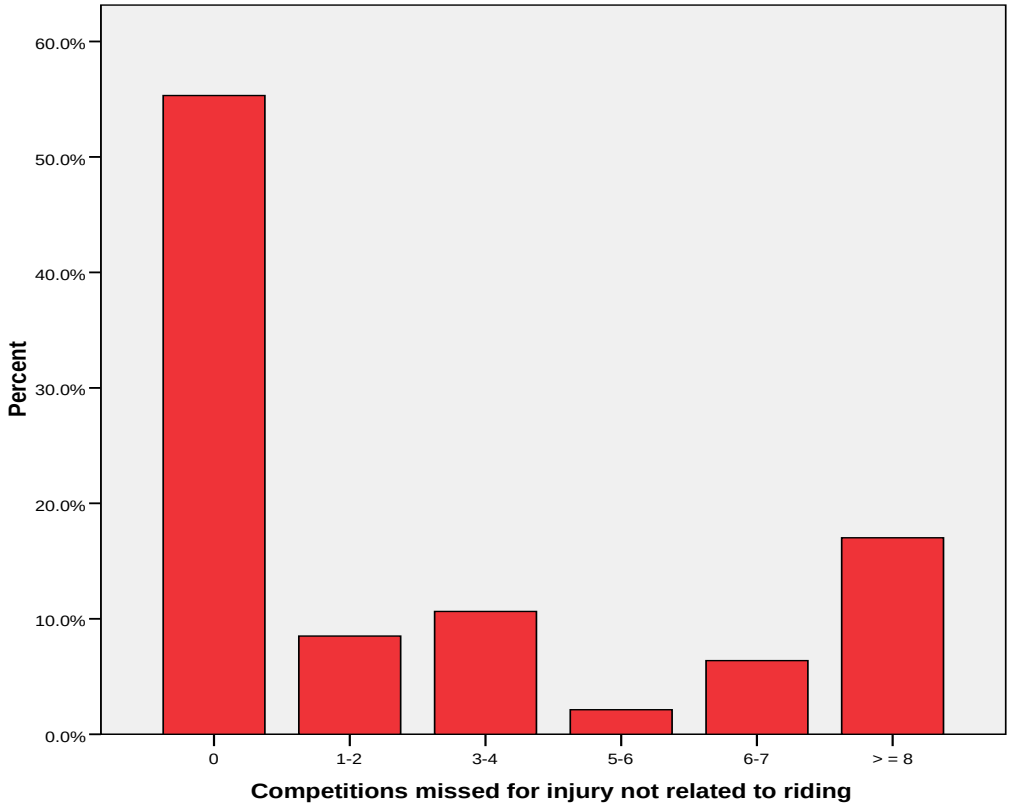


**Figure 4.5: Number of competitions missed for non riding injuries**

### 4.5.2.2.7. Rode or competed whilst injured

As table 4.11 shows over half the sample had competed or ridden whilst injured (54.5%).

**Table 4.11: Rode or competed whilst injured**

| Frequency | Percent | |
|---|---|---|
| Yes | 96 | 54.5 |
| No | 80 | 45.5 |
| Total | 176 | 100.0 |

### 4.5.2.2.8. Reasons for riding whilst injured

When asked why, of those that competed or rode whilst injured, 25 responded that their injury was not severe, 37 said they were stupid and 15 said their entry fee was already paid, as shown in table 4.12.

**Table 4.12: Reasons for riding whilst injured**

| | Frequency | Percent |
|---|---|---|
| N/A | 84 | 47.7 |
| Championship class | 13 | 7.4 |
| Driven to the show already | 1 | .6 |
| Entry paid | 15 | 8.5 |
| Injury not severe enough | 25 | 14.2 |
| Pressure | 1 | .6 |
| Stupid | 37 | 21.0 |
| Total | 176 | 100.0 |

### 4.5.2.2.9. The use of pain medication to continue riding

There was a high prevalence of use of pain medication. As table 4.13 illustrates 10% used it daily, 41.7% used it occasionally. In total only 40% did not use pain medication to continue riding whilst injured.

**Table 4.13: The use of pain medication to continue riding whilst injured**

| | Frequency | Percent |
|---|---|---|
| No | 70 | 40.0 |
| Daily | 18 | 10.3 |
| Weekly | 9 | 5.1 |
| Monthly | 5 | 2.9 |
| Occasionally | 73 | 41.7 |
| Total | 175 | 100.0 |
| Missing | 1 | |
| Total | 176 | |

### *4.5.3. Objective 2: To determine the association between the type of equestrian activity and location and mechanism of injury*

#### 4.5.3.1. Type of activity and location of injury

Type of riding activity was indicated in questions B1 and D6. B1 was originally measured as ordinal grades. This was dichotomised into two categories of yes (take part at any grade) and no (do not take part in that activity). Pearson's chi square tests were used to compare the presence of an injury at each site with each activity in which the participant takes part.

There was a significant association between wrist injuries and taking part in eventing previously ($p=0.006$). People who took part in eventing previously were more likely than those who did not take part in eventing previously to have had a wrist injury. Taking part in eventing previously was also significantly associated with neck injuries ($p<0.001$). Previous dressage was associated with wrist injuries ($p=0.025$), head ($p=0.019$) and knee injuries ($p=0.005$). Show jumping presently was negatively associated with neck injuries ($p=0.019$) and low back injuries

(*p=0.007*). Previous show jumping was associated positively with hip injuries (*p=0.003*).

**Table 4.14: Association between injured site and type of equestrian activity**

(next page)

**A profile of horse riding injuries in adult horse riders registered with the Kwa Zulu Natal Horse Society.**

| | | | Type of equestrian activity | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | Eventing presently | Eventing previously | Dressage presently | Dressage previously | Show jumping presently | Show jumping previously | |
| Sites of riding injuries | Wrist | Count | 27 | 23 | 22 | 16 | 34 | 22 | 53 |
| | | % | 50.9% | 43.4% | 41.5% | 30.2% | 64.2% | 41.5% | |
| | | p value | 0.337 | 0.006* | 0.537 | 0.025* | 0.992 | 0.210 | |
| | Elbow | Count | 7 | 4 | 8 | 1 | 9 | 3 | 13 |
| | | % | 53.8% | 30.8% | 61.5% | 7.7% | 69.2% | 23.1% | |
| | | p value | 0.528 | 0.882 | 0.082 | 0.469 | 0.773 | 0.547 | |
| | Shoulder | Count | 30 | 16 | 25 | 13 | 42 | 27 | 62 |
| | | % | 48.4% | 25.8% | 40.3% | 21.0% | 67.7% | 43.5% | |
| | | p value | 0.564 | 0.494 | 0.650 | 0.791 | 0.470 | 0.068 | |
| | Head | Count | 29 | 23 | 29 | 20 | 44 | 28 | 70 |
| | | % | 41.4% | 32.9% | 41.4% | 28.6% | 62.9% | 40.0% | |
| | | p value | 0.383 | 0.357 | 0.456 | 0.019* | 0.762 | 0.226 | |
| | Knee | Count | 16 | 10 | 13 | 11 | 20 | 13 | 28 |
| | | % | 57.1% | 35.7% | 46.4% | 39.3% | 71.4% | 46.4% | |
| | | p value | 0.176 | 0.391 | 0.320 | 0.005* | 0.385 | 0.154 | |
| | Chest | Count | 8 | 4 | 6 | 3 | 8 | 5 | 16 |
| | | % | 50.0% | 25.0% | 37.5% | 18.8% | 50.0% | 31.3% | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | p value | 0.702 | 0.713 | 0.961 | 0.905 | 0.214 | 0.764 | |
| | Genital | Count | 1 | 0 | 1 | 0 | 4 | 1 | 4 |
| | | % | 25.0% | .0% | 25.0% | .0% | 100.0% | 25.0% | |
| | | p value | 0.406 | 0.325 | 1.000 | 0.313 | 0.298 | 1.000 | |
| | Foot | Count | 22 | 13 | 15 | 12 | 27 | 19 | 46 |
| | | % | 47.8% | 28.3% | 32.6% | 26.1% | 58.7% | 41.3% | |
| | | p value | 0.707 | 0.901 | 0.375 | 0.220 | 0.364 | 0.270 | |
| | Neck | Count | 22 | 25 | 18 | 13 | 23 | 19 | 46 |
| | | % | 47.8% | 54.3% | 39.1% | 28.3% | 50.0% | 41.3% | |
| | | P value | 0.707 | <0.001* | 0.863 | 0.098 | 0.019* | 0.270 | |
| | Mid Back | Count | 13 | 11 | 13 | 5 | 16 | 13 | 26 |
| | | % | 50.0% | 42.3% | 50.0% | 19.2% | 61.5% | 50.0% | |
| | | p value | 0.614 | 0.105 | 0.175 | 0.928 | 0.759 | 0.075 | |
| | Low Back | Count | 25 | 20 | 25 | 17 | 34 | 28 | 66 |
| | | % | 37.9% | 30.3% | 37.9% | 25.8% | 51.5% | 42.4% | |
| | | p value | 0.118 | 0.764 | 0.968 | 0.131 | 0.007* | 0.094 | |
| | Hip | Count | 6 | 5 | 5 | 6 | 9 | 11 | 16 |
| | | % | 37.5% | 31.3% | 31.3% | 37.5% | 56.3% | 68.8% | |
| | | p value | 0.503 | 0.781 | 0.556 | 0.064 | 0.486 | 0.003* | |
| Total | | Count | 67 | 48 | 60 | 33 | 94 | 59 | 151 |

* statistically significant at 0.05 level

### 4.5.3.2. Grade of activity and type of injury

Present and previous eventing grade was not associated with any type of injury.

Present and previous dressage grade was not associated with any type of injury.

Present show jumping grade was not associated with any type of injury.

**Table 4.15: Type of injury by present show jumping grade**

| | | | Show jumping presently | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | 70cm | 80cm | 90cm | 1m | 1.10 cm | 1.20 and above | |
| Types of injuries due to riding(a) | Concussion due to riding | Count | 11 | 6 | 5 | 4 | 9 | 17 | 52 |
| | | % | 21.2% | 11.5% | 9.6% | 7.7% | 17.3% | 32.7% | |
| | Fractures due to riding | Count | 8 | 7 | 6 | 5 | 13 | 17 | 56 |
| | | % | 14.3% | 12.5% | 10.7% | 8.9% | 23.2% | 30.4% | |
| | Muscle strains due to riding | Count | 11 | 8 | 8 | 9 | 11 | 18 | 65 |
| | | % | 16.9% | 12.3% | 12.3% | 13.8% | 16.9% | 27.7% | |
| | Tendons due to riding | Count | 7 | 3 | 6 | 4 | 9 | 7 | 36 |
| | | % | 19.4% | 8.3% | 16.7% | 11.1% | 25.0% | 19.4% | |
| | None due to riding | Count | 2 | 4 | 1 | 3 | 0 | 3 | 13 |
| | | % | 15.4% | 30.8% | 7.7% | 23.1% | .0% | 23.1% | |
| Total | | Count | 15 | 15 | 12 | 17 | 19 | 28 | 106 |

There was a significant association between taking part in show jumping previously and injuring the tendons (*p=0.021*). Those who jumped 70cm had the highest risk of injury.

#### 4.5.3.3. Type of activity and location of injury during most severe fall

There were no significant associations between site of injury and activity during most severe fall. Most of the severe falls occurred during jumping.

#### 4.5.3.4. Type of activity and mechanism of injury

Mechanism of injury was measured as an ordinal grade on a scale of 1 (least severe) to 8 (most severe) for 7 listed mechanisms. The median grading for each was recorded for each type of activity participated in (Question B1) and activity when incurred the most severe injury (Question D6).

There was a significant association between eventing presently and the severity grading for forceful fall off the horse (*p=0.018*), however, the p value was significantly higher in those not eventing presently. Those who evented in the past had a significantly lower severity grading for being trampled by a horse than those who had not evented in the past (*p=0.030*).

Participants who took part in dressage presently had a significantly lower severity grading for forceful falls off a horse (*p=0.002*) than those who do not take part in dressage presently. People who did dressage previously had a significantly higher severity grading for rider and horse falls than those who did not do dressage previously. Show jumping presently was associated with higher severity score for falling off the horse onto own two feet (*p=0.019*).

**Table 4.16: Comparison of median severity score for each mechanism of injury and equestrian activity involved in presently and in the past.**

| | | | Forceful fall off the horse (thrown off) | Fall off the horse onto own feet | Dislodged from saddle (not touching ground) | Accident involving motor vehicle whilst riding | Rider and horse fall | Dragged on ground while attached to the horse | Trampled on by the horse |
|---|---|---|---|---|---|---|---|---|---|
| Type of activity | Eventing presently | Median | 7 | 3 | 2 | 2 | 5 | 4 | 4 |
| | | p value | 0.018* | 0.501 | 0.107 | 0.351 | 0.580 | 0.947 | 0.058 |
| | Eventing previously | Median | 8 | 2 | 4 | 2 | 5 | 4 | 3 |
| | | pvalue | 0.893 | 0.401 | 0.774 | 0.884 | 0.969 | 0.645 | 0.030* |
| | Dressage presently | Median | 6 | 3 | 3 | 4 | 5 | 4 | 4 |
| | | p value | 0.002 | 0.932 | 0.578 | 0.316 | 0.214 | 0.708 | 0.551 |
| | Dressage previously | Median | 8 | 2 | 2 | 5 | 7 | 5 | 3 |
| | | p value | 0.301 | 0.117 | 0.146 | 0.501 | 0.041* | 0.908 | 0.345 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Show jumping presently | Median | 8 | 4 | 4 | 2 | 6 | 4 | 4 |
| | | p value | 0.674 | 0.019* | 0.678 | 0.943 | 0.164 | 0.581 | 0.288 |
| | Show jumping previously | Median | 8 | 3 | 3 | 4 | 6 | 5 | 6 |
| | | p value | 0.081 | 0.367 | 0.527 | 0.408 | 0.883 | 0.112 | 0.215 |

* statistically significant at 0.05 level

### *4.5.4. Objective 3: To determine the association between use and type of equipment and location of injury*

#### 4.5.4.1. Horse breed and injury site

Horse breed was not associated with site of injury.

#### 4.5.4.2. Horse size and site of injury

Chest injuries were significantly associated with horse size (*p=0.010*). The 15.3 hand (h) to 16.2 h horse size was associated with a higher percentage of chest injuries. This is shown in table 4.17.

**Table 4.17: Horse size and site of injury**

| | | | Horse size | | | | p value |
|---|---|---|---|---|---|---|---|
| | | | < 14.2 h | 14.3 h to 15.2 h | 15.3 h to 16.2 h | > =16.3 | |
| Sites for riding injuries | Wrist | Count | 0 | 6 | 39 | 8 | 0.381 |
| | | % | .0% | 11.3% | 73.6% | 15.1% | |
| | Elbow | Count | 0 | 1 | 6 | 6 | 0.219 |
| | | % | .0% | 7.7% | 46.2% | 46.2% | |
| | Shoulder | Count | 1 | 5 | 40 | 16 | 0.403 |
| | | % | 1.6% | 8.1% | 64.5% | 25.8% | |
| | Head | Count | 0 | 8 | 46 | 16 | 0.872 |
| | | % | .0% | 11.4% | 65.7% | 22.9% | |
| | Knee | Count | 0 | 3 | 18 | 7 | 0.964 |
| | | % | .0% | 10.7% | 64.3% | 25.0% | |
| | Chest | Count | 1 | 1 | 12 | 2 | 0.010* |
| | | % | 6.3% | 6.3% | 75.0% | 12.5% | |
| | Genital | Count | 0 | 0 | 3 | 1 | 0.913 |
| | | % | .0% | .0% | 75.0% | 25.0% | |
| | Foot | Count | 0 | 7 | 29 | 10 | 0.663 |
| | | % | .0% | 15.2% | 63.0% | 21.7% | |
| | Neck | Count | 0 | 8 | 27 | 11 | 0.335 |
| | | % | .0% | 17.4% | 58.7% | 23.9% | |
| | Mid back | Count | 0 | 4 | 16 | 6 | 0.835 |
| | | % | .0% | 15.4% | 61.5% | 23.1% | |
| | Low back | Count | 1 | 8 | 43 | 14 | 0.582 |
| | | % | 1.5% | 12.1% | 65.2% | 21.2% | |
| | Hip | Count | 0 | 1 | 13 | 2 | 0.599 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | % | .0% | 6.3% | 81.3% | 12.5% | |
| Total | | Count | 1 | 15 | 101 | 34 | 151 |

### 4.5.4.3. Horse rating and site of injury

There was no association between rating of the horse and site of injury.

### 4.5.4.4. Saddle type and site of injury

There was a significant association between saddle type and genital injury (*p=0.022*).

Table 4.18 shows that the only genital injury occurred with a jumping saddle.

**Table 4.18: Saddle type and site of injury**

| | | | Saddle type | | | p value |
|---|---|---|---|---|---|---|
| | | | Dressage | Jumping | General purpose | |
| Sites for riding injuries | Wrist | Count | 10 | 15 | 28 | 0.072 |
| | | % | 18.9% | 28.3% | 52.8% | |
| | Elbow | Count | 3 | 3 | 7 | 0.534 |
| | | % | 23.1% | 23.1% | 53.8% | |
| | Shoulder | Count | 14 | 25 | 22 | 0.461 |
| | | % | 23.0% | 41.0% | 36.1% | |
| | Head | Count | 19 | 23 | 27 | 0.837 |
| | | % | 27.5% | 33.3% | 39.1% | |
| | Knee | Count | 6 | 10 | 11 | 0.925 |
| | | % | 22.2% | 37.0% | 40.7% | |
| | Chest | Count | 5 | 7 | 4 | 0.438 |
| | | % | 31.3% | 43.8% | 25.0% | |
| | Genital | Count | 0 | 4 | 0 | 0.022* |
| | | % | .0% | 100.0% | .0% | |
| | Foot | Count | 10 | 14 | 22 | 0.451 |
| | | % | 21.7% | 30.4% | 47.8% | |
| | Neck | Count | 12 | 13 | 21 | 0.522 |
| | | % | 26.1% | 28.3% | 45.7% | |
| | Mid back | Count | 7 | 6 | 12 | 0.461 |
| | | % | 28.0% | 24.0% | 48.0% | |
| | Low back | Count | 20 | 20 | 25 | 0.395 |
| | | % | 30.8% | 30.8% | 38.5% | |
| | Hip | Count | 7 | 5 | 4 | 0.175 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | % | 43.8% | 31.3% | 25.0% | |
| Total | | Count | 38 | 53 | 59 | 150 |

### 4.5.4.5. Stirrup type and site of injury

Stirrup type was significantly associated with foot injuries *(p=0.018).* Those with foot injuries were more likely to use other stirrup types as is shown in table 4.19.

**Table 4.19: Stirrup type and site of injury**

| | | | Stirrup type | | | | | p value |
|---|---|---|---|---|---|---|---|---|
| | | | Standard with tread | Standard with wedge treads | Springer | KY springer | Other | |
| Sites for riding injuries | Wrist | Count | 28 | 4 | 13 | 3 | 5 | 0.495 |
| | | % | 52.8% | 7.5% | 24.5% | 5.7% | 9.4% | |
| | Elbow | Count | 9 | 0 | 1 | 1 | 2 | 0.385 |
| | | % | 69.2% | .0% | 7.7% | 7.7% | 15.4% | |
| | Shoulder | Count | 37 | 2 | 16 | 1 | 6 | 0.432 |
| | | % | 59.7% | 3.2% | 25.8% | 1.6% | 9.7% | |
| | Head | Count | 40 | 4 | 18 | 3 | 5 | 0.875 |
| | | % | 57.1% | 5.7% | 25.7% | 4.3% | 7.1% | |
| | Knee | Count | 14 | 2 | 6 | 2 | 4 | 0.330 |
| | | % | 50.0% | 7.1% | 21.4% | 7.1% | 14.3% | |
| | Chest | Count | 7 | 0 | 7 | 1 | 1 | 0.216 |
| | | % | 43.8% | .0% | 43.8% | 6.3% | 6.3% | |
| | Genital | Count | 2 | 0 | 1 | 0 | 1 | 0.651 |
| | | % | 50.0% | .0% | 25.0% | .0% | 25.0% | |
| | Foot | Count | 24 | 3 | 10 | 1 | 8 | 0.018* |
| | | % | 52.2% | 6.5% | 21.7% | 2.2% | 17.4% | |
| | Neck | Count | 29 | 1 | 11 | 2 | 3 | 0.881 |
| | | % | 63.0% | 2.2% | 23.9% | 4.3% | 6.5% | |
| | Mid back | Count | 14 | 3 | 4 | 2 | 3 | 0.242 |
| | | % | 53.8% | 11.5% | 15.4% | 7.7% | 11.5% | |
| | Low back | Count | 42 | 5 | 14 | 1 | 4 | 0.551 |
| | | % | 63.6% | 7.6% | 21.2% | 1.5% | 6.1% | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Hip | Count | 10 | 0 | 4 | 1 | 1 | 0.878 |
| | | % | 62.5% | .0% | 25.0% | 6.3% | 6.3% | |
| Total | | Count | 90 | 9 | 35 | 5 | 12 | 151 |

### 4.5.4.6. Rein type and site of injury

Table 4.20 illustrates that shoulder and knee injuries were significantly associated with rein type (*p=0.011* and *p=0.047* respectively). The use of synthetic reins was higher in those who had shoulder injuries. Webb reins were more common in those with knee injuries.

**Table 4.20: Rein type and site of injury**

| | | | Rein type | | | | P value |
|---|---|---|---|---|---|---|---|
| | | | Webb | Leather | Synthetic | Pleated | |
| Sites for riding injuries | Wrist | Count | 16 | 9 | 28 | 0 | 0.327 |
| | | % | 30.2% | 17.0% | 52.8% | .0% | |
| | Elbow | Count | 3 | 2 | 8 | 0 | 0.700 |
| | | % | 23.1% | 15.4% | 61.5% | .0% | |
| | Shoulder | Count | 15 | 5 | 39 | 3 | 0.011* |
| | | % | 24.2% | 8.1% | 62.9% | 4.8% | |
| | Head | Count | 21 | 12 | 34 | 3 | 0.994 |
| | | % | 30.0% | 17.1% | 48.6% | 4.3% | |
| | Knee | Count | 12 | 5 | 8 | 3 | 0.047* |
| | | % | 42.9% | 17.9% | 28.6% | 10.7% | |
| | Chest | Count | 4 | 3 | 9 | 0 | 0.761 |
| | | % | 25.0% | 18.8% | 56.3% | .0% | |
| | Genital | Count | 1 | 2 | 1 | 0 | 0.379 |
| | | % | 25.0% | 50.0% | 25.0% | .0% | |
| | Foot | Count | 21 | 6 | 18 | 1 | 0.080 |
| | | % | 45.7% | 13.0% | 39.1% | 2.2% | |
| | Neck | Count | 15 | 8 | 22 | 1 | 0.900 |
| | | % | 32.6% | 17.4% | 47.8% | 2.2% | |
| | Mid back | Count | 10 | 4 | 10 | 2 | 0.513 |
| | | % | 38.5% | 15.4% | 38.5% | 7.7% | |
| | Low back | Count | 20 | 12 | 30 | 4 | 0.732 |
| | | % | 30.3% | 18.2% | 45.5% | 6.1% | |
| | Hip | Count | 7 | 2 | 5 | 2 | 0.141 |
| | | % | 43.8% | 12.5% | 31.3% | 12.5% | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total | Count | 49 | 24 | 72 | 6 | 151 |

### 4.5.4.7. Bit type and site of injury

Type of bit was significantly associated with wrist injuries (*p=0.047*). Pelham and other bit types were more likely in those with wrist injuries (table 4.21).

**Table 4.21: Bit type and site of injury**

| | | | Bit type | | | | | *p* value |
|---|---|---|---|---|---|---|---|---|
| | | | Snaffle | Pelham | Portugese gag | Double bridle | Other | |
| Sites for riding injuries | Wrist | Count | 38 | 4 | 6 | 1 | 3 | 0.047* |
| | | % | 73.1% | 7.7% | 11.5% | 1.9% | 5.8% | |
| | Elbow | Count | 8 | 1 | 2 | 1 | 0 | 0.803 |
| | | % | 66.7% | 8.3% | 16.7% | 8.3% | .0% | |
| | Shoulder | Count | 44 | 3 | 10 | 2 | 2 | 0.817 |
| | | % | 72.1% | 4.9% | 16.4% | 3.3% | 3.3% | |
| | Head | Count | 48 | 3 | 12 | 4 | 2 | 0.461 |
| | | % | 69.6% | 4.3% | 17.4% | 5.8% | 2.9% | |
| | Knee | Count | 20 | 1 | 4 | 1 | 2 | 0.215 |
| | | % | 71.4% | 3.6% | 14.3% | 3.6% | 7.1% | |
| | Chest | Count | 10 | 1 | 3 | 1 | 1 | 0.540 |
| | | % | 62.5% | 6.3% | 18.8% | 6.3% | 6.3% | |
| | Genital | Count | 4 | 0 | 0 | 0 | 0 | 0.852 |
| | | % | 100.0% | .0% | .0% | .0% | .0% | |
| | Foot | Count | 34 | 2 | 5 | 2 | 2 | 0.498 |
| | | % | 75.6% | 4.4% | 11.1% | 4.4% | 4.4% | |
| | Neck | Count | 36 | 2 | 6 | 2 | 0 | 0.830 |
| | | % | 78.3% | 4.3% | 13.0% | 4.3% | .0% | |
| | Mid back | Count | 19 | 2 | 4 | 1 | 0 | 0.880 |
| | | % | 73.1% | 7.7% | 15.4% | 3.8% | .0% | |
| | Low back | Count | 47 | 4 | 12 | 2 | 0 | 0.508 |
| | | % | 72.3% | 6.2% | 18.5% | 3.1% | .0% | |
| | Hip | Count | 12 | 0 | 3 | 0 | 1 | 0.454 |
| | | % | 75.0% | .0% | 18.8% | .0% | 6.3% | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total | Count | 113 | 6 | 22 | 6 | 3 | 150 |

### 4.5.4.8. Artificial aids by site of injury

Table 4.22 shows the artificial aids which were associated with injuries were: running martingale for shoulder injuries (*p=0.032),* and De Gouge for elbow injuries (*p=0.018*) and hip injuries (*p=0.044*).

**Table 4.22: Artificial aids by site of injury**

| | | | Artificial aids(a) | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Whips | Spurs | Running martingale | Running reins | Market harborourgh | Elastic neck stretcher | De Gouge | Other (please specify) | |
| Sites for riding injuries | Wrist | Count | 46 | 37 | 36 | 17 | 5 | 10 | 7 | 3 | 51 |
| | | % | 90.2% | 72.5% | 70.6% | 33.3% | 9.8% | 19.6% | 13.7% | 5.9% | |
| | Elbow | Count | 13 | 11 | 6 | 5 | 2 | 5 | 6 | 0 | 13 |
| | | % | 100.0% | 84.6% | 46.2% | 38.5% | 15.4% | 38.5% | 46.2% | .0% | |
| | Shoulder | Count | 55 | 49 | 46 | 23 | 8 | 12 | 9 | 5 | 61 |
| | | % | 90.2% | 80.3% | 75.4% | 37.7% | 13.1% | 19.7% | 14.8% | 8.2% | |
| | Head | Count | 61 | 52 | 43 | 22 | 12 | 18 | 15 | 2 | 67 |
| | | % | 91.0% | 77.6% | 64.2% | 32.8% | 17.9% | 26.9% | 22.4% | 3.0% | |
| | Knee | Count | 24 | 19 | 21 | 11 | 4 | 7 | 4 | 1 | 28 |
| | | % | 85.7% | 67.9% | 75.0% | 39.3% | 14.3% | 25.0% | 14.3% | 3.6% | |
| | Chest | Count | 15 | 11 | 12 | 7 | 2 | 4 | 2 | 0 | 16 |
| | | % | 93.8% | 68.8% | 75.0% | 43.8% | 12.5% | 25.0% | 12.5% | .0% | |
| | Genital | Count | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 3 |
| | | % | 100.0% | 100.0% | 66.7% | 66.7% | 66.7% | 33.3% | 66.7% | 33.3% | |
| | Foot | Count | 41 | 29 | 29 | 18 | 4 | 10 | 10 | 4 | 45 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | 91.1% | 64.4% | 64.4% | 40.0% | 8.9% | 22.2% | 22.2% | 8.9% | |
| | Neck | Count | 41 | 35 | 25 | 9 | 3 | 9 | 7 | 1 | 45 |
| | | % | 91.1% | 77.8% | 55.6% | 20.0% | 6.7% | 20.0% | 15.6% | 2.2% | |
| | Mid back | Count | 24 | 18 | 16 | 7 | 4 | 5 | 3 | 0 | 25 |
| | | % | 96.0% | 72.0% | 64.0% | 28.0% | 16.0% | 20.0% | 12.0% | .0% | |
| | Low back | Count | 56 | 48 | 43 | 15 | 8 | 12 | 14 | 1 | 64 |
| | | % | 87.5% | 75.0% | 67.2% | 23.4% | 12.5% | 18.8% | 21.9% | 1.6% | |
| | Hip | Count | 14 | 10 | 13 | 3 | 3 | 3 | 6 | 0 | 16 |
| | | % | 87.5% | 62.5% | 81.3% | 18.8% | 18.8% | 18.8% | 37.5% | .0% | |
| Total | | Count | 135 | 112 | 99 | 48 | 20 | 34 | 28 | 6 | 147 |

### 4.5.4.9. Use of facilities by riding injury sites

Foot injury was significantly associated with use of dressage arena (*p=0.025*). Those with foot injuries were more likely not to use a dressage arena. Neck injury also showed a significant association with dressage arena use (*p=0.031).* Those with neck injuries tended to use a dressage arena more than those without neck injuries. (table 4.23)

**Table 4.23: Use of dressage arena by sites of riding injury**

| | | | Dressage arena | | | | | | p value |
|---|---|---|---|---|---|---|---|---|---|
| | | | Not used | 1-2 times | 3-4 times | 5-6 times | 7-8 times | > = 9 times | |
| Sites for riding injuries | Wrist | Count | 5 | 5 | 4 | 5 | 5 | 29 | 0.617 |
| | | % | 9.4% | 9.4% | 7.5% | 9.4% | 9.4% | 54.7% | |
| | Elbow | Count | 1 | 1 | 1 | 1 | 1 | 8 | 0.898 |
| | | % | 7.7% | 7.7% | 7.7% | 7.7% | 7.7% | 61.5% | |
| | Shoulder | Count | 4 | 6 | 6 | 4 | 10 | 32 | 0.393 |
| | | % | 6.5% | 9.7% | 9.7% | 6.5% | 16.1% | 51.6% | |
| | Head | Count | 8 | 6 | 8 | 6 | 8 | 34 | 0.813 |
| | | % | 11.4% | 8.6% | 11.4% | 8.6% | 11.4% | 48.6% | |
| | Knee | Count | 3 | 3 | 1 | 2 | 6 | 13 | 0.532 |
| | | % | 10.7% | 10.7% | 3.6% | 7.1% | 21.4% | 46.4% | |
| | Chest | Count | 1 | 1 | 1 | 2 | 2 | 9 | 0.937 |
| | | % | 6.3% | 6.3% | 6.3% | 12.5% | 12.5% | 56.3% | |
| | Genital | Count | 1 | 1 | 0 | 0 | 0 | 2 | 0.626 |
| | | % | 25.0% | 25.0% | .0% | .0% | .0% | 50.0% | |
| | Foot | Count | 9 | 4 | 1 | 4 | 4 | 24 | 0.025* |
| | | % | 19.6% | 8.7% | 2.2% | 8.7% | 8.7% | 52.2% | |
| | Neck | Count | 1 | 7 | 2 | 3 | 9 | 24 | 0.031* |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | % | 2.2% | 15.2% | 4.3% | 6.5% | 19.6% | 52.2% | |
| | Mid back | Count | 2 | 5 | 3 | 3 | 3 | 10 | 0.643 |
| | | % | 7.7% | 19.2% | 11.5% | 11.5% | 11.5% | 38.5% | |
| | Low back | Count | 5 | 6 | 8 | 5 | 10 | 32 | 0.697 |
| | | % | 7.6% | 9.1% | 12.1% | 7.6% | 15.2% | 48.5% | |
| | Hip | Count | 0 | 0 | 1 | 2 | 3 | 10 | 0.370 |
| | | % | .0% | .0% | 6.3% | 12.5% | 18.8% | 62.5% | |
| Total | | Count | 16 | 13 | 16 | 15 | 20 | 71 | 151 |

Use of show jumps and cross country jumps was not associated with injury at any site.

### 4.5.4.9. Protective equipment targeted to specific areas

#### 4.5.4.9.1. Use of helmet vs. head injuries

Use of helmet was not associated with head injuries. Therefore showing that the use of helmets were effective in preventing head injuries (table 4.24).

**Table 4.24: Use of helmet vs. head injuries**

| | | | Head | | p value |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Helmet | Helmet flatwork | Count | 80 | 48 | 0.314 |
| | | % | 62.5 | 37.5 | |
| | Helmet jumping | Count | 86 | 56 | 0.852 |
| | | % | 60.6 | 39.4 | |
| | Helmet hacking | Count | 73 | 48 | 0.967 |
| | | % | 60.3 | 39.7 | |
| | Helmet competing | Count | 101 | 69 | 0.239 |
| | | % | 59.4 | 40.6 | |
| Total | | Count | 103 | 70 | 173 |

#### 4.5.4.9.2. Use of gloves for wrist/hand injuries

Use of gloves for jumping and hacking was significantly positively associated with wrist/hand injuries (*p=0.008 and p=0.003 respectively*). It could have been that gloves were used subsequent to a hand injury for protective purposes and not preventative purposes (table 4.25).

**Table 4.25: Use of gloves for wrist/hand injuries**

| | | | Wrist | | p value |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Gloves(a) | Gloves flatwork | Count | 98 | 47 | 0.150 |
| | | % | 67.6 | 32.4 | |
| | Gloves jumping | Count | 83 | 46 | 0.008* |
| | | % | 64.3 | 35.7 | |
| | Gloves hacking | Count | 74 | 44 | 0.003* |
| | | % | 62.7 | 37.3 | |
| | Gloves competing | Count | 105 | 50 | 0.092 |
| | | % | 67.7 | 32.3 | |
| Total | | Count | 109 | 51 | 160 |

### 4.5.4.9.3. Use of boots for foot injuries

Boots were not associated with foot injuries.

### 4.5.4.9.4. Use of back brace for back injuries

The use of a back brace was not associated with mid back injuries.

Table 4.26 shows that the use of a back brace was positively associated with low back injuries. Again this could be used for protecting an existing back injury.

**Table 4.26: Use of back brace for low back injuries**

| | | | Low back | | *p* value |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Brace(a) | Brace flatwork | Count | 1 | 5 | 0.028* |
| | | % | 16.7% | 83.3% | |
| | Brace jumping | Count | 1 | 6 | 0.012* |
| | | % | 14.3% | 85.7% | |
| | Brace hacking | Count | 1 | 3 | 0.149 |
| | | % | 25.0% | 75.0% | |
| | Brace competing | Count | 4 | 8 | 0.031* |
| | | % | 33.3% | 66.7% | |
| Total | | Count | 5 | 8 | 13 |

### 4.5.4.9.5. Use of body protector for all injury sites

Table 4.27 shows that the use of the body protector for competing was significantly associated with having wrist injuries (*p=0.023*).

**Table 4.27: Use of body protector for all injury sites**

| | | | Body Protector | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | Body protector flatwork | Body protector jumping | Body protector hacking | Body protector competing | |
| Sites for riding injuries | Wrist | Count | 1 | 2 | 0 | 34 | 34 |
| | | % | 2.9% | 5.9% | .0% | 100.0% | |
| | Elbow | Count | 0 | 0 | 0 | 8 | 8 |
| | | % | .0% | .0% | .0% | 100.0% | |
| | Shoulder | Count | 0 | 2 | 0 | 33 | 33 |
| | | % | .0% | 6.1% | .0% | 100.0% | |
| | Head | Count | 1 | 3 | 0 | 34 | 34 |
| | | % | 2.9% | 8.8% | .0% | 100.0% | |
| | Knee | Count | 0 | 1 | 0 | 18 | 18 |
| | | % | .0% | 5.6% | .0% | 100.0% | |
| | Chest | Count | 0 | 1 | 1 | 9 | 9 |
| | | % | .0% | 11.1% | 11.1% | 100.0% | |
| | Genital | Count | 0 | 0 | 0 | 1 | 1 |
| | | % | .0% | .0% | .0% | 100.0% | |
| | Foot | Count | 0 | 0 | 0 | 24 | 24 |
| | | % | .0% | .0% | .0% | 100.0% | |
| | Neck | Count | 1 | 4 | 1 | 27 | 27 |
| | | % | 3.7% | 14.8% | 3.7% | 100.0% | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mid back | Count | 0 | 1 | 1 | 14 | 14 |
| | | % | .0% | 7.1% | 7.1% | 100.0% | |
| | Low back | Count | 1 | 4 | 0 | 29 | 29 |
| | | % | 3.4% | 13.8% | .0% | 100.0% | |
| | Hip | Count | 0 | 1 | 0 | 6 | 6 |
| | | % | .0% | 16.7% | .0% | 100.0% | |
| Total | | Count | 1 | 8 | 1 | 77 | 77 |

### *4.5.5. Objective 4: To determine anthropometric and history variables associated with location of horse riding injuries.*

#### 4.5.5.1. Age, weight and height by sites injured

Age was significantly associated with knee injuries. Those who had knee injuries were significantly younger than those without knee injuries (*p=0.027*). Age was also significantly associated with foot injuries, in that those with foot injuries were significantly older than those without (*p=0.048*). Height and weight were not associated with any sites of injury (table 4.28).

**Table 4.28: Summary statistics for age, weight and height by sites injured**

| | | Age | | Height | | Weight | |
|---|---|---|---|---|---|---|---|
| | | Mean | Std dev | Mean | Std dev | Mean | Std dev |
| Sites injured | Wrist | 36 | 12 | 1.71 | .09 | 67 | 12 |
| | Elbow | 33 | 11 | 1.67 | .08 | 63 | 12 |
| | Shoulder | 37 | 13 | 1.69 | .10 | 65 | 14 |
| | Knee | 32 | 10 | 1.70 | .07 | 65 | 12 |
| | Chest | 36 | 14 | 1.71 | .10 | 66 | 8 |
| | Genital | 29 | 10 | 1.75 | .05 | 71 | 9 |
| | Foot | 39 | 13 | 1.70 | .10 | 66 | 15 |
| | Neck | 36 | 12 | 1.68 | .07 | 63 | 10 |
| | Mid back | 33 | 11 | 1.67 | .09 | 65 | 10 |
| | Low back | 37 | 13 | 1.70 | .09 | 65 | 11 |
| | Hip | 36 | 14 | 1.72 | .11 | 67 | 13 |

### 4.5.5.2. Gender by sites injured due to riding

Males were significantly more likely to get genital injuries than females as table 4.29 shows (*p=0.024*).

**Table 4.29: Gender by sites injured due to riding**

| | | | Gender | | p value |
|---|---|---|---|---|---|
| | | | Male | Female | |
| Sites injured due to riding | Wrist | Count | 9 | 43 | 0.645 |
| | | % | 17.3% | 82.7% | |
| | Elbow | Count | 2 | 11 | 0.702 |
| | | % | 15.4% | 84.6% | |
| | Shoulder | Count | 12 | 49 | 0.925 |
| | | % | 19.7% | 80.3% | |
| | Head | Count | 12 | 58 | 0.533 |
| | | % | 17.1% | 82.9% | |
| | Knee | Count | 4 | 24 | 0.453 |
| | | % | 14.3% | 85.7% | |
| | Chest | Count | 3 | 13 | 0.943 |
| | | % | 18.8% | 81.3% | |
| | Genital | Count | 3 | 1 | 0.024* |
| | | % | 75.0% | 25.0% | |
| | Foot | Count | 10 | 35 | 0.583 |
| | | % | 22.2% | 77.8% | |
| | Neck | Count | 5 | 41 | 0.087 |
| | | % | 10.9% | 89.1% | |
| | Mid back | Count | 4 | 22 | 0.572 |

| | | | | | |
|---|---|---|---|---|---|
| | | % | 15.4% | 84.6% | |
| | Low back | Count | 8 | 58 | 0.057 |
| | | % | 12.1% | 87.9% | |
| | Hip | Count | 3 | 13 | 0.943 |
| | | % | 18.8% | 81.3% | |
| Total | | Count | 25 | 125 | 150 |

### 4.5.5.3. Dominant hand by sites injured due to riding

Mid back injuries were associated with dominant hand (table 4.30). A significantly higher proportion of mid back injuries occurred in left handed individuals (*p=0.012*).

**Table 4.30: Dominant hand by sites injured due to riding**

| | | | Dominant hand | | p value |
|---|---|---|---|---|---|
| | | | Right | Left | |
| Sites injured due to riding | Wrist | Count | 49 | 4 | 1.000 |
| | | % | 92.5% | 7.5% | |
| | Elbow | Count | 13 | 0 | 0.606 |
| | | % | 100.0% | .0% | |
| | Shoulder | Count | 55 | 7 | 0.332 |
| | | % | 88.7% | 11.3% | |
| | Head | Count | 64 | 6 | 0.985 |
| | | % | 91.4% | 8.6% | |
| | Knee | Count | 25 | 3 | 0.711 |
| | | % | 89.3% | 10.7% | |
| | Chest | Count | 15 | 1 | 1.000 |
| | | % | 93.8% | 6.3% | |
| | Genital | Count | 4 | 0 | 0.537 |
| | | % | 100.0% | .0% | |
| | Foot | Count | 39 | 7 | 0.070 |
| | | % | 84.8% | 15.2% | |
| | Neck | Count | 40 | 6 | 0.224 |
| | | % | 87.0% | 13.0% | |
| | Mid back | Count | 20 | 6 | 0.012* |

| | | | | | |
|---|---|---|---|---|---|
| | | % | 76.9% | 23.1% | |
| | Low back | Count | 62 | 4 | 0.365 |
| | | % | 93.9% | 6.1% | |
| | Hip | Count | 15 | 1 | 1.000 |
| | | % | 93.8% | 6.3% | |
| Total | | Count | 136 | 15 | 151 |

#### 4.5.5.4. **Rider Information** (Part B)

#### 4.5.5.4.1. Number of years riding by site injured due to riding

Table 4.31 shows that foot injuries were more likely in people who had been riding for longer (>21 years), *(p=0.016).*

**Table 4.31: Years riding by sites injured due to riding**

| | | | Years riding | | | | | p value |
|---|---|---|---|---|---|---|---|---|
| | | | 0-5 years | 6-10 years | 11-15 years | 16-20 years | >21 years | |
| Sites injured due to riding | Wrist | Count | 3 | 2 | 14 | 10 | 24 | 0.130 |
| | | % | 5.7% | 3.8% | 26.4% | 18.9% | 45.3% | |
| | Elbow | Count | 1 | 0 | 4 | 4 | 4 | 0.416 |
| | | % | 7.7% | .0% | 30.8% | 30.8% | 30.8% | |
| | Shoulder | Count | 2 | 3 | 12 | 16 | 29 | 0.141 |
| | | % | 3.2% | 4.8% | 19.4% | 25.8% | 46.8% | |
| | Head | Count | 6 | 3 | 13 | 13 | 35 | 0.113 |
| | | % | 8.6% | 4.3% | 18.6% | 18.6% | 50.0% | |
| | Knee | Count | 1 | 2 | 4 | 10 | 11 | 0.306 |
| | | % | 3.6% | 7.1% | 14.3% | 35.7% | 39.3% | |
| | Chest | Count | 3 | 0 | 3 | 4 | 6 | 0.205 |
| | | % | 18.8% | .0% | 18.8% | 25.0% | 37.5% | |
| | Genital | Count | 0 | 1 | 1 | 1 | 1 | 0.847 |
| | | % | .0% | 25.0% | 25.0% | 25.0% | 25.0% | |
| | Foot | Count | 3 | 2 | 7 | 5 | 29 | 0.016* |
| | | % | 6.5% | 4.3% | 15.2% | 10.9% | 63.0% | |
| | Neck | Count | 3 | 1 | 11 | 9 | 22 | 0.183 |
| | | % | 6.5% | 2.2% | 23.9% | 19.6% | 47.8% | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mid back | Count | 3 | 2 | 3 | 7 | 11 | 0.626 |
| | | % | 11.5% | 7.7% | 11.5% | 26.9% | 42.3% | |
| | Low back | Count | 4 | 7 | 9 | 12 | 34 | 0.447 |
| | | % | 6.1% | 10.6% | 13.6% | 18.2% | 51.5% | |
| | Hip | Count | 1 | 2 | 3 | 3 | 7 | 0.999 |
| | | % | 6.3% | 12.5% | 18.8% | 18.8% | 43.8% | |
| Total | | Count | 10 | 12 | 28 | 31 | 70 | 151 |

### 4.5.5.4.2. Number of years competing by sites injured due to riding

Foot injuries were more likely in those who had been competing for more then 21 years (*p=0.043*) as is illustrated in table 4.32.

**Table 4.32: Years competing by sites injured due to riding**

| | | | Years competing | | | | | *p* value |
|---|---|---|---|---|---|---|---|---|
| | | | 0-5 years | 6-10 years | 11-15 years | 16-20 years | >21 years | |
| Sites injured due to riding | Wrist | Count | 7 | 13 | 11 | 6 | 16 | 0.614 |
| | | % | 13.2% | 24.5% | 20.8% | 11.3% | 30.2% | |
| | Elbow | Count | 3 | 3 | 2 | 3 | 2 | 0.674 |
| | | % | 23.1% | 23.1% | 15.4% | 23.1% | 15.4% | |
| | Shoulder | Count | 8 | 15 | 12 | 4 | 23 | 0.067 |
| | | % | 12.9% | 24.2% | 19.4% | 6.5% | 37.1% | |
| | Head | Count | 10 | 14 | 16 | 9 | 21 | 0.442 |
| | | % | 14.3% | 20.0% | 22.9% | 12.9% | 30.0% | |
| | Knee | Count | 6 | 6 | 8 | 3 | 5 | 0.583 |
| | | % | 21.4% | 21.4% | 28.6% | 10.7% | 17.9% | |
| | Chest | Count | 3 | 1 | 5 | 1 | 6 | 0.335 |
| | | % | 18.8% | 6.3% | 31.3% | 6.3% | 37.5% | |
| | Genital | Count | 1 | 1 | 1 | 0 | 1 | 0.958 |
| | | % | 25.0% | 25.0% | 25.0% | .0% | 25.0% | |
| | Foot | Count | 6 | 6 | 9 | 5 | 20 | 0.043* |
| | | % | 13.0% | 13.0% | 19.6% | 10.9% | 43.5% | |
| | Neck | Count | 8 | 11 | 9 | 3 | 15 | 0.620 |
| | | % | 17.4% | 23.9% | 19.6% | 6.5% | 32.6% | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mid back | Count | 5 | 7 | 6 | 3 | 5 | 0.834 |
| | | % | 19.2% | 26.9% | 23.1% | 11.5% | 19.2% | |
| | Low back | Count | 11 | 17 | 11 | 7 | 20 | 0.673 |
| | | % | 16.7% | 25.8% | 16.7% | 10.6% | 30.3% | |
| | Hip | Count | 4 | 4 | 1 | 3 | 4 | 0.652 |
| | | % | 25.0% | 25.0% | 6.3% | 18.8% | 25.0% | |
| Total | | Count | 25 | 32 | 29 | 19 | 46 | 151 |

#### 4.5.5.4.3. Hours riding per week by site injured due to riding

The number of hours of riding per week was not associated with any site of injury.

#### 5.5.4.4. Minutes per training session by sites injured due to riding

The amount of minutes training per session was not associated with any site of injury.

#### 4.5.5.4.5. Number of horses ridden by sites injured due to riding

The number of horses ridden was not associated with any site of injury.

#### 4.5.5.4.6. Number of hours of instruction by sites injured due to riding

The number of hours of instruction received per month was not associated with any site of injury.

#### 4.5.5.4.7. Length of time of instruction by sites injured due to riding

The length of time of instruction received was not associated with any site of injury.

### 4.5.5.4.8. Other activities by type of riding injury

Muscle strains due to riding were significantly less common in those who do gym presently (*p=0.003*) and in those who play golf presently (*p=0.007*). People who were doing no other exercise presently were significantly more likely to have fractures due to riding (*p=0.019*) (table 4.33 and 4.34).

**Table 4.33: Type of present activity by type of riding injury**

| | | | Activities presently(a) | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | Gym presently | Running presently | Cycling presently | Golf presently | None presently | |
| Types of injuries due to riding | Concussion due to riding | Count | 17 | 12 | 5 | 1 | 35 | 59 |
| | | % | 28.8% | 20.3% | 8.5% | 1.7% | 59.3% | |
| | Fractures due to riding | Count | 20 | 13 | 5 | 3 | 43 | 67 |
| | | % | 29.9% | 19.4% | 7.5% | 4.5% | 64.2% | |
| | Muscle strains due to riding | Count | 22 | 16 | 8 | 0 | 46 | 79 |
| | | % | 27.8% | 20.3% | 10.1% | .0% | 58.2% | |
| | Tendons due to riding | Count | 13 | 10 | 2 | 0 | 29 | 47 |
| | | % | 27.7% | 21.3% | 4.3% | .0% | 61.7% | |
| | None due to riding | Count | 7 | 2 | 0 | 1 | 7 | 15 |
| | | % | 46.7% | 13.3% | .0% | 6.7% | 46.7% | |
| Total | | Count | 42 | 25 | 11 | 5 | 67 | 125 |

Those who cycled previously were significantly more likely to have concussion injuries due to riding (*p=0.049*). No other previous activities were associated with types of riding injuries.

**Table 4.34: Type of previous activity by type of riding injury**

| | | | Activities previously(a) | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | Gym previously | Running previously | Cycling previously | Golf previously | None previously | |
| Types of injuries due to riding | Concussion due to riding | Count | 15 | 6 | 6 | 0 | 17 | 39 |
| | | % | 38.5% | 15.4% | 15.4% | .0% | 43.6% | |
| | Fractures due to riding | Count | 16 | 6 | 5 | 0 | 19 | 41 |
| | | % | 39.0% | 14.6% | 12.2% | .0% | 46.3% | |
| | Muscle strains due to riding | Count | 22 | 8 | 5 | 2 | 22 | 53 |
| | | % | 41.5% | 15.1% | 9.4% | 3.8% | 41.5% | |
| | Tendons due to riding | Count | 13 | 5 | 2 | 1 | 11 | 28 |
| | | % | 46.4% | 17.9% | 7.1% | 3.6% | 39.3% | |
| | None due to riding | Count | 2 | 0 | 0 | 0 | 4 | 6 |
| | | % | 33.3% | .0% | .0% | .0% | 66.7% | |
| Total | | Count | 28 | 11 | 7 | 2 | 33 | 71 |

### 4.5.5.4.9. Medical conditions

Although musculoskeletal problems were the most common condition at 12.1%, the majority (71.7%) of the participants had no known medical conditions (table 4.35).

**Table 4.35: Medical conditions of participants**

| | | Responses | | Percent of Cases |
|---|---|---|---|---|
| | | N | Percent | N |
| Medical conditions(a) | Anaemia | 9 | 4.8% | 5.2% |
| | Osteoporosis | 1 | .5% | .6% |
| | High blood pressure | 4 | 2.1% | 2.3% |
| | High cholesterol | 5 | 2.7% | 2.9% |
| | Asthma | 9 | 4.8% | 5.2% |
| | Respiratory problems | 4 | 2.1% | 2.3% |
| | Musculoskeletal problem | 21 | 11.2% | 12.1% |
| | Arthritis | 11 | 5.9% | 6.4% |
| | None of the above | 124 | 66.0% | 71.7% |
| Total | | 188 | 100.0% | 108.7% |

High cholesterol and musculoskeletal problems were significantly associated with concussions due to riding (*p=0.019* and *0.043 respectively*), people with high cholesterol and musculoskeletal problems were more likely than those without to suffer from concussions. Having no medical problems was significantly protective for concussions (*p<0.001*) and muscle strains (*p=0.010*) and tendon problems (*p=0.011*), as well as being positively associated with not having any riding injuries (*p=0.024*).

**Table 4.36: Medical conditions by types of injuries due to riding**

| | | | Types of injuries due to riding | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | Concussion due to riding | Fractures due to riding | Muscle strains due to riding | Tendons due to riding | None due to riding | |
| Medical conditions(a) | Anaemia | Count | 6 | 6 | 8 | 5 | 1 | 9 |
| | | % | 66.7% | 66.7% | 88.9% | 55.6% | 11.1% | |
| | Osteoporosis | Count | 0 | 1 | 0 | 0 | 0 | 1 |
| | | % | .0% | 100.0% | .0% | .0% | .0% | |
| | High blood pressure | Count | 2 | 3 | 2 | 2 | 0 | 4 |
| | | % | 50.0% | 75.0% | 50.0% | 50.0% | .0% | |
| | High cholesterol | Count | 5 | 4 | 4 | 2 | 0 | 5 |
| | | % | 100.0% | 80.0% | 80.0% | 40.0% | .0% | |
| | Asthma | Count | 6 | 5 | 8 | 5 | 0 | 9 |
| | | % | 66.7% | 55.6% | 88.9% | 55.6% | .0% | |
| | Respiratory problems | Count | 3 | 2 | 3 | 1 | 0 | 4 |
| | | % | 75.0% | 50.0% | 75.0% | 25.0% | .0% | |
| | Musculoskeletal problem | Count | 14 | 13 | 15 | 11 | 0 | 21 |
| | | % | 66.7% | 61.9% | 71.4% | 52.4% | .0% | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Arthritis | Count | 4 | 6 | 8 | 6 | 0 | 10 |
| | | % | 40.0% | 60.0% | 80.0% | 60.0% | .0% | |
| | None of the above | Count | 46 | 59 | 70 | 37 | 16 | 113 |
| | | % | 40.7% | 52.2% | 61.9% | 32.7% | 14.2% | |
| Total | | Count | 79 | 88 | 108 | 62 | 17 | 161 |

### *4.5.6. Objective 5: To determine if non riding related injuries are associated with riding related injuries in the same sites.*

#### 4.5.6.1. Association between riding and non riding related injuries

There was no significant association between riding and non riding related wrist injuries (*p=0.175*).

There was a significant association between riding and non riding related elbow injuries (*p=0.045*). Those who had a riding related elbow injury were more likely to have a non riding related one too, as is shown in table 4.37.

**Table 4.37: Association between riding and non riding related elbow injuries**

| | | | Elbow injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Elbow injury riding related | No | Count | 160 | 3 | 163 |
| | | % | 98.2% | 1.8% | 100.0% |
| | Yes | Count | 11 | 2 | 13 |
| | | % | 84.6% | 15.4% | 100.0% |
| Total | | Count | 171 | 5 | 176 |
| | | % | 97.2% | 2.8% | 100.0% |

*p*=0.045

There was no significant association between riding and non riding related shoulder injuries (*p=0.241*).

There was no significant association between riding and non riding related head injuries (*p=0.192*).

There was no significant association between riding and non riding related knee injuries (*p=1.000*).

There were no non riding related genital injuries.

There was no significant association between riding and non riding related chest injuries (*p=0.066*).

There was no significant association between riding and non riding related foot injuries (*p=0.315*).

Table 4.38 depicts a significant association between riding and non riding related neck injuries (*p<0.001*). Non riding related neck injuries were more common in those who had riding related neck injuries.

**Table 4.38: Association between riding and non riding related neck injuries**

| | | | Neck injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Neck injury riding related | No | Count | 128 | 2 | 130 |
| | | % | 98.5% | 1.5% | 100.0% |
| | Yes | Count | 37 | 9 | 46 |
| | | % | 80.4% | 19.6% | 100.0% |
| Total | | Count | 165 | 11 | 176 |
| | | % | 93.8% | 6.3% | 100.0% |

p<0.001

There was no significant association between riding and non riding related mid and low back injuries (*p=0.274* and *p=0.613* respectively).

There was no significant association between riding and non riding related hip injuries (*p=1.000*).

# Chapter 5

# Discussion of Results

## 5.1. Introduction

In this chapter we discuss the results of the statistical analysis in Chapter 4.

## 5.2. Outline of the Objectives of the Study

The **first objective** was to describe the profile of injuries – type, locations and mechanisms.

The **second objective** was to determine the association between the type of equestrian activity and location and mechanism of injury.

The **third objective** was to determine the association between use and type of equipment and location of injury.

The **fourth objective** was to determine anthropometric and history variables associated with location of horse riding injuries.

The **fifth objective** was to determine if non riding related injuries are associated with riding related injuries in the same sites.

## 5.3. Results and comparison of results for this study with other studies

### 5.3.1. Response Rates

Sutherlands (2008) profile of musculoskeletal injuries in competitive swimmers in the Greater Durban Area had 100 out of the 400 swimmers

return their questionnaires, thus yielding a response rate of 25%. Similarly the response rate in this study compares favourably with similar studies in other sporting codes (Adamson, 2006). The sample for this research consisted of the entire population of adult competitive horse riders registered with KZN horse society who compete in dressage, show jumping and or eventing which was four hundred and ninety eight (N= 498) (Smith, 2009). The response rate for this study was 36.34%, and there were 176 completed questionnaires (n=176).

## 5.3.2. Objective One

To describe the profile of injuries – type, locations and mechanisms.

## 5.3.2.1. Demographics

#### 5.3.2.1.1. Age

The inclusion criterion for this study, in terms of age, was for participants to be over 18 years of age. The ages in the study ranged from 18 to 76 years and the average age was 36.3 years (Std dev 12.5 years). This is similar to Carrillo et al. (2007) whose retrospective review of 23 trauma centres in South Florida, USA which found the mean age of riding injuries to be 36, and Abu-Zidan and Rao (2003) retrospective study which found the mean age of horse related injuries to be 34.1.Both Alexis, Newton and Nielson (2005) and Moss, Wan and Whitlock (2002) found a wide age range of horse related injuries reported at hospitals of 1 to 65 and 2 to 77 years respectively. Therefore the range and the average were consistent with the literature, even though in this study RSIs and acute injuries were looked at compared to the previous research above where acute injuries where studied.

#### 5.3.2.1.2. Ethnicity

The vast majority of participants were White (99.4%). This could be due to the expensive nature of the sport and given South Africa's political history, previously only whites had access to compete in this sport. This makes it

impossible to draw any strong conclusions regarding the association between ethnicity and horse riding injuries because of the low numbers of non-white participants. Comparison to international literature was limited as statistical comparisons were not possible.

#### 5.3.2.1.3. Gender

In the sample only 19% were males. Previous research by Carrillo et al. (2007), Moss, Wan and Whitlock (2002), Sorli (2000) and the CHIRP database (1996) found a female predominance of between 62% and 84.6% in hospital admissions of horse riding related injuries. This research could be a reflection of the preponderance of female horse riders or that females are more likely to seek medical care as the studies were based on injuries reported at a medical centre not a profile of horse riding injuries.

#### 5.3.2.1.4. Occupation

There were a wide range of different occupations, with students being the most common at 14.2% followed by self employed at 10.2%. This is consistent with Abu-Zidan and Rao (2003) who found that 66% of injuries occurred in people who dealt with horses as a hobby, and Carrillo et al. (2007) who found that 15% of those injured, worked professionally in the horse world.

#### 5.3.2.1.5. Hand dominance, weight and height

In this study 91.5% were right hand dominant. Their mean weight was 65.7kgs and mean height was 1.7 metres. Comparison to international literature was limited as statistical comparisons were not possible.

#### 5.3.2.1.6. Medical Aid

In this study 56% of the participants had full medical aid, while 10.9% had none; the rest had a hospital plan with or without savings. Those with medical aid are thought to be more likely to seek medical treatment following an injury due to the costs involved. It is unknown if this high percentage of those with medical aid is due to the risks involved with horse riding or due to other

reasons, i.e. medical aid covered by work or students who are still on their parents medical aid.

## 5.3.2.2. History of Injury

### 5.3.2.2.1. Type of injury

Injuries due to riding were very prevalent (90.3%). Muscle strains were the most common type of injury (62.5%), while fractures were also common (50.6%). The overall prevalence of injury was 90.3% as only 9.7% had not had an injury due to riding. This is consistent with hospital admission research by Sorli (2000) where 54.2% had suffered a fracture, while 9% had been concussed and Abu-Zidan and Rao (2003) who found that underlying fractures were very common. This is inconsistent with the CHIRP database (1996) summary of 1179 records that found the majority of horse related injuries reported to trauma centres were abrasions, bruises or inflammation.

### 5.3.2.2.2. Locations of injuries

In 151 of the 176 (85.8%) participants there were 446 horse riding related sites of injury. The head was the most commonly injured site; with 46.4% of participants reporting any head injury, this was followed by lower back and the shoulder. This is supported by Thomas et al. (2006) and Sorli (2000) who both found the head most commonly injured. These findings are similar to Silver (2002) who found that head injuries outnumbered spinal by 5:1, which would indicate that the force required to cause head injury is rather less than that required to fracture the spine Sorli (2002).

However these results are dissimilar to research by Carrillo et al. (2007), Ball, et al. (2007), Abu-Zidan and Rao (2003), Moss, Wan and Whitlock (2002) and CHIRP database (1996), who found that the majority of injuries presenting at medical centres were the upper extremities. A possible explanation for their findings is that the arm is usually extended when a rider falls.

The low back was the site most likely to be injured many times, as 14.2% of low back injuries happened greater than or equal to five times. Similarly Silver

(2002) found there were more lumbar and thoracic than cervical injuries. This could suggest that the head and neck are more likely to suffer an acute traumatic injury while the low back suffers more from a RSI.

#### 5.3.2.2.3. Mechanisms of injuries

Forceful falls were ranked as the most severe type of injury mechanism followed by rider and horse fall. This is supported by the results obtained in the retrospective studies by Ball et al. (2007), Abu-Zidan and Rao (2003) and Moss, Wan and Whitlock (2002).

#### 5.3.2.2.4. Activity

Most injuries occurred whilst jumping (63.8%) which is similar to previous research by Silver (2002) who found jumping to be the most dangerous part of this sport and Paix (1999) who concluded that all the injuries in eventing occurred due to jumping.

#### 5.3.2.2.5. Treatment received

One hundred and fifty (85.2%) of the respondents had been treated for their riding injuries. The most common type of treatment was physiotherapy (58.7%) followed by chiropractic (54.7%) of cases. This shows the high percentage of horse riders needing musculoskeletal treatment and concurs with earlier findings on the most common type of injury, muscle strains (Section 4.5.2.2.1). These findings also re-in force the high rate of RSIs found in this study. The CHIRP database (1996) shows that 48.6% of riding related injuries required only advice or minor treatment and 36.5% required a medical follow up, unlike previous research by Carrillo et al. (2007), Ball et al. (2007), Alexis, Newton and Nielson (2005) and Abu-Zidan and Rao (2003) which highlights the high percentage of horse riders requiring medical treatment and hospital admissions due to traumatic injuries.

Interestingly, 31% of participants had missed more than eight competitions due to riding injuries and over half the sample had competed whilst injured (54.5%).

There was a high prevalence of use of pain medication in order to continue riding, 10% used it daily and 41.7% used it occasionally. In total only 40% did not use pain medication to continue riding whilst injured. It is therefore assumed that the use of pain medication in order to continue riding would indicate an ongoing problem or injury. This is consistent with Ball et al. (2007) findings that 87% resumed riding after a horse riding accident and 55% still had ongoing physical difficulties. This highlights that injuries are very common and that horse riders need education on injuries and the risks of continuing to ride whilst injured.

## 5.3.3. Objective Two

To determine the association between the type of equestrian activity and location and mechanism of injury.

### 5.3.3.1. Eventing

Paix (1999) found that the cross country phase of eventing to be over 70 times as dangerous as horse riding in general, with an overall injury rate of one per 14 hours of cross country riding. People who took part in eventing previously were more likely than those who did not take part in eventing previously to have had a wrist injury ($p=0.006$). Participating in eventing previously was also significantly associated with neck injuries ($p<0.001$). There was a significant association between eventing presently and the severity grading for forceful fall off the horse ($p=0.018$). This is consistent with Paix (1999) findings from attending 10% of all events in South Australia over an eight year period, where head and neck injuries predominated and all the injures occurred as a result of the rider falling from the horse.

### 5.3.3.2. Dressage

Previous dressage was associated with wrist ($p=0.025$), head ($p=0.019$) and knee ($p=0.005$) injuries. This is in contrast to Silver (2002) whose findings found that from the dressage position, the rider is more likely to fall onto and injure the buttocks. Those who took part in dressage presently (in this study)

had a significantly lower severity grading for forceful falls off a horse than those who do not take part in dressage presently (*p=0.002*). This emphasizes that dressage is the safer activity when compared to eventing and show jumping.

#### 5.3.3.3. Show jumping

Show jumping presently was negatively associated with neck injuries (*p=0.019*) and low back injuries (*p=0.007*). This is in contrast to Silver (2002) who found that the jumping position was more likely to cause a cervical injury accompanied by inevitable head injury. Previous show jumping was associated positively with hip injuries (*p=0.003*). Show jumping presently (in this study) was coincidently associated with higher severity score for falling off the horse onto own two feet (*p=0.019*). There was a significant association between taking part in show jumping previously and injuring the tendons (*p=0.021*).

Those who jumped 70cm (the lower grade) in show jumping had the highest risk of injury. Previous research differs in that Silver (2002) found that the highest injury rates were among riders competing at highest levels and Paix (1999) who stated that increasing injury rates appeared as difficulty of the competition increased. This is further supported by Alexis, Newton and Nielson (2005) who found that, 10% of injuries occurred in novice riders and 35% in experienced horse riders (the remaining 55% of injuries occurred in beginner or inexperienced riders, which was not covered in this study of horse riders registered with the KZNHS, as beginner or inexperienced horse riders would not be competent enough to compete).

There were no significant associations between site of injury and activity during most severe fall. Most of the severe falls occurred during jumping, (Section 5.3.2.2.4) but it was not specified if it was during show jumping or eventing. Therefore it is recommended that future studies should differentiate between show jumping and eventing jumping.

## 5.3.4. Objective Three

To determine the association between use and type of equipment and location of injury.

### 5.3.4.1. Horse breed, size and rating and injury site

Horse breed and difficulty of the horse was not associated with the site of injury, whereas horse size, 15.3 hand to 16.2 hand was associated with a higher percentage of chest injuries (*p=0.010*). This is dissimilar to Carrillo et al. (2007) who found that strength, size, speed and unpredictable behaviour of the horse can cause significant injuries and Williams and Ashby (1995) who found that injury occurrence is inversely proportional to horse's age, size and character. Thus older smaller horses have less risk. The study by Ball et al. (2007) found that the main cause of injury was as a result of the horse being "spooked" or simply not being trained enough for the demands the rider was placing on it. It is suggested that future research be directed at the relationship between an injury and the horse ridden at the time of the injury, so that more information on the horses effect on the injury can be taken into consideration.

### 5.3.4.2. Saddle type and site of injury

The only genital injury occurred with a jumping saddle (*p=0.022*), but due to only one genital injury being reported this is not significant. Comparison to international literature was limited and as a result statistical comparisons were not possible.

### 5.3.4.3. Stirrup type and site of injury

Stirrup type was significantly associated with foot injuries *(p=0.018).* Those with foot injuries were more likely to use "other" stirrup types, which included nuangle, jointed, plastic and offset stirrup types. These stirrup types are either lighter, more flexible or angled for better foot placement. They also could have been used subsequent to a foot injury for protective rather than preventative purposes. Therefore future studies would need to investigate if the stirrup type

was changed after an injury for protection or before for prevention of a foot injury.

#### 5.3.4.4. Bit type and site of injury

Type of bit was significantly associated with wrist injuries (*p=0.047*). Pelham and other bit types, being Waterford and gag were more likely in those with wrist injuries. These bits are more severe and used when the horse pulls on the riders hands, thereby putting extra strain on the riders wrists. These could also have been used for protective rather than preventative purposes. Therefore I would suggest that future research look at the association between bit use and injury occurrence.

#### 5.3.4.5. Rein type and artificial aid and site of injury

Shoulder injuries were significantly associated with the use of synthetic reins and the artificial aids, running martingale type *(p=0.11 and p=0.032 respectively)*. There is no known reasonable explanation for this. It is suggested that future research look at this association.

#### 5.3.4.6. Use of facilities and site of injury

As most of the severe falls occurred during jumping, (Section 5.3.2.2.4) it was surprising that the use of show jumps and cross country jumps was not associated with injury at any site. The use of a dressage arena was associated with injuries (foot injuries, *p=0.025* and neck injuries, *p=0.031)*, but due to it being a much used facility and no known reasonable explanation for it, the results are thought to be coincidental and not due to the facility. It is recommended that future research look at factors that influence this relationship.

#### 5.3.4.7. Protective equipment

The CHIRP database (1996) indicated that 21.8% of those injured used protective equipment, but did not specify the type of equipment. Abu-Zidan and Rao (2003) advised that safety devices such as special helmets, hand gloves and especially shoes as well as education should be used to reduce

and prevent injuries. Ball et al. (2007) found that the minority of riders injured reported the use of safety equipment. This study looked at the different protective equipment and is discussed below.

#### 5.3.4.7.1. Helmet use and site of injury

Helmet use was negatively associated with head injuries. Showing that helmet use is effective in preventing head injuries. This could be due to improved helmet protective design, compulsory wearing of helmets that meet safety standards at competitions and the majority of riders wearing helmets when jumping, which is where the most severe injuries occur (Section 5.3.2.2.4). Moss, Wan and Whitlock (2002) review of findings between 1971 and 1991 found that helmet use is assisting in reducing the incidence of skull fractures and severity of the injury. Fantus and Fildes (2007) found a fourfold greater mortality for the non-helmeted rider and Abu-Zidan and Rao (2003) comparatively found that those with a helmet had significantly less incidence of intracranial injuries than those who did not.

#### 5.3.4.7.2. Glove use and site of injury

Use of gloves for jumping and hacking was significantly associated with wrist/hand injuries *(p=0.008 and p=0.003 respectively)*. It could have been that gloves were used subsequent to a hand injury for protective purposes and not preventative purposes. Therefore it is suggested that future research look at the association between the use of gloves and hand/wrist injury.

#### 5.3.4.7.3. Back brace use and site of injury

Use of a back brace was positively associated with low back injuries (*p=0.028* for use whilst doing flatwork, *p=0.012* for jumping and *p=0.031* for competing). Again this could be used for protecting an existing back injury. Therefore it is suggested that future research look at the association between the use of a back brace and an injury to the back.

#### 5.3.4.7.4. Body protector use and site of injury

Use of the body protector for competing was significantly associated with having wrist injuries (*p=0.023*). Body protectors are compulsory for the cross

country phase of eventing. This corresponds with the findings in Section 5.3.3.1. where people who took part in eventing previously were more likely to have had a wrist injury. Paix (1999) reported that all eventing injuries in his study were as a result of the rider falling from the horse, which could explain the wrist injuries as the rider is likely to fall on an outstretched hand/wrist.

## 5.3.5. Objective Four

To determine anthropometric and history variables associated with location of horse riding injuries.

### 5.3.5.1. Age, weight and height by sites injured

Those who had knee injuries were significantly younger than those without knee injuries. Those with foot injuries were significantly older than those without (*p=0.048*). Height and weight were not associated with any sites of injury. This is dissimilar to Pilato, Shifrin and Bixby-Hammet (2007) who reported that 60% of over 30 year olds and 51% of under 29s reported shoulder pain, 80% over 30s and 73% of under 29s had some degree of back pain and of that there is a three to five times increase over the general public of ongoing back pain. In the over 30s, 70% reported neck pain, with 25% ongoing pain. Pilato, Shifrin and Bixby-Hammet (2007) also found younger riders had more pain, which was possibly due to the older riders having more experience. In contrast Abu-Zidan and Rao (2003) found that age has no effect on injury severity.

### 5.3.5.2. Gender by sites injured due to riding

Due to there being more females competing than males, they do have more injuries (Section 5.3.2.2.1). This could also be due to more females having participated in the study due to them having more injuries. Males were significantly more likely to get genital injuries than females (*p=0.024*). This is in contrast to Abu-Zidan and Rao (2003) who stated that sex had no effect on injury severity.

#### 5.3.5.3. Dominant hand by sites injured due to riding

Coincidently, a significantly higher proportion of mid back injuries occurred in left handed individuals (*p=0.012*). There is no known reason for this as all the equipment is ambidextrous and there are no techniques which favour right handed individuals. The horse is always mounted from its lefthand side, which involves the rider pushing off the ground or mounting block with the right leg. This study did not look at factors involved in mounting the horse and if it could influence receiving an injury. Therefore it is suggested that future research look at factors that could influence this relationship.

#### 5.3.5.4. Number of years riding and competing by site injured due to riding

Foot injuries were more likely in people who had been riding and competing for longer (>21 years), *(p=0.016* and *p=0.043 respectively).*

#### 5.3.5.5. Riding history and number of horses ridden by site injured due to riding

The amount of time spent riding, per session, per week, the amount of instruction received and the number of horses ridden was not associated with any site of injury. This is in opposition to Silver (2002) who indicated that a rider can expect a serious accident once in every 350 hours and 1 injury for 1 hour of cross country eventing and Ball et al. (2007) who found that hospital admission rate is .49 injuries/1000 hours of horse riding compared to motorcycle ridings where .14 injuries are reported per 1000 hours.

#### 5.3.5.6. Other activities by type of riding injury

Muscle strains due to riding were significantly less common in those who do gym presently and in those who played golf presently (*p=0.003* and *p=0.007* respectively). Horse riders that were doing no other exercise presently were significantly more likely to have fractures due to riding. Horse riders with high cholesterol and musculoskeletal problems were more likely than those without to suffer from concussions due to riding (*p=0.019* and *0.043 respectively*). This association should be further researched to see if they were more likely

to suffer a concussion as a result of high cholesterol and musculoskeletal problems and how these conditions possibly influenced receiving the concussion. Having no medical problems was significantly protective for concussions (*p<0.001*), muscle strains (*p=0.010*) and tendon problems (*p=0.011*), as well as being positively associated with not having any riding injuries (*p=0.024*). This emphasizes the importance of health and fitness in injury prevention.

This is further emphasised by Carlson et al. (2006) whose research found that moderate physical activity and cardiorespiratory fitness may impart some protection against injuries. The benefits gained from participating in physical activity may help in a decreasing an adult's risk for sustaining a musculoskeletal injury related to any activity. People who are physically active may also be able to respond differently to situation than their inactive peers, therefore possibly preventing an injury. However they also found that regular physical activity, especially vigorous exercise and sport, is associated with an increased incidence of activity related injury (Carlson et al. 2006).

## 5.3.6. Objective Five

To determine if non riding related injuries are associated with riding related injuries in the same sites.

Surprisingly, besides for a significant association between riding and non-riding related elbow and neck injuries (*p=0.045 and p<0.001 respectively)*, there were no other significant associations between riding and non-riding related injuries. This is in opposition to research by Carlson et al. (2006) where a direct association between leisure-time physical activity level and incidence of injury episodes related to sports and leisure-time activities was observed. Injury incidence during certain activities, such as sports and recreation, may differ by physical activity level because of differences in the amount of exposure to these activities (Carlson et al. 2006).

As Carlson et al. (2006) study has shown, there are differences in people partaking in physical activities compared to those not and therefore getting injured. This is supported by Soprano and Fuchs (2007) who reported that there has been an overall increase in injuries in young athletes over the past 20 to 30 years. This is thought to be due to many factors including among other factors, participation on multiple teams in different sports. This is further contrasted by Bowerman, Smith, Carlson and King (2006) who investigated knee joint laxity and muscular strength to determine if any differences existed between athletes and non-athletes. The results of this study revealed that non-athletes displayed greater laxity than athletes. Different sports have different risks factors for injuries and there is little knowledge on whether these differences influence each other.

## 5.4. Summary of Findings

There were 176 respondents to the study. The ages in the study ranged from 18 to 76 years and the average age was 36.3 years. The vast majority of participants were White (99.4%) females (81%). There was a wide range of different occupations, with student being the most common at 14.2%. In the study 91.5% were right hand dominant and 56% had full medical aid, while 10.9% had none.

Injuries due to riding were very prevalent. Muscle strains were the most common type of injury (62.5%), while fractures were also common (50.6%). The overall prevalence of injury was 90.3%. Four hundred and forty six riding related sites of injury were reported as ever having been injured in 151 of the 176 (85.8%) participants. The head was the most commonly injured site, with 46.4% of participants reporting a head injury, followed by low back with 43.7%. The low back was the site most likely to be injured many times, as 14.2% of low back injuries happened greater than or equal to 5 times. Forceful falls were ranked as the most severe type of injury mechanism. Most injuries occurred whilst jumping (63.8%). In the study 150 (85.2%) of respondents had received treatment for their riding injuries. The most

common type of treatment was physiotherapy (58.7%) followed by chiropractic (54.7%) of cases.

Interestingly, thirty-one percent of participants had missed more than eight competitions due to riding injuries and over half the sample had competed whilst injured (54.5%). There was a high prevalence of the use of pain medication in order to continue riding, 10% used it daily and 41.7% used it occasionally.

There was a significant association between wrist and neck injuries and taking part in eventing previously ($p=0.006$ and $p<0.01$ respectively). Most of the severe falls occurred during jumping. There was a significant association between eventing presently and the severity grading for forceful fall off the horse ($p=0.018$).

The 15.3h to 16.2 h horse size was associated with a higher percentage of chest injuries. The only genital injury occurred with a jumping saddle. “Other” stirrup type was significantly associated with foot injuries. Shoulder injuries were significantly associated with synthetic rein type. The more severe bits; pelham and “other” bit types were more likely used on the horse in those with wrist injuries. The artificial aid associated with shoulder injuries was the running martingale.

The use of a helmet seemed to prevent head injuries. Gloves, when used for jumping and hacking were significantly positively associated (*p=0.008 and p=0.003 respectively*) with wrist/hand injuries. It could have been that gloves were used subsequent to a hand injury for protective purposes and not preventative purposes. The use of a back brace was positively associated with low back injuries. Again this could be used for protecting an existing back injury.

Those who presented with knee injuries were significantly younger than those without knee injuries. Age was also significantly associated with foot injuries,

in that those with foot injuries were significantly older than those without. Foot injuries were more likely in people who had been riding and competing for longer (>21 years).

Muscle strains due to riding were significantly less common in those who do gym presently (*p=0.003*) and in those played golf presently (*p=0.007*). People who were doing no exercise presently were significantly more likely to have fractures due to riding.

High cholesterol and musculoskeletal problems were significantly associated with concussions due to riding. Having no medical problems was significantly protective for concussions and muscle strains and tendon problems, as well as being positively associated with not having any riding injuries.

Surprisingly, besides for a significant association between riding and non-riding related elbow and neck injuries, there was no other significant association between riding and non riding related injuries.

## 5.5. Objectives and Hypotheses

5.5.1. To describe the profile of injuries – type, locations and mechanisms.

5.5.2. To determine the association between the type of equestrian activity and location and mechanism of injury.

*It was hypothesised that the type of equestrian activity would not have a significant impact on the injury.*

REJECTED

The hypothesis was rejected, therefore the type of equestrian activity did have a significant impact on the injury. This is in keeping with the results reported

by Paix (1999) and Silver (2002) that the type of equestrian activity affects the type and severity of the injury.

5.5.3. To determine the association between use and type of equipment and location of injury.

*It was hypothesised that type of equipment used would not determine the injury location*.

REJECTED

The hypothesis was not accepted, therefore the type and use of equipment is associated with injury location. This is in keeping with Abu-Zidan and Rao (2003) findings that protective equipment may reduce the severity of an injury.

5.5.4. To determine anthropometric and history variables associated with location of horse riding injuries.

*The hypothesis indicated that there would not be a significant relationship between the anthropometric variables (demographics, age, weight, height, ethnicity, gender, dominant hand and medical aid) and the profile of horse riding injuries.*

REJECTED

The hypothesis was rejected, therefore anthropometric and history variables do influence the location of horse riding injuries. This is in opposition with Abu-Zidan and Rao (2003) results which found that there is no association with age and gender and horse riding injuries.

*The hypothesis indicated that there would not be a significant relationship between the riding history variables (number of years riding and competing,*

*time spent riding per session, number of horses ridden, instruction received and other activities) and the profile of horse riding injuries.*

ACCEPTED

This hypothesis is accepted showing that there is no significant relationship between the riding history variables and the profile of horse riding injuries. This study is in contrast to Ball et al. (2007) and Silver (2002) findings, where there is an association between the amount of time spent riding and injury occurrence.

5.5.5. To determine if non riding related injuries are associated with riding related injuries in the same sites.

*It was hypothesised that non riding related injuries would not be associated with riding related injuries in the same sites.*

ACCEPTED

The hypothesis is accepted, showing that non riding related injuries are not associated with riding related injuries in the same sites, this is in contrast to the results from Carlson et al. (2006) and Bowerman et al. (2006) studies where there is an association between injury and other activity done.

# Chapter 6

# Conclusion and Recommendations

## 6.1. Introduction

This Chapter incorporates a summary of the results of the study. Conclusions about the results are drawn, and recommendations are provided for future studies based on the results as well as the limitations of this study.

## 6.2. Conclusions

There were 176 respondents to the study. The ages in the study ranged from 18 to 76 years and the average age was 36.3 years. The vast majority of participants were White (99.4%) females (81%).

The overall prevalence of injury was 90.3%. Muscle strains were the most common type of injury (62.5%). The head was the most commonly injured site (46.4%). The low back was the site most likely to be injured many times. Forceful falls were ranked as the most severe type of injury mechanism. Most injuries occurred whilst jumping (63.8%).

There was a significant association between wrist injuries and neck injuries and taking part in eventing previously ($p=0.006$ and $p<0.01$ respectively). Show jumping presently was negatively associated with neck injuries and low back injuries. There was a significant association between eventing presently and the severity grading for forceful fall off the horse ($p=0.018$).

Chest injuries were significantly associated with the horse size of 15.3h to 16.2 h. Use of a helmet was associated with head injury prevention.

Those horse riders with foot injuries were more likely to use other stirrup types. Pelham and other bit types, which included severe bit types, usually

used on strong horses, were more likely in those with wrist injuries. Use of gloves for jumping and hacking was significantly associated with wrist/hand injuries (*p=0.008 and p=0.003 respectively*). Use of a back brace was associated with low back injuries. This could show that the gloves were used subsequent to an injury and therefore for protective not preventative purposes.

Muscle strains due to riding were less common in those who presently did regular exercise. Horse riders that were presently not doing exercise were significantly more likely to have fractures due to riding. People with high cholesterol and musculoskeletal problems were more likely than those without to suffer from concussions. Having no medical problems was significantly protective for concussions and muscle strains and tendon problems as well as being positively associated with not having any riding injuries.

Surprisingly, besides for a significant association between riding and non riding related elbow and neck injuries, there was no other significant association between riding and non riding related injuries.

## 6.3. Recommendations

- A more specific and in depth approach to each individual injury needs to be further evaluated. So that the factors at the time of a specific injury may be assessed for their influence on the injury. This will aid in seeing if equipment was used for preventative or for protective measures. This will also examine the relationship between an injury and the horse ridden at the time of the injury, so more information on the horses effect on the injury can be taken into consideration.

- To include a physical examination of the rider to record findings more accurately and anatomically correct, therefore focusing on the specific muscle groups that are commonly used by horse riders. This will provide a more accurate view of what muscles are most prone to be

affected by injury, and thus help with prevention strategies to prevent overuse injuries of these muscles.

- Future studies should include questions on injuries due to handling the horse from the ground and mounting the horse and their affect on riding injuries.

- It is suggested that a longitudinal study be done, where horse riders are tracked over a number of years, and not just involved in one off studies. This would lead to greater amounts of knowledge with regard to chronic injuries and the possibility of medical conditions influencing injuries.

- Further longitudinal studies are recommended to establish the sequence of causative factors for the participants who are injured. This would be to determine whether the risk factors were present before the horse riding injury or were the cause of the horse riding injury, so that definite causative factors for injuries would be established rather than those associated with horse riding injuries.

- Future studies should also look at the association between the facilities used and what factors influence the injury profile.

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## Photographs

All horse riding photos kindly provided by Michele Van Eyssen. 2009.

# Appendix A

## QUESTIONNAIRE FOR COMPETITIVE HORSE RIDERS

**Please complete the questionnaire as honestly as you can. All responses are strictly confidential. Please tick one box per question unless otherwise indicated.**

## PART A: IDENTIFICATION

1. Age: _____ years

2. Ethnicity:

| | |
|---|---|
| Black | |
| White | |
| Coloured | |
| Indian | |
| Other (please specify): _____ | |

3. Height : ___.____m

4. Weight : ___.____kgs

5. Gender :

Male ☐ Female ☐

6. Occupation: _____

7. Which is your dominant hand?

Right ☐ Left ☐

8. Do you have Medical Aid?

| | |
|---|---|
| Full comprehensive cover | |
| Hospital plan | |
| Hospital plan and savings | |
| No | |

## PART B: RIDER INFORMATION

1. What level do you compete at? (you may tick more than 1)

| | | Presently | Previously |
|---|---|---|---|
| Eventing | Welcome | | |
| | Pre Novice | | |
| | Novice | | |
| | Intermediate | | |
| | * and above | | |
| Dressage | Preliminary | | |
| | Novice | | |
| | Elementary | | |
| | Elementary-Medium | | |
| | Medium | | |
| | Advanced | | |
| Showjumping | 70cm | | |
| | 80cm | | |
| | 90cm | | |
| | 1m | | |
| | 1.10m | | |
| | 1.20m and above | | |

2. Number of years as a horse rider?

| | | | |
|---|---|---|---|
| 0-5 | | 16-20 | |
| 6-10 | | more than 21 | |
| 11-15 | | | |

3. Number of years competing in horse riding disciplines?

| | | | |
|---|---|---|---|
| 0-5 | | 16-20 | |
| 6-10 | | more than 21 | |
| 11-15 | | | |

4. How many total hours on average do you ride per week? (training and competition)

| | | | |
|---|---|---|---|
| 0-2 | | 7-8 | |
| 3-4 | | 9-10 | |
| 5-6 | | more than 11 | |

5. How many minutes on average are spent on the horse per training session?

| | | | |
|---|---|---|---|
| 1-15 | | 46-60 | |
| 16-30 | | more than 61 | |
| 31-45 | | | |

6. How many horses are you currently riding on a regular basis (i.e. more than twice a week)?

| | | | |
|---|---|---|---|
| 1 | | 3 | |
| 2 | | 4 or more | |

7. How many hours of formal riding instruction do you receive a month on average?

| | | | |
|---|---|---|---|
| 0 | | 5–8 | |
| 1–4 | | More than 9 | |

8. For how long have you received formal riding instruction?

| | | | |
|---|---|---|---|
| Never | | 6–10 years | |
| Less than 1 year | | More than 11 years | |
| 1–5 years | | | |

9. Do you regularly participate in any of the following activities? (more than 4 times a month)

| | **Presently** | **Previously** |
|---|---|---|
| Gym workouts | | |
| Running (sprint or long distance) | | |
| Cycling | | |
| Golf | | |
| Other (please specify): | | |
| No | | |

## PART C: HORSE AND EQUIPMENT INFORMATION

**If more than one horse is ridden, please choose the horse most ridden or most advanced in its training.**

**1.** Horse breed:

| | |
|---|---|
| Thoroughbred | |
| Warmblood | |
| Other (please specify): | |

**2.** Horse size:

| | |
|---|---|
| Under 14.2h/1.44m | |
| Between 14.3h/1.45 m and 15.2h/1.54m | |
| Between 15.3h/1.55m and 16.2h/1.65 m | |
| Over 16.3h/1.66 m | |

**3.** Rate how you find your horse to ride:

| | |
|---|---|
| Easy | |
| Average | |
| Difficult | |

**4.** Type of saddle used the most:

| | |
|---|---|
| Dressage | |
| Jumping | |
| General purpose | |

**5.** Stirrup type:

| | |
|---|---|
| Standard with tread | |
| Standard with wedge treads | |
| Springer | |
| KY springer | |
| Other (please specify): _____ | |

**6.** How often do you check your stirrup lengths?

| | |
|---|---|
| Never | |
| 1 – 3 times a year | |
| 4 – 6 times a year | |
| More than 6 times a year | |

**7.** Rein type:

| | |
|---|---|
| Webb | |
| Leather | |
| Synthetic | |
| Pleated | |
| Other (please specify): _____ | |

**8.** Type of bit:

| | |
|---|---|
| Snaffle | |
| Pelham | |
| Portuguese gag (2/3 rings) | |
| Double bridle | |
| Other (please specify): | |

**9.** Please grade the following artificial aids in order of most used (8) to least used (1):

| | Rating |
|---|---|
| Whip | |
| Spurs | |
| Running martingale | |
| Running reins | |
| Market harborourgh | |
| Elastic neck stretcher | |
| De gouge | |
| Other (please specify): | |

**10.** On average how often do you use the following facilities during a training month on one horse?

| | 1-2 times | 3-4 times | 5-6 times | 7-8 times | More than 9 |
|---|---|---|---|---|---|
| Dressage arena | | | | | |
| Showjumps | | | | | |
| Crosscountry jumps | | | | | |

**11.** Do you wear any of the following protective equipment during the following activities (more than one answer is possible)?

| | Flatwork | Jumping | Hacking | Competing |
|---|---|---|---|---|
| Helmet | | | | |
| Gloves | | | | |
| Long boots/gators | | | | |
| Back brace/support | | | | |
| Body protector | | | | |
| Other (please specify): | | | | |

## PART D: HISTORY OF INJURY

**1.** Do you have any of the following medical conditions?

| | |
|---|---|
| Anaemia | |
| Diabetes | |
| Osteoporosis | |
| High blood pressure | |
| High cholesterol | |
| Asthma | |
| Respiratory problems | |
| Musculoskeletal problem | |
| Arthritis | |
| Proprioception problem | |
| Other (please specify): | |
| None of the above | |

**2.** Have you had any of the following in the past?

| | Injuries due to riding | Injuries NOT related to riding |
|---|---|---|
| Concussions | | |
| Any fractures or dislocations | | |
| Any muscle strain/sprain/tears | | |
| Connective tissue injuries (tendons/ligaments) | | |
| None of the above | | |

**3.** If you have had any of the conditions or injuries from questions 1 or 2, did horse riding make the condition or injury worse?

Yes ☐ No ☐

**4.** Have you injured any of the following? (One or more response are possible) and give a brief detail.

| | No. of times related to riding | Detail. (eg. Fracture, sprain, stitches, tendon injury) | No. of times NOT related to riding | Detail. (eg. Fracture, sprain, stitches, tendon injury) |
|---|---|---|---|---|
| Wrist/Hand | | | | |
| Elbow | | | | |
| Shoulder | | | | |
| Head/Facial | | | | |
| Knee/ Thigh | | | | |
| Chest | | | | |
| Abdomen | | | | |
| Genital | | | | |
| Foot/Ankle | | | | |
| Neck | | | | |
| Mid back | | | | |
| Low back | | | | |
| Hip | | | | |
| Other (please specify) | | | | |
| No injury | | | | |

**5.** Please grade the following mechanisms of injuries that you have experienced from most severe (8) to least severe (1) if applicable:

| | Rating |
|---|---|
| Forceful fall off the horse (thrown off) | |
| Fall off the horse onto own feet | |
| Dislodged from saddle (not touching ground) | |
| Accident involving motor vehicle whilst riding | |
| Rider and horse fall | |
| Dragged on ground while attached to the horse | |
| Trampled on by the horse | |
| Other (please specify) | |

**6.** Which horse riding activity were you doing during your most severe injury?

| | |
|---|---|
| Hacking | |
| Flatwork schooling | |
| Jumping | |

**7.** In the year that you received your worst injury, how many training sessions and competitions did you miss due to injury?

| Training session/competitions | Injury related to riding | Injury NOT related to riding |
|---|---|---|
| 0 | | |
| 1–2 | | |
| 3–4 | | |
| 5–6 | | |
| 6–7 | | |
| More than 8 | | |

**8.** From who have you received treatment previously? (One or more answers are possible).

| | Injury related to riding | Injury NOT related to riding |
|---|---|---|
| Biokineticist | | |
| Chiropractic | | |
| Paramedic | | |
| Medical practitioner (GP) | | |
| Physiotherapist | | |
| Self treatment | | |
| Sports massage therapist | | |
| Other (please specify): | | |

**9.** Have you ever ridden or taken part in a competition whilst injured?

Yes ☐ No ☐

**10.** If you answered yes to the above question, please state why?

---

**11.** If you have been injured or are in pain do you take pain medication in order to continue riding? (eg. Myprodol, Ibuprofen etc)

| | |
|---|---|
| No | |
| Daily | |
| Weekly | |
| Monthly | |
| Occasionally | |

**THANK YOU FOR PARTICIPATING IN THIS STUDY.**

**If you wish to get the results of this research, please give your email address to the researcher and it will be made available to you, once the study is completed.**

# Appendix B

31 May 2009

Dear chairperson of the KwaZulu Natal Horse Society,

I am conducting research on horse riding injuries in adult horse riders registered with the KwaZulu Natal Horse Society. The purpose of this study is to investigate the frequency and nature of injuries among horse riders and to assess and identify risk factors that may be associated with the injuries.

This study will include adult horse riders registered with the KwaZulu Natal Horse Society. All the information supplied will be treated confidentially and used for research purposes only. Participation is voluntary and failure to participate will not result in any adverse consequences.

I would like to ask permission to be at various shows in KwaZulu Natal in order to hand out the questionnaires to adult horse riders. I would also like to acquire a list of the adult member's names and email addresses so that I may know who is present at the shows, in order to email the questionnaire to those not present. This would be handled confidentially in order to get an unbiased random response, by giving all the members of KZNHS an opportunity to respond to the questionnaire.

The results will be made available to the KZNHS upon completion of the research.

Please feel free to contact Jo-Anne Catlin (researcher), or my supervisor, Dr. Garrick Haswell if you have any questions.

Thank you very much
Yours sincerely,

**Jo-Anne Catlin**
(Researcher)
084 2079 355

**Dr. G. Haswell (M Tech: Chiropractic)**
(Supervisor)
031 563 4451

## Appendix C

## LETTER OF INFORMATION

Dear Participant,

Welcome to my study. Thank you for your interest.

**The title of my research project is**: A profile of horse riding injuries in adult horse riders registered with the KwaZulu Natal Horse Society.

| | | |
|---|---|---|
| Name of supervisor: | Dr. G. Haswell (M Tech: Chiropractic) | (031-563-4451) |
| Name of Research Student: | Jo-Anne Catlin | (084 207 9355) |
| Name of Institution: | Durban University of Technology | |

**The purpose of the study:**
There is very little information regarding the frequency and occurrences of traumatic and repetitive strain injuries in horse riders. The aim of this study is to determine an injury profile and the risk factors associated with horse riding injuries in adult horse riders registered with the KwaZulu Natal Horse Society.

**Procedures:**
You will be required to complete a questionnaire about horse riding injuries and related risk factors. The average time for the questionnaire to be completed is 10 minutes.

**Benefits:**
The results of this research will be forwarded to the KwaZulu Natal Horse Society, to allow for improved recommendations with regards to training and injury prevention.

**Risks/ Discomforts and Cost:**
There are no risk / discomfort or cost involved from your participation in the study.

**Confidentiality:**
All patient information is confidential and the results will be used for research purposes only. You have the right to be informed of any new findings that are made and you may ask questions of an independent source if you so wish. If you are not satisfied with any area of the study please feel free to contact the researcher Jo-Anne Catlin on 084 207 9355 or the supervisor Dr Haswell on 031 563 4451, failing which you may contact the Durban University of Technology Research Ethics Committee via Mr. V Singh at 031 373 2701.

Thank you for your participation,
Yours sincerely,

**Jo-Anne Catlin**
(Researcher)

**Dr. G. Haswell (M Tech: Chiropractic)**
(Supervisor)

# APPENDIX D

Durban University of Technology: Department of Chiropractic

**A Profile of Musculoskeletal Injuries in Competitive Swimmers in the Greater Durban Area**

Competitive Swimmers injury Questionnaire

**Section 1: Patient Information**

1. Age in years? | Years |

2. What is your gender?

| Male | Female |
|---|---|

3. Which ethnic group do you belong to?

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

4a. Do you do any other **exercise** (e.g. weight training/ gym/ spinning) on a regular basis (i.e. twice a week.) besides swimming?

| Yes | No |
|---|---|

4b. If yes please specify.

.....
.....

5a. Have you ever sustained an injury due to the above mentioned exercise? (If no move to question 6)

| Yes | No |
|---|---|

5b. Please state your worst **two injuries** from the exercises mentioned in question 4b.

……
……

6. Has the injury/s mentioned in question 4 prevented you from swimming for any period of time?

| Yes | No |
|---|---|

7a. Do you **compete** in any other **sport** (e.g. waterpolo, hockey, cricket, etc.) besides swimming?

| Yes | No |
|---|---|

7b. If yes please specify.

……
……

8. Please state your worst two injuries from the **sport(s)** mentioned in question 7b.

……
……

9. Has the sports injury/s mentioned in question 7 prevented you from swimming for any period of time? Yes | No

10. In your opinion do you eat a balanced diet? Yes | No

11. Do you take any supplements on a regular basis? Yes | No

12. If you answered yes to question 11, please specify what supplements you are taking.

| | Tick |
|---|---|
| Protein Shake | |
| Multivitamins (please specify) | |
| Creatine | |
| Vitamin B injections | |
| Other (please specify) | |

13a. To your knowledge are there any hereditary diseases in your family (e.g. Arthritis, Scoliosis, musculoskeletal diseases)? Which may affect your swimming at a competitive level. Yes | No

13b. If Yes please specify the disease(s)

.....
.....

## Section 2: Swimming History

14. At what age did you start swimming competitively? Years

15. How many years have you been swimming competitively? Years

16. On average how many hours per week do you train swimming? Hours

17. What is the average duration of each swimming session? Hours

18. On average how many kilometres do you swim per week? Kilometres

19. On average how many sessions per week do you swim? Sessions

20. What is the average time (rest) between swimming sessions? Hours

21. On average how many hours per week of land training (gym) do you do?

| Hours |
|---|

22. On average how many hours per day do you spend stretching?

| Hours |
|---|

23. When do you usually stretch?

| Before training | After training | Before and After training | Never |
|---|---|---|---|
| | | | |

24. What is your main stroke? (Only tick one)

| Butterfly | Backstroke | Breaststroke | Freestyle | Individual Medley |
|---|---|---|---|---|
| | | | | |

25. What is your second main stroke? (Only tick one)

| Butterfly | Backstroke | Breaststroke | Freestyle | Individual Medley |
|---|---|---|---|---|
| | | | | |

26. Would you classify yourself as? (Can tick more than one)?

| Sprinter (50 /100m) | Middle distance swimmer (200 /400m) | Long distance swimmer (800 / 1500m) | Open water swimmer (1km +) |
|---|---|---|---|
| | | | |

27. What are your 2 main events do you compete in? (Include distance and stroke)

……
……

28. What are your 2 secondary events do you compete in? (Include distance and stroke)

……
……

29. What other events do you swim? (Include distance and stroke)

……
……

30. To which side do you breathe?

| Left | Right | Bilateral |
|---|---|---|
| | | |

31. What is the highest level at which you have competed?

| Schools | Provincial | National | International | Other |
|---|---|---|---|---|
| | | | | |

If other, please specify.

.....
.....
.....

32. On average how many galas do you swim in a season? | Galas per season |

33. On average how many races do you swim per gala? races

34a. Do you receive any maintenance treatment (for injury prevention) on a regular basis?

| Yes | No |
|---|---|

34b. If yes, please specify by ticking appropriate treatments below

| | | | |
|---|---|---|---|
| Bracing / strapping | | Medication/ injections | |
| Orthopaedic / surgery | | Home remedies e.g.: ice | |
| Physiotherapy | | Nutritional therapy | |
| Chiropractic | | Homoeopathy | |
| Rehabilitation | | Sports massage | |
| No treatment | | Other (please specify) | |

35. Do you receive regular **stroke correction**-at least once per month?

| Yes | No |
|---|---|

36. What equipment do you use on a regular basis while swimming training?

| | | | |
|---|---|---|---|
| Kick board | | Bands | |
| Pull buoy | | Fins | |
| Weight belts | | Parachutes | |
| Stretch cords | | Paddles | |
| Snorkel | | | |
| Other (please specify) | | | |

## Section 3: Previous Swimming Injuries

37. Have you **ever** sustained an injury due to swimming? (If No please move to question 47)

| Yes | No |
|---|---|

38. If yes, name the injury? (Was it traumatic, a sudden injury or did it occur over a long period of time?) (tick the appropriate box/s)

| | Name Injury | Traumatic or accident? | Sudden onset? | Over a period time? |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

39. Have you **ever** received treatment for your swimming injury?

| Yes | No |
|---|---|

40. If yes, what type of treatment did you receive? (You can tick more than one treatment)

| | | | |
|---|---|---|---|
| Bracing / strapping | | Medication/ injections | |
| Orthopaedic / surgery | | Home remedies e.g.: ice | |
| Physiotherapy | | Nutritional therapy | |

| | | | |
|---|---|---|---|
| Chiropractic | | Natural therapy e.g.: Homoeopathy | |
| Rehabilitation | | Sports massage | |
| Other (please specify) | | | |

41a .How often have the following areas of your body been injured while swimming? (This includes any injuries from swimming sustained at **any time during your swimming career.)**

(Please tick the appropriate columns)

| | **Area of body** | **Seldom (once or twice)** | **Often (3-5 times)** | **Very often (more than 5 times)** |
|---|---|---|---|---|
| 1. | A. Foot/ toes | | | |
| 2. | B. Ankle | | | |
| 3. | C. Achilles tendon | | | |
| 4. | D. Leg (calf/ Shin) | | | |
| 5. | E. Knee | | | |
| 6. | F. Hamstring (back of leg) | | | |
| 7. | G. Quadriceps (front of leg) | | | |
| 8. | H. Hip / Groin | | | |
| 9. | I. Lower Back | | | |
| 10. | J. Upper Back | | | |
| 11. | K. Neck | | | |
| 12. | L. head | | | |
| 13. | M. Shoulder | | | |
| 14. | N. Biceps (front of upper arm) | | | |
| 15. | O. Triceps (back of upper arm) | | | |
| 16. | P. Elbow | | | |
| 17. | Q. Forearm | | | |
| 18. | R. Wrist | | | |
| 19. | S. Hand | | | |
| 20. | T. Other (please specify) | | | |

41b. From the list above (Q.41 1-20) please state the area(s) that sustained the worst injured:

……

……

42. Consider the worst injury that you have sustained during swimming. How would you describe it? (Please tick the appropriate columns)

| Mild | Moderate | Severe |
|---|---|---|

43. How have the injuries listed below affected your swimming?
(Please tick appropriate column and if they **limited your swimming** please will you **specify what you were able to do?** e.g. kicking)

| | **Area of body** | **Prevented** | **Limited swimming** | **No** |
|---|---|---|---|---|

| | | swimming | (specify) | effect |
|---|---|---|---|---|
| 1. | Foot/ toes | | | |
| 2. | Ankle | | | |
| 3. | Achilles tendon | | | |
| 4. | Leg (calf/ Shin) | | | |
| 5. | Knee | | | |
| 6. | Hamstring (back of leg) | | | |
| 7. | Quadriceps (front of leg) | | | |
| 8. | Hip / Groin | | | |
| 9. | Lower Back | | | |
| 10. | Upper Back | | | |
| 11. | Neck | | | |
| 12. | Head | | | |
| 13. | Shoulder | | | |
| 14. | Biceps (front of upper arm) | | | |
| 15. | Triceps (back of upper arm) | | | |
| 16. | Elbow | | | |
| 17. | Forearm | | | |
| 18. | Wrist | | | |
| 19. | Hand | | | |
| 20. | Other (please specify) | | | |

44. What is the **longest period**, which you were **unable** to swim due to any the above-mentioned injury/s? (Please tick the appropriate columns)

| Less than 1 month | Less than 3 months | 3-6 months | Greater than 6 months |
|---|---|---|---|

45. What do you feel is the most likely cause for your injury? (Please tick the appropriate columns)

| | | | |
|---|---|---|---|
| Insufficient warm-up | | Over training | |
| Stretching | | Insufficient rest | |
| Over racing | | Poor nutrition | |
| Injured while racing | | Poor Technique | |

| |
|---|
| Other (please specify) |

46. During which activity was your injury sustained? (Please tick the appropriate columns)

| | | | |
|---|---|---|---|
| Warm-up | | Stretching | |
| Diving | | Tumble turns | |
| Kicking | | Pulling | |
| Butterfly | | Drills | |
| Backstroke | | Paddles | |
| Breaststroke | | Fin work | |
| Freestyle | | Parachutes | |
| Stretch cords | | Bands | |
| Weight belts | | Snorkel | |
| Other (please specify) | | | |

## Section 4: Present Swimming Injuries

47. Are you **presently** suffering with any injuries due to swimming?
(If you answered No please moved to question 57)

| Yes | No |
|---|---|

48. If you answered yes to Q47 please specify your current injuries.
(Maximum of 3 injuries in **order of severity**)

| | **Present Injuries** |
|---|---|
| 1. | |
| 2. | |
| 3. | |

## Questions 49 – 57 are referring to you most severe swimming injury from the above- mentioned list.

49. Have you received treatment for the above-mentioned swimming injury(s)?

| Yes | No |
|---|---|

50. If yes, what type of treatment did you receive?
(You can tick more than one treatment)

| | | | |
|---|---|---|---|
| Bracing / strapping | | Medication/ injections | |
| Orthopaedic / surgery | | Home remedies e.g.: ice | |
| Physiotherapy | | Nutritional therapy | |
| Chiropractic | | Natural therapy e.g.: Homoeopathy | |
| Rehabilitation | | Sports massage | |
| No treatment | | Other (please specify) | |

51. How would you describe to pain on a scale of 0 to 10 (0 represents no pain and 10 represents severe pain.)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

52. At this moment how does your **present injury** affect your swimming?

| | | | | |
|---|---|---|---|---|
| Prevents swimming | Severe limitation & pain | Some limitation | Some pain | No effect |

Please specify what you **are able to do** if your swimming was limited.

……

……

53. How long have you been **suffering** with this injury?

| | | | |
|---|---|---|---|
| Less than 1 month | Less than 3 months | 3-6 months | Greater than 6 months |

54. What is the longest period this **present injury** has **prevented** you from swimming?

| | | | |
|---|---|---|---|
| Less than 1 month | Less than 3 months | 3-6 months | Greater than 6 months |

55. What do you feel is the most likely cause for your injury?

| | | | |
|---|---|---|---|
| Insufficient warm-up | | Over training | |
| Stretching | | Insufficient rest | |
| Over racing | | Poor nutrition | |
| Injured while racing | | Poor Technique | |
| Other (please specify) | | | |

56. During which activity was your present injury sustained?

| | | | |
|---|---|---|---|
| Warm-up | | Stretching | |
| Diving | | Tumble turns | |
| Kicking | | Pulling | |
| Butterfly | | Drills | |
| Backstroke | | Paddles | |
| Breaststroke | | Fin work | |
| Freestyle | | Parachutes | |
| Stretch cords | | Bands | |
| Weight belts | | Snorkel | |
| Other (please specify) | | | |

57. During what part of your swimming cycle were you injured?

| | | | |
|---|---|---|---|
| Beginning of a cycle | Mid-cycle | Hell week | Taper |

# Appendix E

DR.KELLYSUTHERLAND
CHIROPRACTOR
M.Tech: Chiropractic (S.A.), M.C.A.S.A

17 August 2009

To Whom It May Concern:

I hereby give written consent to Jo-Anne Catlin for the use of a modified version of my Competitive Swimmers injury Questionnaire in his research.

Yours Sincerely

**Dr. Kelly Sutherland**
**Chiropractor**

# Appendix F

## INFORMED CONSENT FORM

(TO BE COMPLETED BY THE PARTICIPANTS OF THE FOCUS GROUP)

**DATE:**

**TITLE OF RESEARCH PROJECT: A profile of horse riding injuries in adult horse riders registered with the Kwa Zulu Natal Horse Society.**

**NAME OF SUPERVISOR: Dr. G. Haswell**

**NAME OF RESEARCH STUDENT: Jo-Anne Catlin**

## Please circle the appropriate answer YES /NO

1. Have you read the research information sheet? Yes No
2. Have you had an opportunity to ask questions regarding this study? Yes No
3. Have you received satisfactory answers to your questions? Yes No
4. Have you had an opportunity to discuss this study? Yes No
5. Have you received enough information about this study? Yes No
6. Do you understand the implications of your involvement in this study? Yes No
7. Do you understand that you are free to
    a) Withdraw from this study at any time? Yes No
    b) Withdraw from the study at any time, without reasons given Yes No
    c) Withdraw from the study at any time without affecting your future health care or relationship with the Chiropractic day clinic at the Durban Institute of Technology. Yes No
8. Do you agree to voluntarily participate in this study Yes No
9. Who have you spoken to regarding this study?

---

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

## Please Print in block letters:

Focus Group Member: _____ Signature:

Witness Name: _____ Signature:

Researcher's Name: _____ Signature:

# Appendix G

## CODE OF CONDUCT

**This form needs to be completed by every member of the Focus Group prior to the commencement of the focus group meeting.**

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

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

2. Due respect to be given to every suggestion and comment by any member of the focus group and be debated with reference to the outcomes of the research.

3. The information gathered from this focus group by the researcher will be made public in terms of a mini dissertation and journal publication. The researcher will ensure that any participants in the focus group and research remain anonymous and confidential.

| Member represents | Member's Name | Signature | Contact Details |
|---|---|---|---|
| | | | |
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# Appendix H

## CONFIDENTIALITY STATEMENT – FOCUS GROUP DECLARATION

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

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. The returned questionnaires will be coded and kept anonymous in the research process.
3. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this focus group.
4. The information from this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.
5. Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

| Member represents | Member's Name | Signature | Contact Details |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |

# Appendix I

## FOCUS GROUP QUESTIONNAIRE FOR COMPETITIVE HORSE RIDERS

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

## PART A: IDENTIFICATION

1. Are you a member of KZNHS?

| | |
|---|---|
| Yes | |
| No | |

2. Age: (years)

| | |
|---|---|
| 18 – 24 | |
| 25 – 35 | |
| 36 – 45 | |
| 46 - 55 | |
| Above 56 | |

3. Ethnicity (for statistical purposes):

| | |
|---|---|
| Black | |
| White | |
| Coloured | |
| Indian | |
| Asian | |

4. Height : ___

5. Weight : ___

6. Gender :

| | |
|---|---|
| Male | |
| Female | |

7. Occupation: _____

8. Do you have Medical Aid?

| | |
|---|---|
| Yes | |
| No | |

## PART B: RIDER INFORMATION

1. Which discipline and at what level do you compete at? (may tick more than 1)

| | | |
|---|---|---|
| Eventing | Welcome | |
| | Pre Novice | |
| | Novice | |
| | Intermediate | |
| | * and above | |
| Dressage | Preliminary | |
| | Novice | |
| | Elementary | |
| | Elementary-Medium | |
| | Medium | |
| | Advanced | |
| Showjumping | 80cm (G grade) | |
| | 90cm (F grade) | |
| | 1m (D grade) | |
| | 1.10m (C grade) | |
| | 1.20m (B grade) and above | |

2. Number of years as a horse rider:

| | |
|---|---|
| 0-5 years | |
| 5-10 years | |
| 10-15 years | |
| 15-20 years | |
| more than 20 years | |

3. How many hours in total do you ride per week?

| | |
|---|---|
| 0-2 hours | |
| 2-4 hours | |
| 4-6 hours | |
| 6-8 hours | |
| 8-10 hours | |
| more than 10 hours | |

4. How many minutes on average are spent on the horse per session?

| | |
|---|---|
| 0-15 minutes | |
| 15-30 minutes | |
| 30-45 minutes | |

| | |
|---|---|
| 45-60 minutes | |
| more than 60 minutes | |

5. . How many horses are you currently riding on a regular basis? (more than 3 times a week)

| | |
|---|---|
| 1 horse | |
| 2 horses | |
| 3 horses | |
| 4 or more horses | |

6. How many hours of formal riding instruction do you receive a month on average?

| | |
|---|---|
| 0 hours | |
| 1 – 4hours | |
| 4 – 8 hours | |
| More than 8 hours | |

7. For how many years have you received formal riding instruction?

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

8. Do you presently or have you previously participated in any of the following?

| | Presently | Previously |
|---|---|---|
| Gym | | |
| Running | | |
| Cycling | | |
| Golf | | |
| Other (please specify) | | |

## PART C: HORSE AND EQUIPMENT INFORMATION

**If more than one horse is ridden, please choose the horse most ridden or most advanced in its training.**

**1.** Horse breed:

| | |
|---|---|
| Thourebred | |

| | |
|---|---|
| Warmblood | |
| Other (please specify) | |

**2.** Horse size:

| | |
|---|---|
| Under 14.2h/1.44m | |
| Between 14.2h/1.4 m and 15.2h/1.54m | |
| Between 15.3h/1.55m and 16.2h/1.65 m | |
| Over 16.2h/1.65 m | |

**3.** Type of saddle used the most:

| | |
|---|---|
| Dressage | |
| Jumping | |
| General Purpose | |

**4.** Stirrup type:

| | |
|---|---|
| Standard with tread | |
| Standard with wedge treads | |
| Springer | |
| KY springer | |
| Other (please specify) | |

**5.** Rein type:

| | |
|---|---|
| Webb | |
| Leather | |
| Synthetic | |
| Pleated | |

**6.** Type of bit:

| | |
|---|---|
| Snaffle | |
| Double jointed snaffle | |
| Portuguese gag (2/3 rings) | |
| Double bridle | |
| Other (please specify) | |

**7.** Please grade the following artificial aids in order of most used (1) to least used (8)

| | Rating |
|---|---|
| Whip | |

| | |
|---|---|
| Spurs | |
| Running martingale | |
| Running reins | |
| Marketharbourgh | |
| Elastic neck stretcher | |
| Degouge' | |
| Other (please specify) | |

**8.** How often do you use the following facilities during a training week on one horse?

| | 1 -2 times | 3 –4 times | 5 -6 times | 7 -8 times |
|---|---|---|---|---|
| Dressage arena | | | | |
| Showjumps | | | | |
| Crosscountry jumps | | | | |

**9.** Do you wear any of the following protective equipment (more than one answer is possible)?

| | Flatwork | Jumping | Hacking | Competing |
|---|---|---|---|---|
| Helmet | | | | |
| Gloves | | | | |
| Long boots/gators | | | | |
| Back brace/support | | | | |
| Body protector | | | | |
| Other (please specify? | | | | |

## PART D: HISTORY OF INJURY

**1.** Do you have any of the following medical conditions?

| | |
|---|---|
| Anaemia | |
| Diabetes | |
| Osteoporosis | |
| High blood pressure | |
| High cholesterol | |
| Respiratory problems | |

| | |
|---|---|
| Musculoskeletal problems | |
| Other (please specify) | |

**2.** Have you had any of the following in the past?

| | Due to riding | Not related to riding |
|---|---|---|
| Orthopaedic surgery | | |
| Concussions | | |
| Any fractures or dislocations | | |
| Any muscle strain/sprain/tears | | |
| Connective tissue injuries (tendons/ligaments) | | |

**3.** Have you injured any of the following? (One or more answers are possible):

| | Whilst riding | | Not related to riding | |
|---|---|---|---|---|
| | once | 2 or more | once | 2 or more |
| Wrist | | | | |
| Elbow | | | | |
| Shoulder | | | | |
| Head/Neck/Facial | | | | |
| Knee/ Thigh | | | | |
| Chest | | | | |
| Abdomen | | | | |
| Genital | | | | |
| Foot/Ankle | | | | |
| Back | | | | |
| Hand | | | | |
| Other (please specify) | | | | |

**4.** Please grade the following mechanisms of injuries that you have experienced from most severe (1) to least severe (8) if applicable

| | Rating |
|---|---|
| Forceful fall off the horse (thrown off) | |
| Fall off the horse onto own feet | |
| Dislodged from saddle (not touching ground) | |
| Accident involving motor vehicle whilst riding | |
| Schooling | |

| | |
|---|---|
| Hacking | |
| Jumping | |
| Rider and horse fall | |

**5.** How many training sessions and competitions did you miss in the last year due to injury?

| | Whilst riding | Not related to riding |
|---|---|---|
| 1 – 2 | | |
| 3 – 4 | | |
| 5 – 6 | | |
| 6 – 7 | | |
| More than 8 | | |

**6.** From who have you received treatment previously? (One or more answers are possible).

| | |
|---|---|
| Biokineticist | |
| Chiropractic | |
| Paramedic | |
| GP | |
| Physiotherapy | |
| Self treatment | |
| Sports massage | |
| Other (please specify) | |

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

# Appendix J

## Transcript of Focus group

Good evening and thank you all for coming tonight. Please can you read through the following and then we will comment on them. There is appendix F,G and H, followed by the questionnaire.
Break, for every one to read.
Ok, I think the first part – part A is pretty straight forward; age, height, weight, gender, occupation and ethnicity, they all basic questions, so lets go straight to part B. Ok, what level do you compete at? Oh, you are welcome to write on the sheets if you want to. Does everyone think that's a straight forward question?
Yes all round.
Number of years as a horse rider?
Yes all round.
How many hours in total do you ride per week? Is that enough of a break down?
Yes all round.
Just shout if I'm going to fast. How many minutes on average are spent on the horse per session? Are you all happy with that?
Yes all around.
How many horses are you currently riding on a regular basis?
Yes all round.
How many hours of formal riding instruction do you receive a month on average?
Yes all round.
Shew, this is going quicker than I thought!
For how many years have you received formal riding instruction? Is everyone happy with the word formal?
Yes all round.
Ok. Do you presently or have you previously participated in any of the following?
As in competitively or just recreational?
Recreational, but I don't want some one saying yes if they play tennis like once a year. So should I put regularly in there?
Yes all around.
Maybe you could put 3 times a week.
So more than 3 times a week?
Or 3 times a week?
Ja, 3 or more.
Who plays golf 3 times a week?
What did you say?
Golf.
Who plays golf 3 times a week?
True
Or once a week? Or what about just a regular basis? Cause that opens it up quite a bit.
What's regular basis? What's regular to some people, would that be regular to other people? Maybe put 3 times a month or something? Or 4 times a month?

Maybe do month.
Yes all round.
Ok, 4 times a month.
Yes all round.
Do you think there any other sports that horse riders would be doing more of?
No all around.
You had other there.
Sorry
You had other there.
Ok, part C. If more than 1 horse is ridden please choose the horse most ridden or most advanced. The 3 basic or 2 basic ones…
Spelling over there.
Thank you. Ok. Horse size.
Yes all around.
Type of saddle used the most. Do you think that's ok? Should I leave it at used the most?
Yes all round.
Ok, Stirrup type. I don't know if I should have the springer and the KY springer?
I think that's enough variation.
Ja, that's fine.
Ok, keep both of them.
Rein type.
Whatever's on the bridle!
Every one laughs.
Same applies to the type of bit. Is there anything you find more used?
You must also put Pelham.
Yes, cause I ride in a Pelham.
Pelham is important. Keep the others, but, if it's a snaffle or double jointed snaffle, it's still a snaffle, so keep snaffle and put Pelham instead.
Ok, will put it there instead.
Just thinking for rein type, shouldn't you have other there as well?
Ja, ok, cool.
Ok, question 7. Please grade the following artificial aids in order of most used to least used. Anything else, or is that quite straight forward?
Yes all round.
How often do you use the following facilities during a training week on one horse? Do you think this is relevant in how much they using a particular facility?
I think so.
Yes all round.
Do you wear any of the following protective equipment? Is there anything else you would put there?
Do we have to be honest there?
Everyone laughs.
That's fine.
Yes all round.
Ok, past history of injury. Or history of injury. Ok, any other conditions that you may have found, to have a higher incidence in people, especially practicing people.

Laughs, no I would say that's it.
High blood pressure after teaching?
Everyone laughs
Or high blood pressure during teaching.
Have you had any of the following in the past? Is everyone happy with that?
Yes all round.
Have you injured any of the following? Do you think its sufficient just to say once or twice or more?
Yes all round.
When you say injured, I take in as the above, sprain or fracture?
Any sort of injury.
Yes, any sort.
Do you think the wording is too ambiguous then?
No that's fine.
Would you consider a graze an injury?
No, but I could change that then.
I'm just thinking…
It's also whether you also trying to work out if its fracture or soft tissue.
I'm not narrowing or separating that, I'm just wanting to know if they have injured a particular area.
Oh, ok.
A graze then wouldn't …
To some people a graze is serious!
Ja, so it would still be injured as such.
Its their perception on what injury is.
Maybe you could just put detail? In another column. So, then they can say how and put graze, bruise, sprain etc.
And give brief detail. Or give…
Just have a detail column.
Just detail. And add brief detail.
Everyone laughs, yes brief.
Explanation or detail?
Detail or brief detail. Explanation is how they injured it.
Ja, you don't want to know how exactly they fell! Maybe put example, fracture, muscle injury.
Yes all around.
That's not a bad idea.
Ok, please grade the following mechanisms of injuries.
What about while grooming?
I'm only doing riding injuries. Is everyone happy with those ones?
Yes all around.
How many training sessions and competitions did you miss in the last year due to injury? Should it be riding or training sessions?
Riding.
Do they have to mark this? What happens if they have none?
Ok, I will include a zero. Cool. And then from who have received treatment previously?
Just looking here, you haven't got a specialist.
Ok.
So if they have had surgery, then they would have.

Does everyone think that this, is there anything else that you would think from a riding history or past injury history that you think is relevant?
What about analgesia's and do they ride with pain or pain relief? Or is that getting a bit detailed?
Everyone agrees?
That's actually a very good point.
Yes, that is.
Are you masking your injuries or carrying on riding and causing more injuries?
How many live on Cateflams. Or took them just in case.
Just thinking of how many physios rode on analgesics and ended up needing disc surgery.
Everyone laughs.
So, do you take pain medication to continue riding?
Good question.
So how many voltaren injections do you need?
Everyone laughs.
So should I give an option of different medication? Or how often they use it?
I think how often.
All agree.
They are different, but its mainly anti-inflammatory, sort of pain relief.
So how often do you take pain medication in order to ride? And then have on a weekly basis? Daily basis?
Yes all around.
Need a 0 column.
Everyone laughs.
And then what, daily, weekly, monthly?
Daily, weekly, monthly.
You could put other, then for people who might say well every now and then.
An occasional rather than an other maybe.
Ja, occasional.
How's that, I suppose that will give a lot of info, hey?
All agree.
You will see that they all drug addicts!
Everyone laughs.
Legal drug addicts!
I think you also need to include if they ride whilst they are in pain, without medication.
Good idea. Ok, how about; do you continue to ride whilst injured or in pain?
Next question; if so how often do you take pain medication in order to ride?
Daily. Weekly. Monthly. Occasionally?
All agree on that.
Anything else that you think? Regards to equipment, horse?
Orthotics I was just thinking. Though you have put back brace there. What about wrist guards etc.
I have got an other under protective equipment.
But a lot of people ride with back supports and wrist supports.
I have got back brace/supports, but I don't have for extremities. I don't know…
I was just thinking of strapping, wrists and knees and backs.
Yes, riders do sometimes need to strap a wrist for example with an injury.
You hardly ever see that though.

I think other would cover that.
Yes, if its injured and needing protection, people would specify in other.
All agreed.
Are all these questions related to the last year, somewhere you specified a year, or the entire career?
Entire career. Do you think I should…?
Just make sure it's more clear.
From the beginning, or just say if not specified, say related to entire riding career. One you've got here, number of years as a horse rider, and then the one you say within the last year.
It's just that one question on injuries that is related to the last year.
Oh, ok, then that should be fine.
What about stirrup length differences? My stirrups are different lengths when my pelvis is out.
Yes, a lot of people don't check that regularly. Stirrups can stretch with time as well, making them uneven.
Yes, how they sit on the saddle can make a difference.
People often ride unevenly.
But a lot of the time they don't know it.
It also depends on the horse.
So, should I ask if they check their stirrup length regularly?
Yes, I check every time I ride.
But most people don't unless they have a problem.
So why don't you ask if they check regularly?
And if they are aware of pain related to any differences?
How about; Are you aware if your stirrup lengths are unequal?
A lot of people wouldn't know that or to check that, so would just say no.
Ok, how about; do you regularly check your stirrup lengths (i.e., more than twice a year), or do you check your stirrup lengths at least twice a year?
That sounds better.
And are you aware of any pain related to stirrup length or differences in stirrup length?
I think that should cover it, as back problems and pain can come from sitting unevenly on the horse.
What about the horses effect on the rider, if it's a strong horse for example?
Yes, because that will cause tension in their back & shoulders.
But how do you rate a horse, its all based on the individual, I might ride a horse and think its soft and the someone else will think its hot
It is how the horse affects you personally though.
No, I probably should include what the horse is like. How about is your horse's mouth; soft, hard/heavy or average?
That's similar to bits though.
Also people might think their horses' mouth is soft because they ride in a snaffle but they really should be in a Pelham because they getting towed around!
You also not taking in to account a hot, bouncy horse compared to a schoolmaster and what that does to your body.
True, so how about asking what the horse is like to ride. What kind of ride is your horse? Easy, average or difficult.
Is there any thing else that you feel needs to addressed?

No all round.
Ok, before we end can you just make sure appendix H, the letter of information is clear to you and that you have signed all the relevant paperwork. Thank you again for your time and input in helping me with this process.

## Appendix K

## POST FOCUS GROUP QUESTIONNAIRE FOR COMPETITIVE HORSE RIDERS

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

## PART A: IDENTIFICATION

1. Age (years):

| | |
|---|---|
| 18 – 24 | |
| 25 – 35 | |
| 36 – 45 | |
| 46 - 55 | |
| Above 56 | |

2. Ethnicity (for statistical purposes):

| | |
|---|---|
| Black | |
| White | |
| Coloured | |
| Indian | |
| Asian | |

3. Height : ___

4. Weight : ___

5. Gender :

| | |
|---|---|
| Male | |
| Female | |

6. Occupation: _____

7. Do you have Medical Aid?

| | |
|---|---|
| Yes | |
| No | |

## PART B: RIDER INFORMATION

1. What level do you compete at? (may tick more than 1)

| | | Presently | Previously |
|---|---|---|---|
| Eventing | Welcome | | |
| | Pre Novice | | |
| | Novice | | |
| | Intermediate | | |
| | * and above | | |
| Dressage | Preliminary | | |
| | Novice | | |
| | Elementary | | |
| | Elementary-Medium | | |
| | Medium | | |
| | Advanced | | |
| Showjumping | 80cm (G grade) | | |
| | 90cm (F grade) | | |
| | 1m (D grade) | | |
| | 1.10m (C grade) | | |
| | 1.20m (B grade) and above | | |

2. Number of years as a horse rider?

| | |
|---|---|
| 0-5 years | |
| 5-10 years | |
| 10-15 years | |
| 15-20 years | |
| more than 20 years | |

3. How many hours on average in total do you ride per week?

| | |
|---|---|
| 0-2 hours | |
| 2-4 hours | |
| 4-6 hours | |
| 6-8 hours | |
| 8-10 hours | |
| more than 10 hours | |

4. How many minutes on average are spent on the horse per session?

| | |
|---|---|
| 0-15 minutes | |
| 15-30 minutes | |
| 30-45 minutes | |
| 45-60 minutes | |
| more than 60 minutes | |

5. How many horses are you currently riding on a regular basis? (more than 3 times a week)

| | |
|---|---|
| 1 horse | |
| 2 horses | |
| 3 horses | |
| 4 or more horses | |

6. How many hours of formal riding instruction do you receive a month on average?

| | |
|---|---|
| 0 hours | |
| 1 – 4hours | |
| 4 – 8 hours | |
| More than 8 hours | |

7. For how many years have you received formal riding instruction?

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

8. Do you presently or have you previously regularly participated in any of the following? (more than 4 times a month)

| | Presently | Previously |
|---|---|---|
| Gym | | |
| Running | | |
| Cycling | | |
| Golf | | |
| Other (please specify) | | |

## PART C: HORSE AND EQUIPMENT INFORMATION

**If more than one horse is ridden, please choose the horse most ridden or most advanced in its training.**

**1.** Horse breed:

| | |
|---|---|
| Thoroughbred | |
| Warmblood | |

| | |
|---|---|
| Other (please specify) | |

**2.** Horse size:

| | |
|---|---|
| Under 14.2h/1.44m | |
| Between 14.2h/1.4 m and 15.2h/1.54m | |
| Between 15.3h/1.55m and 16.2h/1.65 m | |
| Over 16.2h/1.65 m | |

**3.** Type of saddle used the most:

| | |
|---|---|
| Dressage | |
| Jumping | |
| General Purpose | |

**4.** Stirrup type:

| | |
|---|---|
| Standard with tread | |
| Standard with wedge treads | |
| Springer | |
| KY springer | |
| Other (please specify) | |

**5.** Do you regularly check your stirrup lengths?

| | |
|---|---|
| Never | |
| 1 – 3 times a year | |
| 4 – 6 times a year | |
| More than 6 times a year | |

**6.** Rein type:

| | |
|---|---|
| Webb | |
| Leather | |
| Synthetic | |
| Pleated | |
| Other (please specify) | |

**7.** Type of bit:

| | |
|---|---|
| Snaffle | |
| Pelham | |
| Portuguese gag (2/3 rings) | |

| | |
|---|---|
| Double bridle | |
| Other (please specify) | |

**8.** Please grade the following artificial aids in order of most used (1) to least used (8):

| | Rating |
|---|---|
| Whip | |
| Spurs | |
| Running martingale | |
| Running reins | |
| Market harborourgh | |
| Elastic neck stretcher | |
| De gouge | |
| Other (please specify) | |

**9.** How often on average do you use the following facilities during a training week on one horse?

| | 1 -2 times | 3 –4 times | 5 -6 times | 7 -8 times |
|---|---|---|---|---|
| Dressage arena | | | | |
| Showjumps | | | | |
| Crosscountry jumps | | | | |

**10.** How is your horse to ride?

| | |
|---|---|
| Easy | |
| Average | |
| Difficult | |

**11.** Do you wear any of the following protective equipment (more than one answer is possible)?

| | Flatwork | Jumping | Hacking | Competing |
|---|---|---|---|---|
| Helmet | | | | |
| Gloves | | | | |
| Long boots/gators | | | | |
| Back brace/support | | | | |
| Body | | | | |

| | | | | |
|---|---|---|---|---|
| protector | | | | |
| Other (please specify) | | | | |

## PART D: HISTORY OF INJURY

**1.** Do you have any of the following medical conditions?

| | |
|---|---|
| Anaemia | |
| Diabetes | |
| Osteoporosis | |
| High blood pressure | |
| High cholesterol | |
| Respiratory problems | |
| Musculoskeletal problems | |
| Other (please specify) | |

**2.** Have you had any of the following in the past?

| | Due to riding | Not related to riding |
|---|---|---|
| Orthopaedic surgery | | |
| Concussions | | |
| Any fractures or dislocations | | |
| Any muscle strain/sprain/tears | | |
| Connective tissue injuries (tendons/ligaments) | | |
| Hospital admission(s) | | |

**3.** Have you injured any of the following? (One or more answers are possible) and give a brief detail (eg. Fracture, sprain)

| | Whilst riding | | Not related to riding | |
|---|---|---|---|---|
| | once | 2 or more | once | 2 or more |
| Wrist | | | | |
| Elbow | | | | |
| Shoulder | | | | |
| Head/Neck/Facial | | | | |
| Knee/ Thigh | | | | |
| Chest | | | | |
| Abdomen | | | | |
| Genital | | | | |
| Foot/Ankle | | | | |
| Back | | | | |

| | | | | |
|---|---|---|---|---|
| Hand | | | | |
| Other (please specify) | | | | |

**4.** Please grade the following mechanisms of injuries that you have experienced from most severe (1) to least severe (8) if applicable:

| | Rating |
|---|---|
| Forceful fall off the horse (thrown off) | |
| Fall off the horse onto own feet | |
| Dislodged from saddle (not touching ground) | |
| Accident involving motor vehicle whilst riding | |
| Schooling | |
| Hacking | |
| Jumping | |
| Rider and horse fall | |

**5.** How many riding sessions and competitions did you miss in the last year due to injury?

| | Whilst riding | Not related to riding |
|---|---|---|
| 0 | | |
| 1 – 2 | | |
| 3 – 4 | | |
| 5 – 6 | | |
| 6 – 7 | | |
| More than 8 | | |

**6.** From who have you received treatment previously? (One or more answers are possible).

| | |
|---|---|
| Biokineticist | |
| Chiropractic | |
| Paramedic | |
| GP | |
| Physiotherapy | |
| Self treatment | |
| Specialist | |
| Sports massage therapist | |
| Other (please specify) | |

**7.** If you have been injured or are in pain do you take pain medication in order to continue riding?

| | |
|---|---|
| No | |
| Daily | |
| Weekly | |
| Monthly | |
| Occasionally | |

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

# Appendix L

## Pre-test Evaluation

1 What is your opinion of the subject presented in this questionnaire?
(Please mark the most appropriate box)

- 1.1 Extremely interesting ☐
- 1.2 Interesting ☐
- 1.3 Average ☐
- 1.4 Boring ☐
- 1.5 Very boring ☐

2 Do you think the topics raised in this questionnaire were adequately covered?

- 2.1 Yes ☐
- 2.2 No ☐

3 What is your opinion about the covering letter?
(Please mark one box only)

- 3.1 Very clear ☐
- 3.2 Clear ☐
- 3.3 Adequate ☐
- 3.4 Unclear ☐
- 3.5 Needs revising ☐

4 How would you describe the instructions accompanying each of the questions?
(Please mark one box only)

- 4.1 Very clear ☐
- 4.2 Clear ☐
- 4.3 Adequate ☐
- 4.4 Unclear ☐
- 4.5 Needs revising ☐

5 Do you think the questionnaire is too long?

- 5.1 Yes ☐
- 5.2 No ☐

6 What is your opinion of the wording of the questionnaire?
(Please mark the appropriate box/es)

- 6.1 The meaning of **all questions** is absolutely clear ☐
- 6.2 The meaning of **most** questions is clear ☐
- 6.3 There is too much chiropractic/ medical jargon ☐
- 6.4 The questions will not be understood by lay persons ☐
- 6.5 The questionnaire needs to be revised because it is unclear ☐

If you had any difficulty answering any question/s, please write the number/s of the question/s in the space below with a suggestion on how the question/s can be improved?

_____
_____
_____
_____

Thank you for your most valuable time in helping me with my research project.

# Appendix M

## ETHICS CLEARANCE CERTIFICATE

| | | | |
|---|---|---|---|
| **Student Name** | **Jo-Anne Catlin** | **Student No** | **20300537** |
| **Ethics** | **FHSEC** | **Date of FRC Approval** | |
| **Research Title:** | A profile of horse riding injuries in adult horse riders registered with the KwaZulu Natal Horse Society. | | |

*In terms of the ethical considerations for the conduct of research in the Faculty of Health Sciences, Durban University of Technology, this proposal meets with Institutional requirements and confirms the following ethical obligations:*

1. The researcher has read and understood the research ethics policy and procedures as endorsed by the Durban University of Technology, has sufficiently answered all questions pertaining to ethics in the DUT 186 and agrees to comply with them.
2. The researcher will report any serious adverse events pertaining to the research to the Faculty of Health Sciences Research Ethics Committee.
3. The researcher will submit any major additions or changes to the research proposal after approval has been granted to the Faculty of Health Sciences Research Committee for consideration.
4. The researcher, with the supervisor and co-researchers will take full responsibility in ensuring that the protocol is adhered to.
5. ***The following section must be completed if the research involves human participants:***

| | YES | NO | N/A |
|---|---|---|---|
| ❖ Provision has been made to obtain informed consent of the participants | X | | |
| ❖ Potential psychological and physical risks have been considered and minimised | X | | |
| ❖ Provision has been made to avoid undue intrusion with regard to participants and community | X | | |
| ❖ Rights of participants will be safe-guarded in relation to:<br>- Measures for the protection of anonymity and the maintenance of Confidentiality. | X | | |
| - Access to research information and findings. | X | | |
| - Termination of involvement without compromise | X | | |
| - Misleading promises regarding benefits of the research | X | | |

_____ _____

SIGNATURE OF STUDENT/RESEARCHER DATE

_____ _____

SIGNATURE OF SUPERVISOR/S DATE

_____ _____

SIGNATURE OF HEAD OF DEPARTMENT DATE

_____ _____

SIGNATURE: CHAIRPERSON OF RESEARCH ETHICS COMMITTEE DATE

## Appendix N

### Table A: Type of injury by present eventing grade

| | | | Eventing presently | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | Welcome | Pre Novice | Novice | Intermediate | * and above | |
| Types of injuries due to riding(a) | Concussion due to riding | Count | 12 | 8 | 6 | 5 | 6 | 37 |
| | | % | 32.4% | 21.6% | 16.2% | 13.5% | 16.2% | |
| | Fractures due to riding | Count | 14 | 9 | 9 | 2 | 9 | 43 |
| | | % | 32.6% | 20.9% | 20.9% | 4.7% | 20.9% | |
| | Muscle strains due to riding | Count | 19 | 7 | 8 | 4 | 6 | 44 |
| | | % | 43.2% | 15.9% | 18.2% | 9.1% | 13.6% | |
| | Tendons due to riding | Count | 8 | 4 | 7 | 2 | 6 | 27 |
| | | % | 29.6% | 14.8% | 25.9% | 7.4% | 22.2% | |
| | None due to riding | Count | 4 | 3 | 1 | 1 | 0 | 9 |
| | | % | 44.4% | 33.3% | 11.1% | 11.1% | .0% | |
| Total | | Count | 27 | 15 | 12 | 8 | 12 | 74 |

**Table B: Type of injury by previous eventing grade**

| | | | Eventing previously | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | Welcome | Pre Novice | Novice | Intermediate | * and above | |
| Types of injuries due to riding(a) | Concussion due to riding | Count | 1 | 8 | 9 | 7 | 4 | 29 |
| | | % | 3.4% | 27.6% | 31.0% | 24.1% | 13.8% | |
| | Fractures due to riding | Count | 3 | 8 | 9 | 7 | 5 | 32 |
| | | % | 9.4% | 25.0% | 28.1% | 21.9% | 15.6% | |
| | Muscle strains due to riding | Count | 2 | 11 | 11 | 8 | 5 | 37 |
| | | % | 5.4% | 29.7% | 29.7% | 21.6% | 13.5% | |
| | Tendons due to riding | Count | 2 | 4 | 5 | 5 | 2 | 18 |
| | | % | 11.1% | 22.2% | 27.8% | 27.8% | 11.1% | |
| | None due to riding | Count | 1 | 1 | 1 | 1 | 0 | 4 |
| | | % | 25.0% | 25.0% | 25.0% | 25.0% | .0% | |
| Total | | Count | 4 | 15 | 14 | 10 | 6 | 49 |

**Table C: Type of injury by present dressage grade**

| | | | Dressage presently | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | Preliminary | Novice | Elementary | Elementary-medium | Medium | Advanced | |
| Types of injuries due to riding(a) | Concussion due to riding | Count | 9 | 11 | 7 | 4 | 3 | 1 | 35 |
| | | % | 25.7% | 31.4% | 20.0% | 11.4% | 8.6% | 2.9% | |
| | Fractures due to riding | Count | 10 | 11 | 6 | 3 | 2 | 4 | 36 |
| | | % | 27.8% | 30.6% | 16.7% | 8.3% | 5.6% | 11.1% | |
| | Muscle strains due to riding | Count | 13 | 14 | 6 | 6 | 3 | 3 | 45 |
| | | % | 28.9% | 31.1% | 13.3% | 13.3% | 6.7% | 6.7% | |
| | Tendons due to riding | Count | 8 | 5 | 4 | 4 | 1 | 0 | 22 |
| | | % | 36.4% | 22.7% | 18.2% | 18.2% | 4.5% | .0% | |
| | None due to riding | Count | 3 | 2 | 1 | 0 | 0 | 0 | 6 |
| | | % | 50.0% | 33.3% | 16.7% | .0% | .0% | .0% | |
| Total | | Count | 19 | 19 | 11 | 6 | 4 | 4 | 63 |

**Table D: Type of injury by previous dressage grade**

| | | | Dressage previously | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | Preliminary | Novice | Elementary | Elementary-medium | Medium | Advanced | |
| Types of injuries due to riding(a) | Concussion due to riding | Count | 1 | 4 | 11 | 4 | 1 | 1 | 22 |
| | | % | 4.5% | 18.2% | 50.0% | 18.2% | 4.5% | 4.5% | |
| | Fractures due to riding | Count | 1 | 3 | 9 | 4 | 2 | 1 | 20 |
| | | % | 5.0% | 15.0% | 45.0% | 20.0% | 10.0% | 5.0% | |
| | Muscle strains due to riding | Count | 1 | 4 | 9 | 5 | 2 | 2 | 23 |
| | | % | 4.3% | 17.4% | 39.1% | 21.7% | 8.7% | 8.7% | |
| | Tendons due to riding | Count | 1 | 4 | 3 | 3 | 1 | 2 | 14 |
| | | % | 7.1% | 28.6% | 21.4% | 21.4% | 7.1% | 14.3% | |
| | None due to riding | Count | 1 | 0 | 0 | 0 | 1 | 0 | 2 |
| | | % | 50.0% | .0% | .0% | .0% | 50.0% | .0% | |
| Total | | Count | 2 | 6 | 13 | 6 | 3 | 2 | 32 |

**Table E: Type of injury by previous show jumping grade**

| | | | Show jumping previously | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | 70cm | 80cm | 90cm | 1m | 1.10cm | 1.20 and above | |
| Types of injuries due to riding(a) | Concussion due to riding | Count | 3 | 1 | 4 | 9 | 6 | 13 | 36 |
| | | % | 8.3% | 2.8% | 11.1% | 25.0% | 16.7% | 36.1% | |
| | Fractures due to riding | Count | 4 | 1 | 3 | 11 | 8 | 11 | 38 |
| | | % | 10.5% | 2.6% | 7.9% | 28.9% | 21.1% | 28.9% | |
| | Muscle strains due to riding | Count | 5 | 1 | 4 | 12 | 7 | 14 | 43 |
| | | % | 11.6% | 2.3% | 9.3% | 27.9% | 16.3% | 32.6% | |
| | Tendons due to riding | Count | 6 | 0 | 2 | 6 | 7 | 9 | 30 |
| | | % | 20.0% | .0% | 6.7% | 20.0% | 23.3% | 30.0% | |
| | None due to riding | Count | 0 | 0 | 1 | 0 | 1 | 0 | 2 |
| | | % | .0% | .0% | 50.0% | .0% | 50.0% | .0% | |
| Total | | Count | 7 | 2 | 6 | 14 | 11 | 19 | 59 |

**Table F: Association between injured sites and activity during most severe fall.**

| | | | Activity during most severe fall | | | p value |
|---|---|---|---|---|---|---|
| | | | Hacking | Flatwork | Jumping | |
| Sites for riding injuries(a) | Wrist | Count | 15 | 3 | 34 | 0.409 |
| | | % | 28.8% | 5.8% | 65.4% | |
| | Elbow | Count | 1 | 3 | 9 | 0.139 |
| | | % | 7.7% | 23.1% | 69.2% | |
| | Shoulder | Count | 11 | 7 | 44 | 0.190 |
| | | % | 17.7% | 11.3% | 71.0% | |
| | Head | Count | 18 | 8 | 44 | 0.928 |
| | | % | 25.7% | 11.4% | 62.9% | |
| | Knee | Count | 6 | 2 | 20 | 0.641 |
| | | % | 21.4% | 7.1% | 71.4% | |
| | Chest | Count | 4 | 2 | 10 | 0.957 |
| | | % | 25.0% | 12.5% | 62.5% | |
| | Genital | Count | 1 | 0 | 3 | 0.777 |
| | | % | 25.0% | .0% | 75.0% | |
| | Foot | Count | 10 | 7 | 28 | 0.381 |
| | | % | 22.2% | 15.6% | 62.2% | |
| | Neck | Count | 12 | 3 | 31 | 0.603 |
| | | % | 26.1% | 6.5% | 67.4% | |
| | Mid back | Count | 5 | 2 | 18 | 0.653 |
| | | % | 20.0% | 8.0% | 72.0% | |
| | Low back | Count | 14 | 10 | 41 | 0.191 |
| | | % | 21.5% | 15.4% | 63.1% | |
| | Hip | Count | 5 | 3 | 8 | 0.382 |
| | | % | 31.3% | 18.8% | 50.0% | |
| Total | | Count | 38 | 15 | 97 | 150 |

**Table G: Horse breed by site of injury**

| | | | Horse breed | | | p value |
|---|---|---|---|---|---|---|
| | | | Thoroughbred | Warmblood | Other | |
| Sites for riding injuries(a) | Wrist | Count | 31 | 14 | 7 | 0.844 |
| | | % | 59.6% | 26.9% | 13.5% | |
| | Elbow | Count | 8 | 5 | 0 | 0.351 |
| | | % | 61.5% | 38.5% | .0% | |
| | Shoulder | Count | 38 | 19 | 5 | 0.571 |
| | | % | 61.3% | 30.6% | 8.1% | |
| | Head | Count | 40 | 20 | 9 | 0.842 |
| | | % | 58.0% | 29.0% | 13.0% | |
| | Knee | Count | 21 | 5 | 2 | 0.120 |
| | | % | 75.0% | 17.9% | 7.1% | |
| | Chest | Count | 9 | 6 | 1 | 0.623 |
| | | % | 56.3% | 37.5% | 6.3% | |
| | Genital | Count | 3 | 1 | 0 | 0.726 |
| | | % | 75.0% | 25.0% | .0% | |
| | Foot | Count | 28 | 9 | 9 | 0.067 |
| | | % | 60.9% | 19.6% | 19.6% | |
| | Neck | Count | 28 | 11 | 6 | 0.740 |
| | | % | 62.2% | 24.4% | 13.3% | |
| | Mid back | Count | 19 | 5 | 2 | 0.337 |
| | | % | 73.1% | 19.2% | 7.7% | |
| | Low back | Count | 38 | 22 | 6 | 0.484 |
| | | % | 57.6% | 33.3% | 9.1% | |
| | Hip | Count | 11 | 4 | 1 | 0.699 |
| | | % | 68.8% | 25.0% | 6.3% | |
| Total | | Count | 90 | 44 | 16 | 150 |

**Table H: Rating of Horse and site of injury**

| | | | Rate how you find your horse to ride | | | p value |
|---|---|---|---|---|---|---|
| | | | Easy | Average | Difficult | |
| Sites for riding injuries | Wrist | Count | 15 | 31 | 7 | 0.390 |
| | | % | 28.3% | 58.5% | 13.2% | |
| | Elbow | Count | 4 | 7 | 2 | |
| | | % | 30.8% | 53.8% | 15.4% | 0.820 |
| | Shoulder | Count | 15 | 32 | 15 | |
| | | % | 24.2% | 51.6% | 24.2% | 0.355 |
| | Head | Count | 20 | 41 | 9 | |
| | | % | 28.6% | 58.6% | 12.9% | 0.196 |
| | Knee | Count | 8 | 17 | 3 | |
| | | % | 28.6% | 60.7% | 10.7% | 0.486 |
| | Chest | Count | 2 | 11 | 3 | |
| | | % | 12.5% | 68.8% | 18.8% | 0.510 |
| | Genital | Count | 1 | 2 | 1 | |
| | | % | 25.0% | 50.0% | 25.0% | 0.939 |
| | Foot | Count | 13 | 25 | 8 | |
| | | % | 28.3% | 54.3% | 17.4% | 0.717 |
| | Neck | Count | 10 | 28 | 8 | |
| | | % | 21.7% | 60.9% | 17.4% | 0.856 |
| | Mid back | Count | 7 | 15 | 4 | |
| | | % | 26.9% | 57.7% | 15.4% | 0.859 |
| | Low back | Count | 17 | 36 | 13 | |
| | | % | 25.8% | 54.5% | 19.7% | 0.836 |
| | Hip | Count | 2 | 11 | 3 | |
| | | % | 12.5% | 68.8% | 18.8% | 0.510 |
| Total | | Count | 36 | 87 | 28 | 151 |

**Table I: Use of show jumps by sites of riding injury**

| | | | Show jumps | | | | | | p value |
|---|---|---|---|---|---|---|---|---|---|
| | | | Not used | 1-2 times | 3-4 times | 5-6 times | 7-8 times | > = 9 times | |
| Sites for riding injuries | Wrist | Count | 4 | 9 | 6 | 10 | 3 | 21 | 0.153 |
| | | % | 7.5% | 17.0% | 11.3% | 18.9% | 5.7% | 39.6% | |
| | Elbow | Count | 1 | 1 | 2 | 4 | 2 | 3 | 0.858 |
| | | % | 7.7% | 7.7% | 15.4% | 30.8% | 15.4% | 23.1% | |
| | Shoulder | Count | 6 | 8 | 8 | 11 | 4 | 25 | 0.273 |
| | | % | 9.7% | 12.9% | 12.9% | 17.7% | 6.5% | 40.3% | |
| | Head | Count | 9 | 10 | 10 | 13 | 9 | 19 | 0.938 |
| | | % | 12.9% | 14.3% | 14.3% | 18.6% | 12.9% | 27.1% | |
| | Knee | Count | 1 | 4 | 5 | 8 | 2 | 8 | 0.392 |
| | | % | 3.6% | 14.3% | 17.9% | 28.6% | 7.1% | 28.6% | |
| | Chest | Count | 2 | 0 | 1 | 5 | 1 | 7 | 0.360 |
| | | % | 12.5% | .0% | 6.3% | 31.3% | 6.3% | 43.8% | |
| | Genital | Count | 0 | 0 | 0 | 0 | 1 | 3 | 0.352 |
| | | % | .0% | .0% | .0% | .0% | 25.0% | 75.0% | |
| | Foot | Count | 6 | 5 | 3 | 12 | 5 | 15 | 0.592 |
| | | % | 13.0% | 10.9% | 6.5% | 26.1% | 10.9% | 32.6% | |
| | Neck | Count | 5 | 9 | 5 | 11 | 4 | 12 | 0.397 |
| | | % | 10.9% | 19.6% | 10.9% | 23.9% | 8.7% | 26.1% | |
| | Mid back | Count | 2 | 6 | 3 | 7 | 1 | 7 | 0.250 |
| | | % | 7.7% | 23.1% | 11.5% | 26.9% | 3.8% | 26.9% | |
| | Low back | Count | 12 | 7 | 7 | 9 | 10 | 21 | 0.360 |
| | | % | 18.2% | 10.6% | 10.6% | 13.6% | 15.2% | 31.8% | |
| | Hip | Count | 4 | 1 | 1 | 2 | 1 | 7 | 0.428 |
| | | % | 25.0% | 6.3% | 6.3% | 12.5% | 6.3% | 43.8% | |
| Total | | Count | 20 | 18 | 20 | 30 | 17 | 46 | 151 |

**Table J: Use of cross country jumps by sites of riding injury**

| | | | Cross country jumps | | | | | | p value |
|---|---|---|---|---|---|---|---|---|---|
| | | | Not used | 1-2 times | 3-4 times | 5-6 times | 7-8 times | > = 9 times | |
| Sites for riding injuries | Wrist | Count | 24 | 22 | 4 | 1 | 1 | 1 | 0.602 |
| | | % | 45.3% | 41.5% | 7.5% | 1.9% | 1.9% | 1.9% | |
| | Elbow | Count | 5 | 4 | 1 | 2 | 0 | 1 | 0.214 |
| | | % | 38.5% | 30.8% | 7.7% | 15.4% | .0% | 7.7% | |
| | Shoulder | Count | 28 | 21 | 8 | 2 | 2 | 1 | 0.745 |
| | | % | 45.2% | 33.9% | 12.9% | 3.2% | 3.2% | 1.6% | |
| | Head | Count | 36 | 24 | 4 | 5 | 1 | 0 | 0.148 |
| | | % | 51.4% | 34.3% | 5.7% | 7.1% | 1.4% | .0% | |
| | Knee | Count | 9 | 15 | 4 | 0 | 0 | 0 | 0.081 |
| | | % | 32.1% | 53.6% | 14.3% | .0% | .0% | .0% | |
| | Chest | Count | 7 | 6 | 3 | 0 | 0 | 0 | 0.714 |
| | | % | 43.8% | 37.5% | 18.8% | .0% | .0% | .0% | |
| | Genital | Count | 2 | 1 | 1 | 0 | 0 | 0 | 0.938 |
| | | % | 50.0% | 25.0% | 25.0% | .0% | .0% | .0% | |
| | Foot | Count | 24 | 14 | 6 | 0 | 2 | 0 | 0.214 |
| | | % | 52.2% | 30.4% | 13.0% | .0% | 4.3% | .0% | |
| | Neck | Count | 19 | 21 | 3 | 2 | 1 | 0 | 0.255 |
| | | % | 41.3% | 45.7% | 6.5% | 4.3% | 2.2% | .0% | |
| | Mid back | Count | 11 | 12 | 2 | 1 | 0 | 0 | 0.623 |
| | | % | 42.3% | 46.2% | 7.7% | 3.8% | .0% | .0% | |
| | Low back | Count | 33 | 23 | 5 | 4 | 0 | 1 | 0.528 |
| | | % | 50.0% | 34.8% | 7.6% | 6.1% | .0% | 1.5% | |
| | Hip | Count | 8 | 4 | 2 | 2 | 0 | 0 | 0.507 |
| | | % | 50.0% | 25.0% | 12.5% | 12.5% | .0% | .0% | |
| Total | | Count | 73 | 52 | 14 | 7 | 2 | 3 | 151 |

**Table K: Use of boots for foot injuries**

| | | | Foot | | p value |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Boots | Boots for flatwork | Count | 113 | 37 | 0.286 |
| | | % | 75.3% | 24.7% | |
| | Boots for jumping | Count | 104 | 36 | 0.802 |
| | | % | 74.3% | 25.7% | |
| | Boots forhacking | Count | 93 | 32 | 0.800 |
| | | % | 74.4% | 25.6% | |
| | Boots for competing | Count | 126 | 42 | 0.116 |
| | | % | 75.0% | 25.0% | |
| Total | | Count | 128 | 43 | 171 |

**Table L: Use of back brace for mid back injuries**

| | | | Mid back | | p value |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Brace(a) | Brace for flatwork | Count | 4 | 2 | 0.192 |
| | | % | 66.7% | 33.3% | |
| | Brace for jumping | Count | 5 | 2 | 0.294 |
| | | % | 71.4% | 28.6% | |
| | Brace for hacking | Count | 2 | 2 | 0.104 |
| | | % | 50.0% | 50.0% | |
| | Brace for competing | Count | 11 | 1 | 1.000 |
| | | % | 91.7% | 8.3% | |
| Total | | Count | 11 | 2 | 13 |

**Table M: Hours ride per week by sites injured due to riding**

| | | | Hours ride per week | | | | | | p value |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0-2 | 3-4 | 5-6 | 7-8 | 9-10 | > 11 | |
| Sites injured due to riding | Wrist | Count | 3 | 10 | 11 | 8 | 4 | 17 | 0.165 |
| | | % | 5.7% | 18.9% | 20.8% | 15.1% | 7.5% | 32.1% | |
| | Elbow | Count | 0 | 2 | 3 | 3 | 1 | 4 | 0.950 |
| | | % | .0% | 15.4% | 23.1% | 23.1% | 7.7% | 30.8% | |
| | Shoulder | Count | 2 | 6 | 14 | 10 | 7 | 22 | 0.533 |
| | | % | 3.3% | 9.8% | 23.0% | 16.4% | 11.5% | 36.1% | |
| | Head | Count | 3 | 10 | 17 | 11 | 7 | 22 | 0.689 |
| | | % | 4.3% | 14.3% | 24.3% | 15.7% | 10.0% | 31.4% | |
| | Knee | Count | 1 | 5 | 6 | 4 | 2 | 9 | 0.732 |
| | | % | 3.7% | 18.5% | 22.2% | 14.8% | 7.4% | 33.3% | |
| | Chest | Count | 0 | 0 | 7 | 2 | 2 | 5 | 0.384 |
| | | % | .0% | .0% | 43.8% | 12.5% | 12.5% | 31.3% | |
| | Genital | Count | 0 | 0 | 1 | 0 | 0 | 3 | 0.363 |
| | | % | .0% | .0% | 25.0% | .0% | .0% | 75.0% | |
| | Foot | Count | 2 | 5 | 12 | 7 | 3 | 17 | 0.435 |
| | | % | 4.3% | 10.9% | 26.1% | 15.2% | 6.5% | 37.0% | |
| | Neck | Count | 1 | 8 | 10 | 6 | 9 | 11 | 0.297 |
| | | % | 2.2% | 17.8% | 22.2% | 13.3% | 20.0% | 24.4% | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mid back | Count | 0 | 5 | 4 | 7 | 3 | 6 | 0.402 |
| | | % | .0% | 20.0% | 16.0% | 28.0% | 12.0% | 24.0% | |
| | Low back | Count | 3 | 12 | 16 | 11 | 8 | 16 | 0.482 |
| | | % | 4.5% | 18.2% | 24.2% | 16.7% | 12.1% | 24.2% | |
| | Hip | Count | 1 | 1 | 6 | 2 | 2 | 4 | 0.830 |
| | | % | 6.3% | 6.3% | 37.5% | 12.5% | 12.5% | 25.0% | |
| Total | | Count | 5 | 20 | 38 | 25 | 19 | 43 | 150 |

**Table N: Minutes per training session by sites injured due to riding**

| | | | Minutes per training session | | | | | p value |
|---|---|---|---|---|---|---|---|---|
| | | | 1-15 | 16-30 | 31-45 | 46-60 | >61 | |
| Sites injured due to riding | Wrist | Count | 1 | 5 | 32 | 13 | 2 | 0.900 |
| | | % | 1.9% | 9.4% | 60.4% | 24.5% | 3.8% | |
| | Elbow | Count | 0 | 0 | 9 | 4 | 0 | 0.711 |
| | | % | .0% | .0% | 69.2% | 30.8% | .0% | |
| | Shoulder | Count | 1 | 5 | 41 | 15 | 0 | 0.335 |
| | | % | 1.6% | 8.1% | 66.1% | 24.2% | .0% | |
| | Head | Count | 1 | 4 | 49 | 14 | 2 | 0.133 |
| | | % | 1.4% | 5.7% | 70.0% | 20.0% | 2.9% | |
| | Knee | Count | 0 | 1 | 20 | 5 | 2 | 0.206 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | % | .0% | 3.6% | 71.4% | 17.9% | 7.1% | |
| | Chest | Count | 0 | 0 | 8 | 8 | 0 | 0.248 |
| | | % | .0% | .0% | 50.0% | 50.0% | .0% | |
| | Genital | Count | 0 | 1 | 3 | 0 | 0 | 0.617 |
| | | % | .0% | 25.0% | 75.0% | .0% | .0% | |
| | Foot | Count | 0 | 4 | 28 | 13 | 1 | 0.928 |
| | | % | .0% | 8.7% | 60.9% | 28.3% | 2.2% | |
| | Neck | Count | 0 | 3 | 31 | 11 | 1 | 0.638 |
| | | % | .0% | 6.5% | 67.4% | 23.9% | 2.2% | |
| | Mid back | Count | 0 | 2 | 15 | 8 | 1 | 0.965 |
| | | % | .0% | 7.7% | 57.7% | 30.8% | 3.8% | |
| | Low back | Count | 1 | 8 | 36 | 17 | 4 | 0.231 |
| | | % | 1.5% | 12.1% | 54.5% | 25.8% | 6.1% | |
| | Hip | Count | 0 | 1 | 11 | 3 | 1 | 0.741 |
| | | % | .0% | 6.3% | 68.8% | 18.8% | 6.3% | |
| Total | | Count | 2 | 15 | 92 | 38 | 4 | 151 |

**Table O: Number of horses ridden by sites injured due to riding**

| | | | How many horses riding on regular basis | | | | p value |
|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 or more | |
| Sites injured due to riding | Wrist | Count | 16 | 21 | 4 | 11 | 0.302 |
| | | % | 30.8% | 40.4% | 7.7% | 21.2% | |
| | Elbow | Count | 4 | 5 | 2 | 2 | 0.869 |
| | | % | 30.8% | 38.5% | 15.4% | 15.4% | |
| | Shoulder | Count | 20 | 18 | 6 | 18 | 0.174 |
| | | % | 32.3% | 29.0% | 9.7% | 29.0% | |
| | Head | Count | 27 | 19 | 6 | 17 | 0.451 |
| | | % | 39.1% | 27.5% | 8.7% | 24.6% | |
| | Knee | Count | 8 | 8 | 3 | 8 | 0.572 |
| | | % | 29.6% | 29.6% | 11.1% | 29.6% | |
| | Chest | Count | 4 | 6 | 0 | 6 | 0.132 |
| | | % | 25.0% | 37.5% | .0% | 37.5% | |
| | Genital | Count | 0 | 1 | 1 | 2 | 0.253 |
| | | % | .0% | 25.0% | 25.0% | 50.0% | |
| | Foot | Count | 14 | 15 | 4 | 13 | 0.345 |
| | | % | 30.4% | 32.6% | 8.7% | 28.3% | |
| | Neck | Count | 17 | 14 | 7 | 7 | 0.680 |
| | | % | 37.8% | 31.1% | 15.6% | 15.6% | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mid back | Count | 11 | 8 | 1 | 6 | 0.593 |
| | | % | 42.3% | 30.8% | 3.8% | 23.1% | |
| | Low back | Count | 28 | 17 | 9 | 11 | 0.405 |
| | | % | 43.1% | 26.2% | 13.8% | 16.9% | |
| | Hip | Count | 8 | 3 | 2 | 3 | 0.633 |
| | | % | 50.0% | 18.8% | 12.5% | 18.8% | |
| Total | | Count | 51 | 50 | 16 | 33 | 150 |

**Table P: Number of hours of instruction by sites injured due to riding**

| | | | Hours of formal instruction per month | | | | p value |
|---|---|---|---|---|---|---|---|
| | | | 0 | 1-4 | 5-8 | >=9 | |
| Sites injured due to riding | Wrist | Count | 11 | 18 | 16 | 7 | 0.575 |
| | | % | 21.2% | 34.6% | 30.8% | 13.5% | |
| | Elbow | Count | 1 | 5 | 4 | 3 | 0.805 |
| | | % | 7.7% | 38.5% | 30.8% | 23.1% | |
| | Shoulder | Count | 9 | 26 | 14 | 13 | 0.236 |
| | | % | 14.5% | 41.9% | 22.6% | 21.0% | |
| | Head | Count | 11 | 22 | 24 | 12 | 0.667 |
| | | % | 15.9% | 31.9% | 34.8% | 17.4% | |
| | Knee | Count | 3 | 11 | 6 | 7 | 0.359 |
| | | % | 11.1% | 40.7% | 22.2% | 25.9% | |
| | Chest | Count | 4 | 7 | 2 | 3 | 0.356 |
| | | % | 25.0% | 43.8% | 12.5% | 18.8% | |
| | Genital | Count | 1 | 0 | 1 | 2 | 0.192 |
| | | % | 25.0% | .0% | 25.0% | 50.0% | |
| | Foot | Count | 11 | 18 | 10 | 6 | 0.169 |
| | | % | 24.4% | 40.0% | 22.2% | 13.3% | |
| | Neck | Count | 6 | 20 | 16 | 3 | 0.191 |
| | | % | 13.3% | 44.4% | 35.6% | 6.7% | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mid back | Count | 4 | 11 | 9 | 2 | 0.644 |
| | | % | 15.4% | 42.3% | 34.6% | 7.7% | |
| | Low back | Count | 11 | 24 | 22 | 7 | 0.528 |
| | | % | 17.2% | 37.5% | 34.4% | 10.9% | |
| | Hip | Count | 3 | 4 | 5 | 4 | 0.635 |
| | | % | 18.8% | 25.0% | 31.3% | 25.0% | |
| Total | | Count | 24 | 58 | 43 | 24 | 149 |

**Table Q: Length of time of instruction by sites injured due to riding**

| | | | How long have you received formal instruction | | | | | p value |
|---|---|---|---|---|---|---|---|---|
| | | | Never | < 1 year | 1-5 years | 6-10 years | > 11 years | |
| Sites injured due to riding | Wrist | Count | 3 | 1 | 8 | 11 | 26 | 0.370 |
| | | % | 6.1% | 2.0% | 16.3% | 22.4% | 53.1% | |
| | Elbow | Count | 1 | 1 | 4 | 1 | 5 | 0.580 |
| | | % | 8.3% | 8.3% | 33.3% | 8.3% | 41.7% | |
| | Shoulder | Count | 2 | 4 | 11 | 14 | 29 | 0.967 |
| | | % | 3.3% | 6.7% | 18.3% | 23.3% | 48.3% | |
| | Head | Count | 2 | 1 | 13 | 17 | 33 | 0.255 |
| | | % | 3.0% | 1.5% | 19.7% | 25.8% | 50.0% | |
| | Knee | Count | 0 | 2 | 4 | 8 | 12 | 0.636 |
| | | % | .0% | 7.7% | 15.4% | 30.8% | 46.2% | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Chest | Count | 1 | 2 | 2 | 2 | 9 | 0.551 |
| | | % | 6.3% | 12.5% | 12.5% | 12.5% | 56.3% | |
| | Genital | Count | 0 | 0 | 1 | 1 | 2 | 0.974 |
| | | % | .0% | .0% | 25.0% | 25.0% | 50.0% | |
| | Foot | Count | 4 | 1 | 7 | 8 | 22 | 0.148 |
| | | % | 9.5% | 2.4% | 16.7% | 19.0% | 52.4% | |
| | Neck | Count | 2 | 4 | 7 | 9 | 22 | 0.785 |
| | | % | 4.5% | 9.1% | 15.9% | 20.5% | 50.0% | |
| | Mid back | Count | 2 | 2 | 4 | 7 | 11 | 0.792 |
| | | % | 7.7% | 7.7% | 15.4% | 26.9% | 42.3% | |
| | Low back | Count | 1 | 5 | 13 | 12 | 32 | 0.524 |
| | | % | 1.6% | 7.9% | 20.6% | 19.0% | 50.8% | |
| | Hip | Count | 0 | 0 | 4 | 5 | 7 | 0.633 |
| | | % | .0% | .0% | 25.0% | 31.3% | 43.8% | |
| Total | | Count | 6 | 8 | 27 | 33 | 71 | 145 |

**Table R: Association between riding and non riding related wrist injuries**

| | | | Wrist injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Wrist injury riding related | No | Count | 111 | 12 | 123 |
| | | % | 90.2% | 9.8% | 100.0% |
| | Yes | Count | 44 | 9 | 53 |
| | | % | 83.0% | 17.0% | 100.0% |
| Total | | Count | 155 | 21 | 176 |
| | | % | 88.1% | 11.9% | 100.0% |

p=0.175

**Table S: Association between riding and non riding related shoulder injuries**

| | | | Shoulder injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Shoulder injury riding related | No | Count | 104 | 10 | 114 |
| | | % | 91.2% | 8.8% | 100.0% |
| | Yes | Count | 53 | 9 | 62 |
| | | % | 85.5% | 14.5% | 100.0% |
| Total | | Count | 157 | 19 | 176 |
| | | % | 89.2% | 10.8% | 100.0% |

p=0.241

**Table T: Association between riding and non riding related head injuries**

| | | | Head injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Head injury riding related | No | Count | 95 | 11 | 106 |
| | | % | 89.6% | 10.4% | 100.0% |
| | Yes | Count | 58 | 12 | 70 |
| | | % | 82.9% | 17.1% | 100.0% |
| Total | | Count | 153 | 23 | 176 |
| | | % | 86.9% | 13.1% | 100.0% |

p=0.192

**Table U: Association between riding and non riding related knee injuries**

| | | | Knee injury Non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Knee injury riding related | No | Count | 138 | 10 | 148 |
| | | % | 93.2% | 6.8% | 100.0% |
| | Yes | Count | 27 | 1 | 28 |
| | | % | 96.4% | 3.6% | 100.0% |
| Total | | Count | 165 | 11 | 176 |
| | | % | 93.8% | 6.3% | 100.0% |

p=1.000

**Table V: Association between riding and non riding related chest injuries**

| | | | Chest injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Chest injury riding related | No | Count | 157 | 3 | 160 |
| | | % | 98.1% | 1.9% | 100.0% |
| | Yes | Count | 14 | 2 | 16 |
| | | % | 87.5% | 12.5% | 100.0% |
| Total | | Count | 171 | 5 | 176 |
| | | % | 97.2% | 2.8% | 100.0% |

p=0.066

**Table W: Association between riding and non riding related genital injuries**

| | | | Genital injury non riding related | Total |
|---|---|---|---|---|
| | | | No | |
| Genital injury riding related | No | Count | 172 | 172 |
| | | % | 100.0% | 100.0% |
| | Yes | Count | 4 | 4 |
| | | % | 100.0% | 100.0% |
| Total | | Count | 176 | 176 |
| | | % | 100.0% | 100.0% |

**Table X: Association between riding and non riding related foot injuries**

| | | | Foot injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Foot injury riding related | No | Count | 98 | 32 | 130 |
| | | % | 75.4% | 24.6% | 100.0% |
| | Yes | Count | 38 | 8 | 46 |
| | | % | 82.6% | 17.4% | 100.0% |
| Total | | Count | 136 | 40 | 176 |
| | | % | 77.3% | 22.7% | 100.0% |

p=0.315

**Table Y: Association between riding and non riding related mid back injuries**

| | | | Mid back non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Mid back injury riding related | No | Count | 149 | 1 | 150 |
| | | % | 99.3% | .7% | 100.0% |
| | Yes | Count | 25 | 1 | 26 |
| | | % | 96.2% | 3.8% | 100.0% |
| Total | | Count | 174 | 2 | 176 |
| | | % | 98.9% | 1.1% | 100.0% |

p=0.274

**Table Z: Association between riding and non riding related low back injuries**

| | | | Low back injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Low back injury riding related | No | Count | 108 | 2 | 110 |
| | | % | 98.2% | 1.8% | 100.0% |
| | Yes | Count | 64 | 2 | 66 |
| | | % | 97.0% | 3.0% | 100.0% |
| Total | | Count | 172 | 4 | 176 |
| | | % | 97.7% | 2.3% | 100.0% |

p=0.613

**Table AA: Association between riding and non riding related hip injuries**

| | | | Hip injury non riding related | | Total |
|---|---|---|---|---|---|
| | | | No | Yes | |
| Hip injury riding related | No | Count | 159 | 1 | 160 |
| | | % | 99.4% | .6% | 100.0% |
| | Yes | Count | 16 | 0 | 16 |
| | | % | 100.0% | .0% | 100.0% |
| Total | | Count | 175 | 1 | 176 |
| | | % | 99.4% | .6% | 100.0% |

p=1.000