Dietary intake, energy availability and weight control practices of male apprentice jockeys residing at the SA Jockey Academy

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ABSTRACT

INTRODUCTION

Professional jockeys are considered elite sportsmen competing in a sport with certain weight restrictions. Horse racing is categorized as a “weight-making” sport where jockeys can benefit from attaining and/or maintaining a specific weight for competition. The minimum riding weight for professional jockeys and apprentice jockeys who are race riding is currently 52 kg. The lighter the jockey (i.e. the closer he can remain to the minimum weight of 52 kg) the more rides may be allocated to him (and the more money he will earn). This places a great deal of pressure on the jockey to maintain a low body weight, in order to attain rides. Unlike other weight category sports, horse riding does not have an “off season”, therefore jockeys are constantly pressured to maintain a minimal weight. Consequently this may result in unhealthy eating habits, dangerous weight control practices and compromised health. Research on the weight making practices of apprentice jockeys is scarce. In fact, there is currently no published data available on the South African apprentice jockey. The aim of this study was therefore to examine the dietary intake, energy availability and weight control practices of male apprentice jockeys residing at the South African Jockey Academy.

METHODS

Twenty one male flat jockey apprentices of different race groups, between the ages of 16 and 20 years were recruited to take part in this cross sectional observational study. Height, weight and body composition (body fat percentage and fat free mass) were measured. The apprentices completed a 59-item nutrition, health and lifestyle questionnaire including questions on weight control and weight making practices. Dietary intake was recorded with a 24-hour dietary recall on four non-consecutive days including a rest day, two training days, and a race day. On these days, exercise energy expenditure was also recorded with Actiheart© monitors with the aim to calculate energy availability.

MAIN FINDINGS

Total mean reported energy intake of the participants was 7088±2337kJ (35.5±12.5kcal/kg fat free mass [FFM]) and below the recommendations for athletes exercising several hours per day for most days of the week. The micronutrient intakes of the majority of these jockeys were also low (i.e. <67% of recommended intake). Mean calculated energy availability (EA) over two training days and one rest day was 27.1±16.7 kcal/kg FFM and regarded as low (i.e.<30kcal/kg/FFM). Furthermore, the majority of apprentices (88%) had a low EA on the training days. Ninety one percent of the jockeys reported the use of one or more weight control method including food avoidance (81%), restricting food intake and skipping meals

(67%), exercising to sweat (48%) and using the sauna (43%). The top three reported side effects from making weight included thirst (80%), hunger (75%) and tiredness (75%).

CONCLUSION

In conclusion, the results of the present study showed that the majority of South African apprentice jockeys are practicing weight control methods, specifically restricting energy and food intake, to control their weight. This was supported by the mean low dietary energy intake and sub-optimal mean energy availability. These apprentice jockeys are therefore at risk for long-term health consequences including low bone mineral density.

KEY WORDS: Apprentice jockey; weight control methods; energy availability

OPSOMMING

INLEIDING

Professionele jokkies word beskou as elite sportlui, wat kompeterend aan ’n sportsoort met gewigsbeperkinge deelneem. Perdewedrenne word geklassifiseer as ’n sportsoort waarin gewig ’n belangrike rol speel, dit wil sê daar word van jokkies verwag om ’n spesifieke gewig te hê en te handhaaf om aan kompetisies deel te neem. Die minimum gewigsvereiste vir professionele jokkies asook leerlingjokkies wat aan wedrenne deelneem is tans 52 kg. Hoe ligter die jokkie (m.a.w. hoe nader hy aan die minimum gewig van 52 kg is), hoe meer wedrenne sal aan hom toegestaan word (en hoe meer geld sal hy verdien). Daar is dus baie druk op jokkies om hul doelgewig te handhaaf. Anders as ander sportsoorte waar gewig ’n belangrike rol speel, het perdewedrenne nie ’n “af seisoen” nie en is jokkies voortdurend onder druk om ’n minimale gewig te handhaaf. Hierdie druk kan gevolglik bydra tot ongesonde eetgewoontes, gevaarlike gewigsbeheerpraktyke en gesondheidsprobleme. Navorsing oor die gewigsbeheerpraktyke van leerlingjokkies is skaars. Trouens, daar is tans geen gepubliseerde data beskikbaar oor die Suid-Afrikaanse leerlingjokkie nie. Die doel van hierdie studie was dus om die dieetinname, energiebeskikbaarheid en gewigsbeheerpraktyke van manlike leerlingjokkies, woonagtig by die Suid-Afrikaanse Jokkie Akademie, te bestudeer.

METODES

Een-en-twintig leerlingjokkies van verskillende rasse, tussen 16 en 20-jarige ouderdom, is gewerf om deel te neem aan hierdie deursnee waarnemingstudie. Lengte, gewig en liggaamsamestelling (liggaamsvetpersentasie en vetvrye massa) is gemeet. Die deelnemers het ’n 59-item vraelys oor voeding, gesondheid en leefstyl voltooi, wat vrae oor gewigsbeheer en gewigsbeheerpraktyke insluit. Dieetinname is gemeet met behulp van ‘n 24-uur dieet herroepvorm op vier nie-opeenvolgende dae, insluitende ’n rusdag, twee oefendae, en een wedrendag. Op hierdie dae is hul energieverbruik tydens oefening ook gemonitor met behulp van Actiheart© monitors, met die doel om energiebeskikbaarheid te bereken.

RESULTATE

Die totale gemiddelde energie-inname van die deelnemers was 7088±2337kJ (35.5±12.5kcal/kg vetvrye massa), wat minder is as die aanbevelings vir atlete wat veelvoudige ure per dag vir die grootste gedeelte van die week oefen. Die mikronutriënt-inname van die meeste van hierdie jokkies was ook laag (i.e. <67% van die aanbevole

inname). Die gemiddelde berekende energiebeskikbaarheid (EB) oor twee oefendae en een rus dag was 27.1±16.7 kcal/kg vetvry massa en dus laag (<30kcal/kg/vetvry massa). Die meerderheid jokkies (88%) het verder ‘n lae EB gehad op die oefendae. Een-en-negentig present van die jokkies het die gebruik van een of meer gewigsbeheermetode gerapporteer, wat die vermyding van voedsel (81%), beperkte voedselinname en oorslaan van etes (67%), oefen om te sweet (48%) en die gebruik van ’n sauna (43%) insluit. Die top drie gerapporteerde newe-effekte van gewigsbeheer was dors (80%), honger (75%) en moegheid (75%).

GEVOLGTREKKING

Die resultate van hierdie studie toon dat die meeste Suid-Afrikaanse leerlingjokkies gewigsbeheerpraktyke beoefen, veral deur middel van beperkte energie-inname om hul gewig te beheer. Dit word ondersteun deur die gemiddelde lae dieetinname en sub-optimale gemiddelde energiebeskikbaarheid. Hierdie leerlingjokkies loop dus op die langtermyn die risiko om gesondheidsprobleme op te tel, insluitende lae beendigtheid.

SLEUTELTERME: Leerlingjokkie; gewigsbeheermetodes; energiebeskikbaarheid

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

µg	microgram
ACSM	American College of Sports Medicine
ACSN	American College of Sports Nutrition
ADA	American Dietetic Association
BDM	Bone Mineral Density
BMR	Basal Metabolic Rate
BRUMS	Brunel Mood Scale
BW	Body Weight
CHO	Carbohydrate
CNS	Central Nervous System
DE	Disordered Eating
EA	Energy Availability
EAT -26	Eating Attitudes Test 26
Ed	Edition
EDNOS	Non Specific Eating Disorders
estEEE	Estimated Exercise Energy Expended
EI	Energy Intake
FFM	Fat Free Mass
g	Gram
IOC	International Olympic Committee
ISSN	International Society for Sports Nutrition

kcal	Kilocalorie
kg	Kilogram
kJ	Kilojoule
n/r	Not Recorded
NHASA	National Horse Racing Association of South Africa
NICUS	Nutrition Information Centre University of Stellenbosch
NSAIDs	Non-steroidal Anti-inflammatory Drugs
PAC	Physical Activity Calculation
PAL	Physical Activity Level
RDA	Recommended Dietary Allowance
RDI	Recommended Dietary Intake
SAJA	South African Jockey Academy
SD	Standard Deviation
Usg	Urine specific gravity

LIST OF ADDENDA

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Professional jockeys are considered elite sportsmen competing in a sport with certain weight restrictions. Horse racing is categorized as a "weight-making" sport where jockeys are required to attain and maintain a specific weight for competition. In order to 'level the playing field' during competition, the National Horse Racing Authority (NHA) of South Africa adopted the "merit handicapping" system, which is a method of allocating weight impediments to horses to equalize their chances to win. A handicap is defined as the total weight (i.e. jockey and his riding gear/saddle) a horse carries in a race. A specific handicap/weight is allocated to each horse on entering a race, and the horse may not carry more than 1.5 kg over the weight allocated to it (Specogna, 2005).

The minimum riding weight for professional jockeys and apprentice jockeys who are race riding is currently 52 kg. The lighter the jockey (i.e. the closer he can remain to the minimum weight of 52 kg) the more rides may be allocated to him (and the more money he will earn). The heavier the jockey, the less number of rides he can accept. The practice of weight control places a great deal of pressure on the professional as well as apprentice jockey to be at an optimal/minimal weight before each race. Unlike other weight category sports, horse racing does not have an "off season" therefore jockeys are constantly pressured to maintain a minimal weight (Warrington *et al*., 2009:543). Consequently this may result in unhealthy eating habits, dangerous weight control practices and compromised health.

It is not uncommon for professional jockeys to engage in a number of acute and chronic weight making practices including energy and fluid restriction, use of saunas and steam rooms, sweating with excessive exercise and the use of laxatives and diuretics (King & Mezey, 1987:249, Labadarios *et al*., 1993:97, Leydon & Wall, 2002:220, Moore *et al*., 2002:1, Dolan *et al*., 2011:791). Furthermore, there is a growing body of evidence to suggest that these methods employed to 'make weight', are indeed having adverse effects not only on performance, but also on the physical and mental health of jockeys (Caufield & Karageorghis, 2008; Warrington *et al*., 2009:543; Wilson, Drust *et al*., 2014; Wilson, Hawken *et al*., 2014). In addition to sub-optimal energy, carbohydrate and micronutrient intakes in a group of New Zealand jockeys, Leydon and Wall (2002:221) reported that 20% of the jockeys showed signs of disordered eating, including food avoidance, binging and purging. Training with a low energy availability, with or without disordered eating, has previously been shown to impact physiological function and bone health, not only in female athletes, but also

in male athletes (Sundgot-Borgen *et al*., 2013). Warrington *et al*. (2009) examined a range of physiological health parameters, including bone health, in a group of elite male horse racing jockeys. Of concern was the high prevalence of osteopenia (52%) and reported racing related fractures (78%) in this group, contributed in part, by a low energy availability (Warrington *et al*., 2009). More extreme/acute weight making practices, specifically those resulting in severe dehydration, have resulted in serious physical disabilities, including death, especially in sports like wrestling and boxing (Sundgot-Borgen *et al*., 2013).

The apprentice jockey is a trainee jockey, and can only receive a professional jockey license after he has had 50 wins while race riding as an apprentice. The minimum riding weight for apprentice jockeys who are race riding is also set at 52 kg therefore they are subjected to the same stringent weight rules that apply to the professional jockey. As a result apprentice jockeys are also pressurised to maintain a low body weight. Furthermore, since the apprentice jockeys are in constant contact with the professional jockeys at all race meetings and at track, they may adopt the weight making practices of the professional jockeys and 'learn' from them how to control their weight, (Labadarios *et al*., 1993; Warrington *et al*., 2009). Warrington *et al*. (2009), has also shown that the trainee weight of apprentices entering the Racing Academy in Ireland has increased by 37% since the early 1900s, however the minimum riding weight for the professional Irish jockey has only increased by 6%, making it even harder for these new apprentices to 'make the weight'.

Research on the dietary intake, energy availability and weight making practices of apprentice jockeys is scarce. Although a number of authors have pooled data from apprentice jockeys together with professional jockeys in their participant sample (Leydon & Wall, 2002; Moore *et al*., 2002), to our knowledge, no study has examined the weight making practices of apprentices jockeys only. There is also no published data available specifically on the South African apprentice jockey.

1.2 AIMS AND OBJECTIVES

The aim of this study is to examine the dietary intake, energy availability and weight control practices of male apprentice jockeys residing at the South African Jockey Academy in Shongweni, KwaZulu Natal.

Specific objectives

- To calculate the reported total energy, macronutrient and micronutrient intakes of apprentice jockeys;

- To determine the estimated energy expenditure and energy availability of apprentice jockeys;

- To determine weight control practices of apprentice jockeys.

1.3 HYPOTHESIS

South African male apprentice jockeys living at Shongweni Apprentice Academy, KwaZulu Natal, are engaging in a number of weight control practices and have sub-optimal dietary and energy intakes that do not meet their daily energy expenditure and macro- and micronutrient needs.

1.4 RESEARCH TEAM

Title	Affiliation	Role in the study
Dr. L Havemann-Nel	Centre of Excellence for Nutrition (CEN), North West University(NWU), Potchefstroom Campus	Supervisor of the MSc dissertation. Guidance regarding protocol, writing of the literature review, statistical analysis, interpretation of results and writing up of data.
Dr. H H Wright	School of Health and Sport Sciences, University of the Sunshine Coast, Australia, Queensland	Co-supervisor of the MSc dissertation, guidance regarding protocol, writing of the literature review, interpretation of energy availability results and writing up of the data.
Mrs S Olds	Registered Social Worker In Private Practice	Administration of the Lifestyle questionnaire to the 20 participants in the study
Ms A Robson	Registered Dietician In Private Practice	Assisting in the recording of the 24 hour dietary recalls, and the analysis of the dietary data
Mrs K Krog	CEN, NWU, Potchefstroom Campus	Part-time MSc student. Writing of the protocol, assisted with the collection of data from the participants, writing up of the literature review, writing up of the article, interpretation of the results and writing up of data.

1.5 STRUCTURE OF MINI-DISSERTATION

This mini-dissertation is in article format and is presented in four chapters. Chapter one provides a short rationale for the study, outlines the aim, objectives and hypothesis, and gives an overview of the research team. Chapter two presents the literature review where

the researcher provides a brief overview of weight making sports in general, the sport of horse riding, as well as the jockey as an elite sportsman. It continues to discuss the physical characteristics, lifestyle habits and weight making practices of the jockeys as documented in the literature as well as the short term and long term health implications involved with the practice of weight control. Chapter three is the research article written according to the specifications of the Journal of Sports Sciences. The article consists of an abstract, an introduction, a methodology section, results, a discussion and a conclusion, followed by a list of references documented in the style required by the journal. In the final chapter, the researcher provides a short summary and conclusion, acknowledges the limitations and makes recommendations based on the findings. The references for Chapters one, two and four are according to the North West University Harvard style and are listed in the bibliography, following Chapter four.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Sport disciplines such as wrestling, judo, karate, boxing, weight lifting, horse racing and light weight rowing, where athletes compete in different weight categories, are known for the challenges the athletes face in trying to attain or maintain the required weight for their sport (Sundgot-Borgen *et al*., 2013:1012). Athletes who are competing in these sporting categories strive to achieve the required weight for a competition or an event, and should they fail to do so they often cannot compete in the event or the competition. As a result, it is not uncommon for athletes competing in these sports where a low body weight is required, to engage in a number of weight control methods (e.g. a low energy intake, smoking, excessive exercise) and / or 'weight making' practices (e.g. dehydration before an event, fasting, excessive sweating) to maintain or attain a required weight and body form (Sundgot-Borgen *et al*., 2013:1012). These practices however are not always conducive to optimal health or performance and can result in both short term and long term negative health effects (King & Mezey, 1987:249, Labadrios *et al*., 1993:97, Leydon & Wall, 2002:220, Moore *et al*., 2002:1, Baum, 2006:1, Boisseau, 2006:77, Warrington *et al*., 2009:543, Dolan *et al*., 2011:791, Sundgot-Borgen *et al*., 2013:1012). The scope of this literature review will be on weight control methods and weight making practices in horse racing.

2.2 HORSE RACING AS A WEIGHT CATEGORY SPORT

Horse racing is one of the weight category sports that require the race riding jockeys to maintain a low body weight continuously as they are weighed before and after each racing event. The sport does not have an 'in-season' during a specific time of the year therefore jockeys have to maintain an optimal weight throughout the year. A number of studies have reported the frequent use of different weight control methods (e.g. constant dieting) to maintain a low body weight, as well as the application of various weight making practices (e.g. excessive sweating) in the jockey population to 'make the weight' before a race (King & Mezey, 1987:249, Labadarios *et al*., 1993:97, Leydon & Wall, 2002:220, Moore *et al*., 2002:1, Caufield & Karageorghis, 2008:877, Warrington *et al*., 2009:543, Cotugna *et al*., 2011:261, Dolan *et al*., 2011:791, Wilson, Hawken *et al*., 2014:383). Of concern in this group where frequent use of weight control methods and/or weight making practices have been reported, is the reported short-term side effects as well as long term health consequences associated with these practices (Labadarios *et al*., 1993:97, Leydon & Wall, 2002:220, Caufield & Karageorghis, 2008:877, Warrington *et al*., 2009:543, Cotugna *et al*.,

2011:261, Dolan *et al*., 2011:791, Dolan, McGoldrick *et al*., 2012:534, Greene *et al*., 2013:688).

2.2.1 Background of horse racing

Horse racing is a growing international sport, and professional jockeys are considered elite sportsmen competing in a sport with strict weight criteria. This section provides a general background of the sport of horse racing and the characteristics of a typical professional jockey.

Horse racing is often referred to as the “Sport of Kings”. It has been documented as such because it was often the aristocracy, particularly the royalty of early British society which made the sport of thoroughbred horse racing popular. As early as 648 BC horses were used as mounted rides. In the ancient Greek Olympics, horses were also used in chariot racing. Horse racing as an equestrian sport was also cited in archaeological records in ancient Greece, Babylon, Syria and Egypt (Anon, 2014, retrieved, 2014).

The style of racing varies in different countries, and there are three major types of horse racing namely flat racing, steeplechase racing and harness racing. In a steeplechase event the horse and rider will be racing on uneven turf and the race will include jumps. In harness racing the horse will race whilst pulling a cart with driver on a flat straight surface, and in flat horse racing the horse with the rider will race around a flat track. Flat horse racing, where jockeys race on thoroughbred horses is now a common sport internationally. The focus of this review will be on flat horse racing. In this type of horse racing, the track is oval in shape and completely flat and the race is based on speed and stamina. The horses’ race over different distances measured in furlongs. A furlong is equal to an eighth of a mile (220yards or 201.168 metres) (Bruggink 2009, retrieved 2013). Flat horse racing is a gambling sport where bets are placed on the horses in different events. It has become an important activity generating a source of employment as well as a source of revenue for a country. In 2008 it was estimated that a world-wide market of around 115 billion US dollars was generated by the sport (Bruggink 2009, retrieved 2013). The Australian Government, together with the horse racing bodies in Australia published a document stating that horse racing is the third largest industry in Australia. Nearly 500 million Australian dollars is distributed to horse owners and licensed professionals annually (Janders *et al*., 2011:1). The ‘conditions’ races, where horses are handicapped, are the most prestigious and offer the biggest prize money (Anon, 2014, retrieved 2014). Here the horses are allocated different weights to carry in order to make the race more equal. The weight each horse is allocated to carry includes the

jockey, his kit and saddle. The horse and how it races is affected by a number of factors which are also taken into account for the handicapping system. These factors can include placement in the starting line-up, the track surface, (which can be dirt, synthetic or turf surfaces), the gender of the horse, the skill and experience of the trainers and the ranking of the jockey (Anon, 2014, retrieved 2014). Flat horse racing is popular in a number of countries including the United States, Canada, New Zealand, Australia, a number of European and Asian countries, and also in South Africa.

Jockeys are professional race riders registered with official, professional authorities, and trained at jockey academies to race nationally and internationally. During training jockeys are referred to as apprentice jockeys. Apprentice jockeys spend up to five years in training before becoming a professional jockey. They also need to secure a certain number of 'rides' as well as 'wins' before they can obtain a license as professional jockey.

Horse racing in South Africa can be traced back to 1797. In South Africa the body that had always controlled horse racing was known as the 'Jockey Club of Southern Africa', which was founded in 1882. This body was since replaced in 2003 by the "National Horseracing Authority of Southern Africa" (NHASA) and it is this authority that controls the rules pertaining to the sport of horse racing in South Africa. The rules of the NHASA are standardised and meet with international standards (National Horse Racing Authority, 2011, retrieved 2014). South Africa has several prestigious racing events including "The Durban July Handicap", which has been running at Greyville Racecourse in Durban since 1897, "The Summer Cup" held at Turfontein Racecourse in Johannesburg, and the "J&B Met", which is held at Kenilworth Racecourse in Cape Town.

South Africa had 115 professional jockeys and 50 apprentice jockeys, registered with NHASA in 2012. At the Jockey Academy in Shongweni in Kwazulu Natal the apprentice jockeys are trained rigorously for a period of five years in the art of horse racing and have to have ridden 50 'winners' in order to qualify to be a professional jockey.

2.2.2 The jockey as an elite athlete

Jockeys are athletes that have to maintain their fitness levels as well as their weight to perform optimally in their sport (Leydon & Wall, 2002:220, Janders, *et al*., 2011:1). Jockeys have a rigorous work and training schedule, and for most jockeys their day begins at 4.00am. They will spend 3-4 hours performing track work, including riding horses for the trainers at one of the tracks where the horses are stabled. It often means that the jockey has to travel to the track which can involve up to an hour travelling time. Thereafter, they may be

scheduled for a race meeting where they can ride up to eight races, particularly if the race day is from 11.00am to 6.00pm. A race can be over different distances and varies in time, depending on the distance. There can be up to four race meetings in a week. Often the racing also involves travelling and this can include road and/or air travel for a number of hours (Leydon & Wall, 2002:220, Warrington *et al*., 2009:543, Janders *et a*l., 2011:1). Most jockeys have one day a week off, usually a Sunday, however, some countries are now scheduling race days on a Sunday as well (Leydon & Wall, 2002:220). In between racing schedules the jockey will also include gym work or cardiovascular exercise like running, swimming, cycling and squash (Labadarios *et al*., 1993:97, Moore *et al*., 2002:1, Leydon & Wall, 2002:220, Warrington *et al*., 2009:543, Janders *et al.,* 2011:1).

Jockeys often weigh as little as 50kg, but ride horses which weigh up to 500kg and are capable of speeds greater than 60km/hr. The minimum riding weight for a race riding jockey in South Africa prior to 1999 was set at 48kg in a handicap race (Labadarios *et al*., 1993:97). However in 1999 the Jockey Club of South Africa changed the handicapping system in South Africa to that of a merit system, similar to the handicapping system internationally, and increased the minimum riding weight to 50kg. This brought the South African system of handicapping in line with that of the global community. In 2006 the minimum weight for a race riding jockey was increased again from 50kg to 52kg.Therefore the riding weight of the jockey (minimum of 52kg), together with the saddle and riding gear, (minimum of 0.3kg) equals the weight that the horse will be carrying. The weight that a specific race horse is allowed to carry in a specific race is decided according to the ability of the horse in that particular race. Each horse, racing in an event, is therefore given a designated weight in order to make that race more equal. The weight that the horse carries is often called the impost. The National Horse Racing Authority appoints a board of members to allocate a specific weight to a particular horse. This weight is based on previous performances, distance of the race, experience of the jockey etc. Therefore the combined weight of the jockey with his kit and saddle must equal the weight of the impost. If the a jockey is 'light' and weighs less than 52kg, for example 50kg, and he is riding a horse handicapped at 54kg, he will be given heavier riding gear and a saddle of 2 kg as well as lead weights of an additional 2kg which are carried in saddle pads to make up the weight.

The jockey must comply with the weight allocations in order to maintain his ride on a specific horse and to qualify for more rides on other horses, especially those with stricter handicaps, on a race day. For example, if a horse is 'handicapped' with a weight of 55kg, and the saddle and riding gear weighs 1kg, the jockey must weigh less than 54kg in order for the total weight not to exceed the 'handicapped' weight of 55kg. Jockeys are "weighed out" before the

race and “weighed in” after the race and the two weights cannot differ by more than 500g (National Horse Racing Authority, 2011, retrieved 2014). If a jockey is riding a number of rides during a race day and he has to increase or decrease his weight, he will increases his weight with fluid intake or lead weights, or he will decreases his weight in the “sweat box”. It is easier for a jockey weighing close to the minimal riding weight of 52kg to ‘make’ a heavier weight with lead weights, than for the heavier jockey to have to lose weight in order to ‘make’ the weight. In contrast to other weight making sports, where the athletes are weighed several hours prior to the event and then still have the opportunity to rehydrate and refuel before the start of the event, jockeys are weighed several minutes before the race and therefore do not have the advantage to rehydrate and refuel. Having to ‘make’ a lower weight immediately before competition may therefore not be ideal for optimal performance if it means the jockey is going to race in a dehydrated state. The profession of horse racing, unlike other weight category sports does not have an ‘off season’, jockeys are therefore under constant pressure to maintain a minimal weight at all times.

The minimal riding weight of 52kg in Ireland has changed very little since the 1900s, but the weight of the jockey trainees (the apprentices), has increased with 37% over the last 30 years (Warrington *et. al*., 2009:543). The minimum riding weight in South Africa was more recently also adjusted to 52kg however this adjustment was made on empirical grounds and not necessarily in line with the increase in weight of the average South African jockey trainee/apprentice (Labadarios *et al*., 1993:97). A minimum riding weight of 52kg is therefore still regarded as low. Hill and O’Connor (1998), also stated that the steady increase in population size reduces the pool of individuals who naturally possess the physique and characteristics to become a jockey, and this can result in the jockey being too large and therefore too heavy which presents an increasing need for jockeys to adopt strict and potentially dangerous weight loss practices to maximize their riding opportunities (Hill & O’Connor, 1998).

Table 2.1 compares the physical characteristics of professional male jockeys from a number of studies on jockeys. The average weight, height and BMI for the jockeys in these six studies are 54.4±3.9kg, 1.63±0.04m and 20.3±0.5 kg/m^2, respectively (Table 2.1). Jockeys are therefore generally short in stature (on the 25th percentile for the average age of 26 years), with a BMI closer to the lower range of normal.

Table 2.1: A comparison of the physical characteristics of male jockeys from different studies

Reference	Subjects	Age(years)	Height (m)	Weight (kg)	BMI (kg/m^2)	Body fat%
King & Mezey, 1987	N=10 Professional male jockeys	23.5±4	1.60±0.1	52.2±4.2	20.3±1.7	Not calculated
Labadarios *et al*., 1993	N=93 Professional male jockeys	27.8	1.61	52.8±3.3	20.3	11 4 x skinfolds
Leydon & Wall, 2002	N=6 Professional (4) and apprentice (2) male jockeys	23.5±4.3	1.62±0.4	52.8±2.4	20.1±1.5	11.7±9 DEXA
Moore *et al*., 2002	N=91 Professional (80) and apprentice (11) male jockeys	29.6±0.9	1.62±0.8	53.4±0.4	20.3±0.2	Not calculated
Dolan *et al*., 2011 (same population as Warrington et al., 2009)	N=17 Professional male flat jockeys	26.7±7.6	1.60±0.1	53.1±4.1	19.9±1.3	9±2.5 DEXA
Wilson, Sparks *et al*., 2013	N=9 male Professional male jump jockeys	24±3.1	1.72±5.2	63.2±4.7	20.3	11.3±2.2 DEXA

Values are means ± standard deviation (SD); m = meter; kg = kilogram; BMI = Body mass index;

In order for an apprentice jockey to qualify as a professional jockey he needs to obtain a professional license. As mentioned previously jockey academies have been established in the racing centres of the world to train students in the sport of race riding to become professional jockeys. Apprentice jockeys enter the academies usually at an age between 15-17 years. Similar to the professional jockeys, the apprentices' day also start at 4.00am with a track session where they usually ride for 3-4 hours, 6 days a week. Apprentice jockeys can sometimes ride up to 20 horses in a track session, and during these track sessions the apprentices are schooled in the art of race riding. It is also here that they meet and interact with trainers and qualified jockeys. The training academies instil a rigid discipline into the young apprentices. Once they are back at the academy they have school until 2.00pm. After school they have an hour gym session followed by cleaning out the stables. After dinner at 6.00pm there is usually a study session followed by bed time at 21h30 (South African Jockey Academy, 2007, retrieved 2014).

Novice apprentices at mid-adolescence (age 15-16 years) with a weight of below 50kg, are allocated rides on a 'claiming allowance' incentive. This enables an apprentice jockey to be able to 'claim' up to a maximum of 4.5kg on the horses' allocated racing handicap. However the size of this allowance is progressively reduced in accordance with the number of wins an apprentice accumulates. The less the apprentice can 'claim' the more important his weight control becomes, as he has less rides to choose from. This practice puts pressure on the apprentice jockey to maintain a low body weight in order to continue to attract more rides and to establish a good career. 'Making weight' at this life stage (i.e. during adolescence) which is characterized by a critical growth phase, may impose an immediate and long-term health risk to the apprentice jockey

In South Africa, apprentice jockeys usually begin race riding after 3 years at the academy, at which point they can claim 4kg on top of the allocated racing handicap. Once the apprentice secures 20 wins, this claim is reduced to 2kg. After another 20 wins no claim can be made and the apprentice has to ride another 10 wins to receive his racing license and becomes a professional jockey. The "claiming" system helps the young apprentice jockey to get rides. For instance, if an apprentice weighs 40kg, he will be available to ride 'light' rides where a young horse is handicapped at 48kg, which is then made up of the apprentices' weight (40kg) plus a 4kg claim, plus riding kit and a heavy saddle (~2kg) and additional lead weights (~2kg). This light body weight will allow him, if he has good riding skills, to ride the lighter, younger, horses and gain experience. As he gets older, gains weight and has ridden his first 20 winners, his claim reduces to 2kg. Once he has qualified as a professional, usually around the age of 20 years, his body weight may be between 50 and 54kg. This

means he can no longer ride horses with handicaps of 48kg, 50kg, or even 52kg. The heavier he becomes as he gets older the less rides are available to him as a jockey. However the problem the apprentices experience is that they often reach a peak body weight already in their 4th year, and therefore have to "fight" the weight in order to get the number of rides to qualify.

Often students who will potentially be too heavy and too tall, are taken into the academies, to make up numbers or because parents pay to have them in the academy. Because they have to maintain a low body weight, the cycle of weight control and weight making methods begin and is perpetuated in order to maintain their riding weight. These weight making methods may be learned from the riding masters and older professional jockeys, and coupled with the fact that there is no off season in horse racing, makes race riding as a jockey and as an apprentice jockey challenging (Labadarios *et al*., 1993:97, Hill & O'Conner, 1998, Warrington, *et al*., 2009:543, and Dolan *et al*., 2011:791, Janders *et al*., 2011:1).

2.2.3 Energy and nutrient intake of the jockey

The energy and nutrient intakes of professional jockeys from different studies are summarized in Table 2.2. The overall mean energy intake of the jockeys in these studies is 7334±486kJ (1746.2±115.7kcal). When compared to the International Society for Sport Nutrition (ISSN) (Kreider *et al*., 2010:1) who recommends a minimum of 50kcal/kg/day for individuals with a moderate to high level of physical activity, their energy intake of 32 kcal/kg is low. This low energy intake can place an enormous strain on the physiological and psychological systems of the jockey (Loucks *et al*., 2011:S7). Research suggests that very often the energy available in certain athletes is much less than what the actual energy intake should be and as a result some physiological and psychological processes are negatively affected (Caulfield & Karageorghis, 2008:265, IOC, 2010:53, Dolan *et al*., 2011:791, Dolan *et al*., 2012:534, Greene *et al*., 2013:688, Wilson, Hawken *et al*., 2014:383). Furthermore, the mean total reported protein and carbohydrate intake of the jockeys is also below the required recommendations of the International Olympic Committee (IOC) of 1.3 g/kg (IOC, 2011:53), for protein and 5-7 g/kg for carbohydrates (Burke, 2006:675).

Table 2.2: A comparison of the energy and dietary intake of male jockeys from different studies

Reference	Subjects (n)	Energy (kj)	CHO (%TE)	Protein (%TE)	Fat(%TE)	Vitamin C (mg)	Thiamine (mg)	Vitamin A (mcg)	Calcium (mg)	Zinc (mg)	Iron (mg)
Labadarios *et al*., 1993	93 Professional male jockeys	8325±1232	45.0±3.0	14.75±1.2	34.0±1.7	No value	1.0±0.2 (83% of RDA)	No value	536±149 (53.6% of RDA)	9.9±1.9 (124% of RDA)	No value
Leydon & Wall, 2002	5 Professional male jockeys	6769±1339	43.0±11.9	15.0±4.5	31.0±10.8	57.8±39.2 (64% of RDA)	0.91±0.42 (76% of RDA)	531±243 (59% of RDA)	466±221 (46.6% of RDA)	7.13±1.61 (89% of RDA)	8.1±2.9 (101% of RDA)
Waldron-Lynch, 2010	27 Professional male Jockeys (17 flat and 10 National Hunt jockeys)	7392±1189	43.9±8.5	16.2±3.7	35.3±7.0	n/r	n/r	n/r	541±106 (54.1% of RDA)	n/r	n/r
Dolan *et al*., 2011	11 Professional male flat jockeys	7012±1842	45.0	16.0	32.0	67±75 (74% of RDA)	0.12±0.03 (10% of RDA)	498±335 (55% of RDA)	619±295 (62% of RDA)	7.2±2.3 (90% of RDA)	10.5±6.4 (131% of RDA)
Greene et al., 2013	25 Apprentice jockeys 11 male 14 female	7516±2272	45.0±15	16.7±12.2	36,5±26.7	n/r	n/r	n/r	n/r	n/r	n/r
Wilson, Sparks *et al*., 2013	9 Professional male jump jockeys	7240±940	61±14	18±7	21±5	n/r	n/r	n/r	n/r	n/r	n/r

Values are mean ± standard deviation (SD); Kj = Kilojoule; CHO = Carbohydrates; TE = Total energy; mg = milligram, mcg = microgram; RDA = Recommend dietary allowance (NICUS)

Most of the mean reported micro-nutrient intakes are also below the RDA, except for iron, which was shown to be above the RDA, in two of the studies. Zinc intake exceeded the RDA in one study, but in the other two was below the RDA. Calcium was notably low in four of the studies, all below 67% of the RDA (Table 2.2). Warrington *et al*. (2009:543) used this fact as a major compounding factor with regard to the low bone density in the jockey population. Vitamin D was not included in Table 2.2, however Warrington *et al*. (2009:543), reported low intakes of calcium, phosphorus and vitamin D and demonstrated an association with low bone mineral density in jockeys.

It is of interest to note, that all of the methods used in the studies cited used a form of dietary record or recall to evaluate the nutritional intake of the subjects. Labadarios, *et al*. (1993:97), used a 7-day food record and a 24-hour recall on the morning of 2 separate race days. The Leydon and Wall (2002:220) study employed a 7-day weighed food record to assess nutrient intake and Dolan *et al*. (2011:791), completed a 7-day food diary of a typical racing week. Black *et al*. (1991:583), discussed methods of estimating dietary intake and emphasised that under reporting in the various methods of recall exists and must be taken into consideration (Black *et al*., 1991:583, Livingston, 2013). However, at present dietary recall is the method most researchers make use of.

2.3 WEIGHT CONTROL METHODS AND WEIGHT MAKING PRACTICES

2.3.1 Weight control methods and weight making practices in general

Weight control in sport has been practiced for the main purpose of improving performance at a particular event or in a certain weight category. Weight sensitive sports can be divided into three categories, including weight class sports, aesthetically judged sports and gravitational sports (De Souza *et al*., 2014:289, Sundgot-Borgen *et al*., 2013:1012). Weight class sports are sports include wrestling, judo, karate, boxing, weight lifting, horse racing and light weight rowing, where athletes compete in different weight categories. Athletes who have to maintain a low body weight or low body fat percentage for aesthetic reasons, for example gymnasts, body builders, ballet dancers, and figure ice skaters are included in the category for aesthetically judged sports. In competition this category of athletes are judged not only on body strength and sporting ability, but also on physical appearance. The gravitational sports include the sports that need to defy the force of gravitation for instance long distance running. These athletes generally require a low body weight and/or body fat percentage and strive to achieve the perfect ratio of lean mass to fat mass. It is not uncommon for athletes competing in these sports where a low body weight or perfect body form is required, to engage in a number of weight control methods (e.g. a low energy intake, smoking, excessive

exercise etc.) and / or 'weight making' practices (e.g. dehydration before an event, fasting, excessive sweating etc.) to maintain or attain a required weight and body form (Sundgot-Borgen *et al*., 2013:1012). 'Making weight' generally refers to the more immediate or urgent need for the athlete to shed weight within a short period before an event or competition.' Weight control' is the method used to maintain a low body weight or competition weight, consistently over a long period of time,

Common methods used in the wrestling fraternity to control body weight, include dehydration, fasting, using saunas, rubber suits, the use of laxatives and vomiting. Other methods include sweating in 'sweat suits' during aerobic exercise. Lightweight rowers also have to adhere to weight restrictions and according to a study by Morris and Payne (1996:301), the methods used by the rowers to control their body weight included exercise (73.3%), food restriction (71.4%) and fluid restriction (62.9%). The weight making practices of professional jockeys will be discussed in the next section.

Weight making practices are not always conducive to optimal health or performance and can result in both short term and long term negative health effects (Warrington *et al*., 2009:543, Dolan *et al*., 2011:791, Sundgot- Borgen *et al*., 2013:1012). The incident of three collegiate wrestlers who died in 1997, due to dehydration as a result of rapid weight loss for competition, sparked concern. Rapid weight loss due to fluid restriction can be one of the most dangerous methods of 'making weight' for an event or competition (Cian *et al*., 2001:243, Dolan *et al*., 2013:399). Dehydration increases the risk of heat injury including muscle cramps, heat exhaustion and heat stroke. Due to the deaths of the collegiate wrestlers, the National Collegiate Athletic association (NCAA) has ruled that male wrestlers may not compete with a body fat% lower than 5% and high school wrestling controlling bodies have set the boundaries at a body fat percentage not lower than 7% (Oppliger *et al*., 2003:29). Of interest to note is the fact that the weight changes implemented in the collegiate wrestling fraternity and those implemented in the light weight rowers were successful in decreasing the amount of weight lost rapidly but did not stop the use of the inappropriate methods used to 'make weight' like fluid restriction, saunas, sweat suits and sweat boxes (Oppliger, *et al*., 2003:29, Bartok, Schoeller, Clarke *et al*., 2004:160, Bartok, Schoeller, Sullivan *et al*., 2004:510).

In order not to adversely affect health or performance, an athlete should not exceed a weight loss of more than 2 % of body weight prior to competition (Sundgot-Borgen *et al*., 2013:1012). Weight-class athletes are also encouraged not to be more than 3% over their competition weight at any time (Sundgot-Borgen *et al*., 2013:1012). Athletes who reduce their body fat percentage are advised not to drop below 5% for men and 12% for women, as

there is the danger of hormonal disturbance as well as other health impairments (De Souza *et al*., 2013:289, Sundgot-Borgen *et al*., 2013:1012). Very tight weight control continually can lead to disordered eating (DE), which may be difficult to correct (Genton *et al*., 2005:73, Sundgot-Borgen *et al*., 2013:1012). Furthermore, under nutrition in combination with exercise leads to changes in body composition particularly a decrease in the fat-free mass, changes in intracellular composition, muscle strength and physical functioning. This is especially true for athletes who continually try to control their body weight or try to manipulate their weight in order to 'make weight' for a competition (Genton *et al*., 2005:73, Dolan, Cullen *et al*., 2013:399, Sundgot-Borgen *et al*., 2013:1012).

2.3.2 Weight control practices and weight making methods in horse riding

A number of studies have examined weight control and the weight making practices in the jockey population. Table 2.3 provides a summary of the more common weight control and weight making methods practiced by professional and/or apprentice jockeys. In some studies, the entire study population reported the use of one or more weight control methods. All of the professional male jockeys from a study by King and Mezey (1987:249) as well as the professional male jockeys reported by Wilson, Drust *et al*. (2014:online) reported the use of exercise to control weight. Eighty two percent of the jockeys in the study from Labadarios *et al*. (1993:97) also reported the use of exercise as a means of weight control, especially when done in 'sweat suits'. Of interest to note was the fact that the jockeys from the study by Leydon and Wall (2002:220) were aware that exercise developed heavier muscle tissue, resulting in weight gain, yet 25% of them still reported the use of exercise for weight control. Furthermore, all the jockeys from the King and Mezey (1987:249) study also reported the use of the sauna to make weight. These jockeys will spend up to four hours in a sauna to 'waste'. Although not all the methods were investigated in all the studies, the use of saunas to make weight in combination with food restriction and exercise induced sweating seems to be the most common as well as the most prevalent methods to make and/or control weight (Table 2.3). The sauna has also been referred to as "the jockey's home away from home" (Baum 2006:1).

Other methods to make or control weight included smoking, fluid restriction, the use of diuretics and laxatives, hot baths and appetite suppressants (Table 2.3). Methods not included in the table, but also used to make or control weight, include the use of drugs including non-steroidal anti-inflammatory drugs (NSAIDs), aspirin and caffeine (Labadarios *et al.*, 1993:97). The jockeys will experiment with different 'weight making' methods until they find one that works best for them and then will continue with that particular method (Labadarios *et al*., 1993:97, Leydon & Wall, 2002:220).

Table 2.3: A comparison of the prevalence of weight control methods used by jockeys and apprentice jockeys in different studies

Reference	King & Mezey 1987	Labadarios *et al.*, 1993	Leydon & Wall 2002	Moore *et al*., 2002	Cotugna *et al*., 2011	Dolan *et al.*, 2011	Wilson, Hawken *et al*., 2014
Subject	10 Professional males jockeys	93 Professional male jockeys	20 Professional jockeys (4 male & 5 female + Apprentice jockeys)	116 80 Professional jockeys (80 male & 16 female) Apprentice jockeys	20 Professional jockeys (19 male & 1 female)	21 Professional male flat & national hunt jockeys	8 Professional male jockeys (6 jump jockeys & 2 flat jockeys)
Weight control methods							
Smoking (%)	n/r	58	50	44	n/r	24	n/r
Exercise (%)	100	82	25	78	40	38	100
Food restriction (%)	90	77	67	75	35	71	62
Fluid restriction (%)	n/r	n/r	56		5	n/r	62
Sauna (%)	100	80	56	60	60	86	75
Hot Baths (%)		27	28	n/r	n/r	n/r	37
Diuretics (%)	60	70	60	37	n/r	0.21	n/r
Laxatives (%)	70	27	n/r	23	n/r	0.21	n/r
Appetite Suppressants (%)	20	48	5	n/r	n/r	n/r	n/r
Flipping (vomiting) (%)	10				10		

Values represent the percentage (%) of subjects reporting the use of a specific weight control practice in the study

Since there is no ‘off-season’ in horse racing, ‘weight making’ becomes part of a professional jockeys’ lifestyle. Labadarios *et al*. (1993:97) reported that 58% of the 93 qualified jockeys started smoking to control eating. The authors also reported that 66% of the jockeys were unable to maintain or control their weight specifically between the ages of 19 – 20 years. Furthermore, 73% of the jockeys said that their weight increased with age and was more difficult to maintain as they became older. Two thirds (63%), of all the jockeys in the study by Moore *et al*. (2002:1) reported gaining nutrition information and advice from within the racing profession, which included fellow competing jockeys and retired riders.

2.4 SIDE EFFECTS AND HEALTH IMPLICATIONS OF WEIGHT CONTROL METHODS

2.4.1 Reported side effects of weight control/weight making methods amongst jockeys

Table 2.4 provides a summary of the studies that examined the side effects of weight control methods in the jockey population. King and Mezey (1987:249) reported that all the jockeys (100%) reported irritability, tiredness and a decrease in sexual interest (Table 2.4). The jockey studies by Labadarios *et al.* (1993) and Dolan *et al.* (2011) also reported irritability and tiredness, however in a lower percentage (Table 2.4). Furthermore, more than half (52%) of the jockeys from Dolan *et al.* (2011) reported ‘thirst’ as a side effect. Other reported side effects included hunger, dizziness, anxiety, as well as decreased cognitive function and negative mood profiles (using BRUMS scores) at minimal body weight (Table 2.4). Wilson, Fraser *et al*. (2013:453) also made use of the BRUMS score in flat jockeys (n=16) and jump jockeys (n=17) and demonstrated abnormal mood profiles in both groups, with a lower score in the flat jockeys. A decreased cognitive function could be as a result of impaired energy availability as well as dehydration (Sundgot-Borgen *et al*., 2013:1012). Warrington e*t al*. (2009:543) measured the hydration status of the jockey and reported that they were habitually dehydrated, and that 54% of the study population were shown to be competing in a severely dehydrated state. The constant state of dehydration in the jockey population could also explain the symptoms of thirst as well as the irritability.

Other known side effects of fasting and starvation are glycogen depletion and a loss of body mass (including reduced lean mass) and a decreased metabolic rate (Sundgot-Borgen *et al*., 2013:1012). Chronic fasting can further negate the benefits of training, results in a loss of strength and endurance, and compromised performance (Sundgot-Borgen *et al*., 2013:1012).

Table 2.4: Reported side effects caused by weight control methods used by jockeys

Reference	King & Mezey 1987	Labadarios *et al.,* 1993	Leydon & Wall 2002	Caulfield & Karageorghis, 2008	Dolan *et al.,* 2011
Subject	10 Professional males jockeys	93 Professional Males jockeys	20 Professional jockeys (4 male & 5 female) Apprentice jockeys (2 male & 9 female)	41 Professional male flat & jump jockeys	21 Professional male flat & national hunt jockeys
Country	UK	South African	New Zealand	UK & Irish	Irish
BMI (mean & SD)	20.3±1.7	20.3	20.1±1.5	n/r	19.9±1.3
Fat % (mean & SD)	n/r	11 4x skin fold	11.7±9 DEXA	n/r	9±2.5 DEXA
Hunger (%)					38
Thirst (%)					52
Irritability (%)	100	23			33
Tiredness (%)	100	20			24
Dizziness (%)		7			
State of anxiety (%)	10				19
Cognitive function (%)	n/r	Cognitive function decreased for set tasks	n/r	BRUMS* -ve mood profiles at minimal weight	
Lowered sexual interest (%)	100		24		

2.4.2 Health complications of weight control/weight making methods amongst jockeys

As mentioned previously, the general energy and micronutrient intakes (as a result of restricted food intake/food avoidance) in the jockey population is sub-optimal (Table 2.2). This places an enormous strain on the physiological and psychological systems of the jockey, especially the younger jockey/adolescent jockey that is still growing (Caine *et al*., 2003). Not only may they develop nutrient deficiencies, such as anaemia, chronic fatigue, and an increased risk for illnesses, protein metabolism could be disturbed and thus growth and total fat free mass may be impaired (Boisseau, 2006:77). Low intakes of dietary calcium and iron specifically may result in a lowered production of the haemoglobin mass, changed tissue deposition (specifically bone mass) which also could lead to hormonal delays and hormonal abnormalities occurring. Endocrine abnormalities as a result of long term low-energy intake and a decreased body fat percentage can further results in metabolic and neuro-endocrine changes (Sudi *et al*., 2004:675, Genton *et al*., 2005:73, Dolan, Cullen *et al*., 2013:399, Sundgot-Borgen *et al*., 2013:1012) and poor bone health (Warrington *et al*., 2009:543, Waldron-Lynch *et al*., 2010:521, Greene *et al*., 2013:688). Therefore, optimum energy intake is a major factor for adolescent athletes with regard to the development of the skeletal system and maturation thereof (Greene *et al*., 2013:688).

Table 2.5 summarises the reported muscular skeletal problems of six studies performed on professional jockeys. Labadarios *et al*. (1993) reported that 25% of the jockeys in the study suffered from muscular and skeletal problems. Similarly 25% of the participant in the study from Waldron-Lynch *et al*. (2010) reported bone fractures (Table 2.5). Furthermore, five of the six studies (four assessing bone mineral density and one using peripheral quantitative computed tomography) showed reduced bone health/low T-scores in 44 – 53% of the jockeys (Table 2.5). All of the authors suggest that the poor bone health was likely to be due to inadequate dietary intakes of amongst other energy, calcium and vitamin D as a result of decreased dietary intakes with the aim to control weight (Table 2.5). It has been suggested that poor bone health is more apparent in flat jockeys compared to jump jockeys since they are required to ride at a lighter weight compared to the jump jockeys (Wilson, Drust *et al*., (2014:online).

Table 2.5: Health complications due to weight control measures used by jockeys

Reference	Labadarios *et al.*, 1993	Leydon & Wall 2002	Warrington *et al*., 2009	Waldron-Lynch et al., 2010	Dolan, Goldrick *et al.*, 2012	Greene et al., 2013
Subject	93 Professional male flat jockeys	18 Professional flat jockeys male & female (including Apprentice jockeys)	21 Professional male flat & National Hunt jockeys	27 Professional male Jockeys (17 flat and 10 National Hunt jockeys)	20 Professional male flat n=14 & National Hunt jockeys n=16	25 Apprentice jockeys 11 male 14 female
Country	South African	New Zealand	Irish	Irish	Irish	Australian
BMI (mean & SD)	20.3	20.1±1.5	19.9±1.3	20.6±1.7	21.36±1.8	20.2±0.7
Fat % (mean & SD)	11% 4x skin fold	11.7±9 DEXA	9±2.5 DEXA	n/r	6.84±3.63 DEXA	n/r
Muscular/skeletal problems	25%	n/r	78%	25% Recorded injuries were bone fractures	n/r	
BMD (osteopenic= T-scores x2 <-1)	n/r	Total 44%,, 2 male and 6 female(male= 40%, female=46%, apprentices=60%)	53% flat jockeys osteopenic 12% osteoporotic	52% T score<-1.0	Reduced bone mass/controls	Bone health at risk. Using peripheral quantitative computed tomography
Hydration status (Usg) Blood serum osmolality	n/r	n/r	54% competed dehydrated	n/r	n/r	n/r

Warrington *et al*. (2009:543), did not measure the frequency and types of weight control methods in their group of subjects, but they did look at anthropometric measurements including body fat percentage, bone mineral density and hydration status. This study noted that the jockeys are habitually dehydrated, and 54% of their study population were competing in a severely dehydrated state. The blood sample analysis showed high levels of serum sodium and also a high serum osmolality. Blood samples were taken 30 min before the first race and directly after the last race on a race day. There was no significant change in the hydration status throughout the day according to the blood samples. The conclusions drawn by the group were that the racing jockeys are habitually dehydrated in an attempt to make weight for racing. In Table 2.3, four of the studies reported the use of laxatives and five of the studies indicated the use of diuretics. These two forms of weight control in the jockey population also contributed to the state of dehydration. A factor that is critical to note is that most horse racing events take place in hot climates, outdoors and may include three to six races. The additional sweat losses due to climatic factors may decrease the body fluid volume further, increasing the risk for heat stress illness (Maughan & Shirreffs, 2004:917) and having dangerous implications on the cardiovascular system. Drastic shifts in body fluid have significant results on the athletes' plasma volumes and concentrations, and a shift of only 1.5-2.0% in body fluid is considered detrimental (Maughan & Shirreffs, 2004:917).

A low energy intake can also result in low energy availability. Energy availability is the term used to describe the energy left over for body functions after exercise energy expenditure had been subtracted from dietary energy intake (Manore *et al*., 2006) and is expressed in kilocalories per kilogram fat free mass (kcal/kg FFM). The IOC (2010:53) recommends a minimum of 30 – 45 kcal/kg FFM/day for athletes who are aiming to reduce body size and fatness. An energy availability of less than 30 kcal/kg FFM/ day is regarded as low (Manore *et al*., 2006). Although a low energy availability is common in athletes who restrict food intakes, avoid food and/or suffer from disordered eating, excessive exercise training that is not compensated for by additional dietary intake can also result in a low energy availability in athletes who do not deliberately restrict their food intake. Training with a low energy availability, with or without disordered eating, has previously been shown to impact physiological function and bone health not only in female athletes, but also male athletes (Sundgot-Borgen *et al*., 2013).

Eating disorders in itself is harmful to health (Sundgot-Borgen *et al*., 2013:1012). Baum, (2006:1), in the article titled: 'Eating disorders in the male athlete', cited male jockeys as a prime group to develop eating disorders. The author states that the male jockey has to go to much greater lengths than his female counter part to 'make weight'. In fact, there are a

number of studies on professional jockeys who reported that their subjects scored positive for disordered eating using the Eating Attitudes Test-26 (EAT-26) (King & Mezey, 1987:249; Leydon & Wall, 2002; Caufield & Karageorghis, 2008). In the study published by King and Mezey,(1987:249), one jockey reported self-induced vomiting whilst six reported binging followed by 'wasting'. Signs of disordered eating including food avoidance, binging and purging has been reported in 20% of the New Zealand jockeys from the study of Leydon and Wall (2002:221). Furthermore, EAT scores were higher in the jockeys who were more 'wasted' in the study of Caulfield and Karageorghis (2008:877). Wilson, Drust *et al*., (2014:online), classified the results with the EAT-26 test in the jockey studies as a positive indication that the continual weight control could become non-specific disordered eating (EDNOS) and this could deteriorate further the longer the habit is practiced. Disordered eating is therefore a problem within the jockey fraternity that can have long term health consequences, which can be dermatological, dental, cardiovascular, endocrine, gastrointestinal, renal as well as psychological (Sundgot-Borgen *et al*., 2013:1012).

Interesting aspects highlighted by Neumark-Sztainer, *et.al.,* (1999:929), were the factors that have an effect on the adolescent's food choices, including body image, and the adolescent's perception of themselves. All of this puts this age category at great risk of developing disordered eating. The type of sport the adolescent is involved in, and the pressure of "making weight" can have an even greater impact on their nutritional intake (Neumark-Sztainer, *et.al.,* 1999:929).

2.5 CONCLUSION

The jockey, as an elite sportsman, is at risk with regard to short- and long-term health consequences due to weight control methods that are frequently and commonly practised. Short-term consequences of weight control include thirst, hunger, irritability, tiredness, dizziness, a state of anxiety, and lowered sexual interest (Leydon & Wall, 2002:220). These short-term side effects were predominantly as a result of dehydration and food restriction (Dolan *et al*, 2011). Long-term health complications included muscular and skeletal problems, including low bone mineral density, and compromised immunity due to chronic low macro- and micronutrient intakes, a low energy availability, a constant state of dehydration and a low body fat percentage (Labadarios *et al*., 1993:97, Leydon & Wall, 2002:220, Warrington *et al.,* 2009:543, Waldron-Lynch *et al*., 2010:521, Wilson, Drust *et al*., 2014:online).

There is limited data available with regard to the apprentice jockey. The extrapolation may be done from the jockey to the apprentice jockey, however, the apprentice has the added complication of long bone growth and hormonal development to contend with. More studies with only apprentice jockeys are needed in order to determine, their specific requirements, with regard to energy and nutrient requirements, as well as controlled exercise tailored to their individual needs. With scientific help, the lifespan of the jockey as an elite sportsman, as well as maintaining health and well-being during their years as an apprentice and as a jockey can be greatly improved.

CHAPTER 3: ARTICLE

The article entitled: “Dietary intake, energy availability and weight control practices of South African male apprentice jockeys” will be submitted for publication in the Journal of Sport Sciences. The article is therefore written according to the author instructions for the Journal of Sport Sciences as included below.

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Contents List

Manuscript preparation

1. General guidelines
↑Back to top.

- Manuscripts are accepted in English. British English spelling and punctuation are preferred. Please use double quotation marks, except where "a quotation is 'within' a quotation". Long quotations should be indented without quotation marks.
- Manuscripts should be compiled in the following order: title page (including Acknowledgements as well as Funding and grant-awarding bodies); abstract; keywords; main text; acknowledgements; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figure caption(s) (as a list).
- A typical article will not exceed 4,000 words not including references, tables, figures and captions. Footnotes should not be used unless they are absolutely necessary. Papers that greatly exceed this will be critically reviewed with respect to length. Authors should include a word count with their manuscript.
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2. Style guidelines

↑Back to top.

- Description of the Journal's article style.
- Description of the Journal's reference style.
- Guide to using mathematical scripts and equations.

Papers should be written and arranged in a style that is succinct and easy to follow. An informative title, a concise abstract and a well written introduction will help to achieve this. Authors should avoid some of the more common pitfalls, such as excessive use of the passive voice and past tense and unnecessary use of fabricated abbreviations within the text. The Journal would prefer authors to describe human volunteers as participants rather than subjects in the methods section. Figures and tables should be used to add to the clarity of the paper, not to pad it out. At all times, please try to think about your readers, who will not all be specialists in your discipline.

(a) *General*

The manuscript must be in English; British English spellings and words should be used in preference to other versions of English. It must be word-processed, double-spaced throughout, with a 4 cm margin on the left side, with no 'headers and footers' (other than page numbers), and without footnotes unless these are absolutely necessary. Arrange the manuscript under headings (such as Introduction, Methods, Results, Discussion, Conclusions) and subheadings. Ideally, the main body of the text should not exceed 4,000 words, excluding references. Longer manuscripts may be accepted at the discretion of the respective Section Editor. Authors must make every effort to

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Include the following information on the first page of the manuscript: the full title; a running title of no more than 75 characters and spaces; and up to five keywords for indexing purposes.

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Photographs and line drawings, referred to as 'Figure 1', 'Figure 2', and so on, must be numbered in the order in which they occur in the text. Diagrams and drawings should be produced using a computer drawing or graphics package. All illustrations must be suitable for reduction to single column (84 mm) or page width (174 mm) of the Journal, with particular attention to lettering size. Photographs must be reproduced as black and white image files (see section 3 below).

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The Symbols Committee of the Royal Society (1975, addenda 1981). *Quantities, Units and Symbols*. London: The Royal Society.

ARTICLE

Dietary intake, energy availability and weight control practices of South African male apprentice jockeys

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Article to be submitted for publication in the Journal of Sports Sciences

Abstract

The aim of this study was to determine the dietary intake, energy availability and weight control practices of South African male apprentice jockeys between the ages of 16 and 20 years. Dietary intake was recorded with a 24-hour dietary recall on four non-consecutive days including a rest day, two training days, and a race day. Energy expenditure was recorded with Actiheart® monitors with the aim to calculate energy availability. The participants (n=21) also completed a 59-item nutrition, health and lifestyle questionnaire including questions on weight control and weight making practices. Total mean reported energy intake of the participants was 7088±2337kJ. Mean calculated energy availability (EA) over two training days and one rest day was 27.1±16.7 kcal/kg fat free mass (FFM). The majority of apprentices (88%) had a low EA (i.e.<30kcal/kg/FFM) on the training days. Ninety one percent of all the apprentices reported the use of one or more weight control methods including food avoidance (81%), restricting food intake and meals (67%), exercising to sweat (48%) and using the sauna (43%). The top three reported side effects resulting from making weight included thirst (80%), hunger (75%) and tiredness (75%). In conclusion, the majority of South African apprentice jockeys are practicing weight control methods, specifically restricting energy and food intake, rather than using active dehydration techniques, to control their weight. This was supported by a low energy intake and a low energy availability on training days.

Keywords: *Weight control methods, dietary intake, energy availability, apprentice jockeys.*

Introduction

Professional jockeys are considered elite athletes competing in a sport with certain weight restrictions and are therefore required to attain and maintain a specific weight for competition. The minimum riding weight for professional jockeys and apprentice jockeys in South Africa who are race riding is currently 52kg. The lighter the jockey (i.e. the closer he can remain to the minimum weight of 52kg) the more opportunities he will have to ride different horses with a variety of different handicaps, and the more money he will earn. The heavier the jockey, the higher the pressure to 'make the weight' and the less opportunities he will receive to ride, hence reducing his earning potential. The handicapping system places a great deal of pressure on the professional as well as the apprentice jockey who is already race riding, to be at an optimal/minimal weight before each race. Unlike other weight category sports, horse racing does not have an off season therefore jockeys are constantly pressured to maintain a minimal weight (Warrington et al., 2009). Consequently this may result in unhealthy eating habits, dangerous weight control practices and compromised health.

In fact, it is not uncommon for professional jockeys to engage in a number of acute and chronic weight making practices including energy and fluid restriction, use of saunas and steam rooms, sweating with excessive exercise and the use of laxatives and diuretics (Dolan et al., 2011; King & Mezey, 1987; Labadarios, Kotze, Momberg, & Kotze, 1993; Moore, Timperio, Crawford, Burns, & Cameron-Smith, 2002). Furthermore, there is a growing body of evidence to suggest that these methods employed to 'make weight', are indeed having adverse effects not only on performance, but also on the physical and mental health of jockeys (Caufield, & Karageorghis, 2008; Warrington et al., 2009; Wilson, Drust, Morton, & Close, 2014; Wilson, Hawken et al., 2014). In addition to sub-optimal energy, carbohydrate and micronutrient intakes in a group of New Zealand jockeys, Leydon and Wall (2002) reported that 20% of the jockeys showed signs of disordered eating including food avoidance, binging and purging. Training with a low energy availability, with or without disordered eating, has previously been shown to impact physiological function and bone health not only in female athletes, but also male athletes (Sundgot-Borgen et al., 2013). Warrington et al. (2009) examined a range of physiological health parameters, including bone health, in a group of elite male horse racing jockeys. Of concern was the high prevalence of osteopenia (52%) and reported racing related fractures (78%) in this group contributed in part, by a low energy availability (Warrington et al., 2009).

The apprentice jockey is a trainee jockey, and can only receive a professional jockey license after he has had 50 wins while race riding as an apprentice, in South Africa. The minimum

riding weight for apprentice jockeys who are race riding is also set at 52 kg therefore they are subjected to the same stringent weight rules that apply to the professional jockey. As a result apprentice jockeys are also pressurized to maintain a low body weight. Furthermore, since the apprentice jockeys are in constant contact with the professional jockeys at all race meetings and at track they may adopt the weight making practices of the professional jockeys and 'learn' from them how to control their weight, (Labadarios et al., 1993; Warrington et al., 2009). Warrington et al. (2009), has also shown that the trainee weight of apprentices entering the Racing Academy in Ireland has increased by 37% since the early 1900s, however the minimum riding weight for the professional Irish jockey has only increased by 6%, making it even harder for these new apprentices to 'make the weight'.

Research on the dietary intake, energy availability and weight making practices of apprentice jockeys is scarce. Although a number of authors have pooled data from apprentice jockeys together with professional jockeys in their participant sample (Leydon & Wall, 2002; Moore et al., 2002), to our knowledge, no study has examined the weight control practices of apprentices jockeys only. There is also no published data available, specifically on the South African apprentice jockey, with regard to weight control practices and energy availability. In South Africa the apprentices at the academy are all trained as flat jockeys, racing on a flat race course and they need to maintain a low weight. The aim of this study was therefore to determine the dietary intake, energy availability and weight control practices of SA male apprentice flat jockeys living at Shongweni Jockey Apprentice Academy, KwaZulu Natal, South Africa.

Methods

Study design and participants

Twenty one male flat jockey apprentices of different race groups between the ages of 16 and 20 years were recruited to take part in this cross sectional observational study. The participants consisted of 2nd, 3rd and 4th year apprentice jockeys residing at the Shongweni Jockey Academy on a full time basis. First year apprentice jockeys were excluded as they are not yet race riding. Ethical approval for this study was obtained from the Ethics Committee of the North-West University (NWU-0021-08-A1). The apprentices have been informed of all aspects of the study and written informed consent was obtained prior to the start of the study. If the participant was younger than 18 years, written informed consent was obtained from a parent or legal guardian.

Anthropometry and body composition measures

Height was measured with a stadiometer (Abbott) to the nearest 0.1cm whilst participants were standing barefoot with their heels together and their head in the Frankfort plane position. Weight was recorded with an electronic digital scale (model PPS, Scales 2000) to the nearest 100 g whilst wearing minimal clothing. Weight and height were used to calculate body mass index (kg/m^2) and the World Health Organization (WHO) guidelines were used to classify the apprentices as underweight, normal weight or overweight (WHO, 2006).

Body composition (body fat percentage and lean body mass percentage) was determined with Bio-electrical impedance (BIA) using the Bodystat apparatus (BODYSTAT®1500 MDD, Bodystat Ltd.). Using bioelectrical impedance to calculate body composition has been previously validated (Houtkooper, Going, Lohman, Roche, & Van Loan, 1992). The 1500MDD works by passing a safe battery generated signal through the body, and measures the resistance to the flow of the current in the body (bioelectrical impedance). The participants' age, height, and weight were used as variables and together with the bioelectrical impedance factor, body fat percentage, lean muscle mass and total body water were calculated.

Dietary and energy intake

Dietary and energy intakes were recorded with four 24 hour dietary recalls on non-consecutive days by a registered dietician according to the multiple pass method (Conway, Ingwersen, & Moshfegh, 2002). The four days included a weekend rest day, two training days during the week and a race day on the weekend. Portion sizes were estimated using appropriate household utensils and containers, and examples of specific foods, converting where necessary to gram weight. The dietary data was analyzed using the Food Finder dietary analysis software program of the Medical Research Council of South Africa (MRC Food Finder version 1.1.3, 2002). Energy intake was reported in kilojoules and converted to kilocalories to determine energy availability and express energy intake in kilocalories in relation to kilogram body weight. Underreporting was not assessed in this study since it is not uncommon for jockeys to skip meals and restrict their dietary intake in order to 'make weight' prior to racing or weigh-in (Dolan et al., 2011). Dietary data were included in the analysis, for the study, if it was indicated on the 24-hour recall that the intake was representative of a typical rest day, training day or race day, regardless of how 'unrealistically low' the energy intake appeared.

Energy expenditure and energy availability

To calculate energy expenditure, Actiheart® monitors (CamNtech Ltd., Cambridge, UK) were placed on each participant for a period of seven days, including the four days of dietary recall. The Actiheart® monitor is a waterproof, self-contained accelerometer which allows physical activity to be recorded synchronously with heart rate and is worn on the chest. It consists of two electrodes connected by a short lead which clips onto two standard ECG pads. The Actiheart® monitor makes use of a statistical branch model to calculate energy expenditure both on activity counts and heart rate (Brage, Brage, Franks, Ekelund, & Wareham, 2005). The reliability and validity of the Actiheart® monitor to record activity heart rate as well as energy expenditure have been described previously (Brage et al., 2005). In order to determine exercise energy expenditure (EEE), the participants were required to keep an exercise log specifying the time, duration and type of exercise performed.

Energy availability (EA) was calculated from reported dietary energy intake (EI) and estimated exercise energy expenditure (EEE) with the following formula:

EA (kcal/kg FFM) = daily EI (kcal) – daily EEE (kcal) / fat-free mass (kg)

An EA of < 30 kcal/kg FFM/day was considered as low (Manore, Kam, & Loucks, 2007).

Weight control practices

A modified version of a diet, health and lifestyle questionnaire, previously designed and tested on professional jockeys (Dolan et al., 2011), was administered by a registered social worker to each of the participants individually to ensure confidentiality and encourage honest responses. The questionnaire contains 59 open- and closed-ended questions on diet, health and lifestyle issues, including weight control and weight making practices (Dolan et al., 2011).

Data analysis

The data were analyzed using the Statistica Software program (version 11) and was tested for normal distribution. For descriptive purposes data were reported as means and standard deviations and as median and inter quartile ranges for non-parametric data. Descriptive statistics and frequency analyses were used to describe a number of close-ended questions in the lifestyle questionnaire. Non-parametric statistics and median scores were employed for Likert-type questions. The open-ended questions were analyzed using hierarchical content analysis to explore the jockeys' responses.

Results

Participant characteristics and general lifestyle

The participants (n=21) included six 2nd year, seven 3rd year and eight 4th year apprentices of different race groups including Caucasian (n=9), Coloured (n=6), African (n=5), and Indian (n=1). Five of the apprentices have already finished school, while the remaining apprentices are currently in the process of finishing Grade 11 and 12.

The participant anthropometric characteristics are summarized in Table 1. All the participants completed the lifestyle questionnaire whilst only 19 participants completed the 24-hour dietary recalls. These 19 apprentices also wore the Actiheart® monitor, however reliable EEE data could only be extracted from 17 participants on the two training days, and from 11 participants on the rest day. Unfortunately the majority of the apprentices removed the Actiheart® monitors when travelling (flying) to compete, therefore no EEE data was recorded on race day.

Table 1: Participant characteristics (n=21)

Characteristic	Mean ± SD	Range
Age (years)	18.0 ± 1.4	16 – 20
Current weight (kg)	47.7 ± 3.5	40.2 – 53.5
Height (m)	1.58 ± 0.07	1.39 – 1.67
BMI (kg/m^2)	19.4 ± 1.4	17.5 – 23.1
Body fat percentage (%)	12.2 ± 2.5	7.7 – 16.4

SD, Standard deviation; kg, kilogram; BMI, body mass index; m, meter

The mean BMI of these apprentices falls within the healthy BMI range of 18.5-24.9 kg/m^2 (WHO, 2006). Based on their mean body fat percentage these apprentices can be classified as lean. The mean BMI and body fat percentage of the apprentices in the present study are comparable to the professional jockeys in other studies (Caulfield, & Karageorghis, 2008; Dolan et al., 2011; Leydon, & Wall, 2002). Eight (38%) of the apprentices perceived their current weight as ideal, whilst 11 (52%) of the apprentices would have liked to be between 0.5 and 2 kilogram lighter. Only two (10%) of the apprentices reported that they would have liked to weigh respectively 2kg and 5kg heavier. The average height of the participants was

1.58±0.07 m, and this 'short stature' was the main reason why five of the apprentices chose horse racing as a career. Other reasons for becoming a jockey included 'love of riding' (n=6), 'family involvement in the sport' (n=4), 'felt unsuited to any other occupation' (n=3), and 'good lifestyle' (n=2).

Thirty eight percent (n=8) of the participants are smokers who began smoking at the age of 18±1.6 years. Only seven percent (n=5) occasionally consume 1-2 units of alcohol (1 unit = one 25ml measure of spirits, one 125ml glass of wine, one 340ml glass of beer/stout/cider). The main health issues among the participants included general colds and flu (76%), muscular injuries (38%), back problems (38%), concussions (24%) and eye problems (24%). The participants reported sleeping on average 6.7±1.4 hours per night and nine (43%) of the participants reported sleep problems.

Dietary intake

The mean reported daily energy and macronutrient intakes over four non-consecutive days of the apprentice jockeys are summarized in Table 2. The total mean energy intake per day was 7088±2337kJ (35.5±12.5kcal/kg) which can be regarded as low when compared to the International Society of Sports Nutrition (ISSN) guidelines which recommends an energy intake of 50-80kcal/kg/day based on level of activity and body weight (Kreider et al., 2010). The mean reported gram per kilogram protein (1.0±0.3g/kg) and carbohydrate (5.0±1.6g/kg) intakes (Table 2) were below the general International Olympic Committee (IOC) recommended guidelines of 1.3-1.8g/kg/day for protein and 6-10g/kg/day for carbohydrate for athletes exercising several hours per day for most days of the week (Burke, Hawley, Wong, & Jeukendrup, 2011; Phillips, & Van Loon, 2011). Sundgot-Borgen et al. (2013) more recently provided guidelines specifically for athletes in weight sensitive sports that are aimed at minimizing health risks, and recommend a protein intake of 1.5 – 2.0g/kg, similar to the general IOC recommendations. Their minimum recommendation for carbohydrates for athletes in weight-sensitive sports however is 3-5g/kg (Sundgot-Borgen et al., 2013). The fat intake (percentage fat energy of total energy) in the present study was in line with the American College of Sports Medicine, ISSN and IOC recommendations for athletes (20-35% of total energy) (Potgieter, 2013).

A summary of the dietary micronutrient intakes are summarized in Table 3. According to the dietary recall, intake of the following micronutrients were below 67% of the RDA for the two respective age groups. The older group was low in vitamin A, thiamine, folate, vitamin C, vitamin D, calcium, phosphorus, and selenium, whilst the younger group was low in vitamin A, thiamine, folate, vitamin C, calcium, phosphorus, zinc and selenium. Micronutrient

supplementation was reported by seven participants including multivitamin (n=2), vitamin C (n=3), omega 3 (n=1) and anti-oxidant supplements (n=1). One of the apprentices who used a multivitamin supplement also supplemented with iron and zinc. All the apprentices receive vitamin B complex (thiamine, riboflavin and nicotinamide, pyridoxine HCL) and vitamin B_{12} injections administered by the nursing sister once a month.

Table 2: Mean reported daily energy and macronutrient intake of apprentice jockeys (n = 19)

	Energy		Carbohydrates			Protein			Fat	
	Total kJ	**Kcal/kg**	**Total g**	**% of TE**	**g/kg**	**Total g**	**% of TE**	**g/kg**	**Total g**	**% of TE**
Mean±SD	7088±2337	35.5±12.5	236±72	57.0±5.1	5.0±1.6	47.9±15.7	11.7±1.8	1.0±0.3	56.3±24.6	29.4±5.6
Median(25^{th}-75^{th})	7433(5167-9051)	35.2(25.8-44.5)	244(188-306)	56.0(53.2-62.0)	5.2(3.8-6.1)	47.8(38.6-55.9)	11.4(10.5-12.5)	1.0(0.8-1.2)	62.0(32.2-72.9)	30.5(25.0-34.3)
Range	2624-11256	12.0-61.6	76-355	49.2-66.8	1.5-8.02	17.6-80.6	8.2-15.3	0.3-1.6	20.7-106.3	19.1-38.3

Values are presented as means and standard deviations (SD) as well as median and interquartile ranges; kJ = kilojoules; kcal = kilocalories; g = gram, TE = total energy, kg = kilogram.

Table 3: Daily mean reported micronutrient intake of apprentice jockeys (n=19)

	Mean Micronutrient Intake n=19	RDA for adolescents age 14y-18y*	Mean Micronutrient Intake 14y-18y(n=14)	% RDA for adolescent male age 14y-18y* (n=14)	RDA for adult male age 19y-30y*	Mean Micronutrient Intake 19y-30y(n=5)	% RDA for adult male Age 19y-30y* (n=5)
Vitamin A (µg)	201±121.5	900	128±118	14.2	900	164.7±132.0	18.3
Thiamin (mg)	0.8±0.2	1.2	0.83±0.21	69.16	1.2	0.7±0.3	58.3
Riboflavin (mg)	1.4±0.5	1.3	1.4±0.51	107.69	1.3	1.4±0.4	107.69
Niacin (mg)	14.0±4.8	16	14.6±1.43	91.25	16	13.5±6.1	84.37
Vitamin B_6 mg	1.123±0.363	1.3	1.172±0.358	90.15	1.3	1.016±0.382	78.15
Folate (µg)	162±54.3	400	173±53.0	43.25	400	148.9±54.2	37.23
Vitamin B_{12} (µg)	3.6±2.7	2.4	3.2±1.1	133.33	2.4	4.6±4.7	191.67
Vitamin C (mg)	26.0±26.6	75	26±20	34.67	90	25.3±40.4	28.11
Vitamin D (µg)	3-79±2-2	5	4.1±2.41	82	5	3.1±1.6	62
Calcium (mg)	503±196.6	1300	521±180	40.08	1000	462.6±241.7	46.26
Phosphorus (mg)	777.0±229.6	1250	815±206	65.2	700	295.8±267.0	42.25
Iron (mg)	8.5±2.3	11	8.9±2.0	80.9	8.0	7.6±2.8	95
Zinc (mg)	6.0±2.1	11	6.07±2.09	55.18	8.0	5.8±2.1	72.5
Selenium (µg)	30.0±16.9	55	30.2±13.0	54.9	55	29.8±24.8	54.18

* RDA = Recommended Dietary Intake (NICUS 2003)

Exercise and energy availability

Almost all the jockeys indicated that they participate in one or more additional exercise modalities apart from horse riding. The different additional exercise modalities are summarized in Table 4. Running, swimming and soccer were the top three exercise modalities in addition to jockey training. The most common reasons for why 71% of the apprentices run, was for exercise (67%) and/or weight control (27%). Swimming and soccer were mainly practiced for recreation.

Of the 19 apprentices who wore the Actiheart® monitors, reliable data from 17 apprentices was extracted for the two training days, whilst data for only 11 apprentices could be extracted for the rest day. No data was available for the race day. Energy availability on the two training days was calculated using the exercise energy expended (EEE) during the scheduled training sessions from 5h00-9h30 am. These scheduled training sessions typically included track work where the apprentices exercised up to 20 race horses in a session. Unfortunately the apprentices did not keep reliable records of the exercise activities they did in addition to their scheduled apprentice jockey training sessions, therefore the EEE calculated in the present study only represent energy expended during jockey-specific training.

Table 4: Reported additional regular exercise (n=21)

Activity	Number of participants	%
Running	15	71
Swimming	12	57
Soccer	10	48
Weight training	8	38
Squash	7	33
Walking	7	33
Cycling	5	24
Golf	4	19

The mean calculated EA on the rest day as well as the two training days is summarized in Table 5. Mean calculated EA was significantly higher on the rest day compared to the training days ($p<0.05$). Only two of the 11 apprentices on rest day had a low EA (i.e. < 30 kcal/kg FFM) (Manore et al., 2007). In contrast to rest day, only two of the 17 apprentices had a mean EA >30 kcal/kg FFM for the two training days combined. The remaining 15 apprentices had a low EA over the two training days. When combining the rest day data with the training data (n=11), mean calculated EA was 27.1±16.7 kcal/kg FFM and six of the 11 apprentices (55%) had an EA below 30 kcal/kg FFM.

Table 5: Calculated energy availability on rest day and training days

	Rest day (n=11)	Training day 1 (n=17)	Training day 2 (n=17)	Mean of two training days	Mean over 3-days (n=11)
Mean (SD)	46.2±15.8	16.7±20	14.8±15.8	15.2±15.8	27.1±16.7
Median (25^{th} – 75^{th})	49.2(38.0-55.3)*	15.1(2.2-21.6)	11.8(5.7-24.4)	11.8(5.7-24.4)	23.8(17.6-41.2)

Values are presented as means and standard deviations (SD) and median and interquartile ranges (25^{th} – 75^{th}). *P<0.05

Weight control methods used by the apprentice jockeys

Ninety one percent of the apprentices reported the use of one or more weight control method to achieve or maintain a certain weight for their sport. Table 6 provides a summary of the weight control methods reported by apprentice jockeys. From Table 6 it is clear that reducing or restricting food intake to control weight is more common compared to active dehydration strategies, including exercise to sweat, sauna of wearing plastic clothing. Avoiding situations with food was the most common method used to control weight (Table 6). Third common practice was to skip lunch, where two thirds of the apprentices indicated that they do not eat lunch. This statistic was confirmed when 33% of the participants (n=7) indicated in a different question that they always skip lunch, and 47% (n=10) indicated that they often skip lunch. In contrast to skipping lunch, 71% of the participants (n=15) indicated that they never skip breakfast.

Table 6: Reported weight control methods (n=21)

	N	%		n	%
Avoid situations with food	17	81	Sauna	9	43
Follow own diet	15	71	Prepare own food	4	42
Not eat lunch	14	67	Not eat dinner	6	29
Restrict food intake	14	67	Wear plastic clothing	6	29
Not eat between meals	12	57	Exercise excessively	5	24
Exercise to use calories	12	57	Smoke cigarettes	5	24
Keep busy to avoid eating	11	52	Consult a dietician	3	14
Drink fluids before a meal	10	48	Select low calorie food	3	14
Exercise to sweat	10	48	Drink coffee	3	14

Other methods not commonly used and not listed in the table include not eating with the family (n=3), sleeping without covers (n=1), sleep (n=2), fasting (n=1), not eating breakfast (n=2), chewing and spitting out food (n=2), taking advantage of an illness to avoid food (n=2), seeing a psychologist (n=1) and yoga (n=1).

Table 7 provides a summary of the top 10 foods avoided for weight control (first column) in comparison to the top 10 foods thought to affect weight (column 2). From this table it is clear that foods the participants avoided because of weight control issues were very similar to the foods that they perceived to negatively affect their weight. These foods were: the carbohydrate-rich foods including potatoes, bread, rice and pasta as well as high-fat foods like oils, butter, mayonnaise, cream, fried foods and fast foods.

Reported side effects and health consequences of weight control methods

The most common short-term side effect of weight control behaviour selected from the list provided in the questionnaire was thirst, followed by hunger and fatigue (Table 8). Long term health issues the apprentices indicated to be a problem were firstly joint problems (arthritis) (23.8%), followed by decreased kidney function and fluid balance (14.3%). Thirdly, the

apprentices were concerned about the body's energy control or metabolism and the possibility to develop cancer in later life.

Table 7: Foods avoided for weight control (column 1) and foods perceived to affect weight (column 2) (n=21)

Food avoided	Total score*	Food thought to affect weight	n**
Potatoes	33	Potatoes	15
Bread	37	Rice/pasta	13
Cream	37	Bread	11
Oils, butter, mayonnaise	38	Fried food/fast food	9
Rice/ pasta	39	Oils, butter, mayonnaise	7
Cheese	39	Cheese	6
Fried food/fast food	40	Cream	6
Confectionary/sweets	40	Chocolate	6
Red meat	45	Red meat	5
Soft drinks	47	Confectionary/sweets	4

*The sum of scores for each food as ranked by all the apprentices where: 1 = Always avoid, 2 = Often avoid, and 3 = Sometimes avoid. The lower the score the higher the avoidance with a minimum score of 21 and a maximum score of 63

**Number of apprentices who indicated the specific food affect their weight. Foods were not ranked per se by the apprentices, frequency counts were performed and foods were subsequently ranked based on frequency.

The participants were also concerned about the long term effects of their career as a jockey on their relationship with a partner (69% reported that the effect of their career could be "very bad" and 38.1% said it could be "bad"). A total of 85.7% also reported that their career could possibly effect their social life (9.5% said the effect could be "very bad" and 76.2% said the effect could be "bad"). Family life was reported to be "very badly" (14.3%) and "badly" (33.3%) affected by a career as a jockey.

Table 8: Reported short-term effects following weight control methods (n=21)

Short-term effect	n	%	Short-term effect	n	%
Thirst	16	80	Headache	7	35
Hunger	15	75	Decreased performance	7	35
Fatigue	15	75	Decreased concentration	7	35
Irritation/Agitation	14	70	Hyperactivity	6	30
In control	14	70	Dizziness	5	25
Feeling psychologically good	14	70	Disturbed sleep	5	25
Feeling Physically good	14	70	Dry skin	4	20
In control	14	70	Tension	4	20
Sense of achievement	13	65	Trembling	4	20
Down in mood	12	60	Euphoria/On a high	3	15
Dehydration	11	55	Decreased sexual interest	2	10
Relaxation	10	50	Increased infection/illness	1	5
Backache	8	40	Lack of coordination	1	5
Light-headedness	8	40	Swelling of hands and feet	1	5

Discussion

This study is one of the first studies to investigate the dietary intake, energy availability and weight control practices of South African male apprentice flat jockeys. The majority of apprentice jockeys (91%) reported practicing one or more weight control method with the most common methods involving food avoidance and restriction. More than half (55%) of the

apprentices had a general mean low calculated energy availability (i.e. <30kcal/kg fat free mass) whilst 88% of the apprentices had a low energy availability on training days.

The high prevalence of reported weight control and weight making practices amongst the apprentice jockeys in this study is similar to those previously reported amongst professional jockeys (67-100%) (Dolan et al., 2009; King & Mezey, 1987; Leydon & Wall, 2002; Moore et al., 2002). The different methods reported for 'making weight' in this study is also similar to those described by other researchers (Caulfield, & Karageorghis, 2007; Dolan et al., 2011; Greene et al., 2013; King, & Mezey, 1987; Labadarios et al., 1993; Leydon, & Wall, 2002; Moore et al*.,* 2002; Wilson, Fraser et al., 2013). However, the apprentice jockeys in the present study focused more on strategies to avoid and restrict food intake to control weight, compared to exercise and active dehydration strategies that were more commonly the focus of the professional jockeys in the majority of other studies (Cotugna et al., 2010; King, & Mezey, 1987; Labadarios et al., 1993; Moore et al., 2002; Wilson, Fraser et al., 2013). Similarly to this study, Dolan et al. (2011), Leydon, & Wall (2002), and Moore et al. (2002), also reported food restriction as the most common method of weight control. Of interest to note is the fact that in these studies, where food restriction, as a method of weight control, was also ranked high (4^{th} and 1^{st}), apprentice jockeys were included in the participant sample. The possible reason for the fact that food restriction ranks so highly with the apprentice jockeys may be due to the fact that the apprentice is not racing as frequently as the professional jockey and therefore does not need to make use of acute weight making strategies, such as dehydration, as often. In addition, avoiding or restricting food is perhaps an easier weight making strategy, to begin with, compared to dehydration, at the start of a career in horse racing. The fact that 52% of the apprentices in the current study indicated they would like to weigh between 0.5 – 2 kg lighter could also possibly explain the bigger emphasis on more chronic weight control (food avoidance/restriction) compared to acute dehydration that only results in temporary weight loss. The foods mostly avoided/restricted by the apprentices in this study were the same foods perceived to affect their weight (i.e. carbohydrate-rich foods including potatoes, rice, pasta and bread and high-fat foods including fried and fast food, oils, butter, mayonnaise, cheese and cream).

In contrast to others (King & Mezey, 1987; Labadarios et al., 1993; Wilson, Fraser et al., 2013) who reported the use of sauna as the highest or second highest method used to 'make weight', the use of sauna for weight control was ranked only 10^{th} in this study. However, the use of active dehydration strategies to 'make weight' in the present study included exercise to sweat (ranked 9^{th}) and wearing plastic clothing (ranked 13^{th}). Although these strategies were ranked quite low, a number of apprentice jockeys reported the use of

saunas (43%), exercise to sweat (47.6%) and wearing plastic clothing (29%). Extreme weight control practices in athletes can have serious consequences. This has been repeatedly demonstrated in sports like wrestling and boxing, where extreme weight control practices, specifically those resulting in severe dehydration, have resulted in serious physical disabilities, including death, before, during or after an event (Sundgot-Borgen *et al*., 2013). Whilst it is clear from the literature that food restriction, exercise, and the sauna are the most common weight control methods in jockeys, Labadarios et al. (1993), Leydon, & Wall (2002), and Moore et al. (2002), also reported smoking as a popular method to control weight. In these studies 75%, 50%, and 48% of the participants respectively, used smoking to control weight. In contrast to these findings, only 24% of the apprentices in the present study reported smoking as a weight control method. This practice may also increase in frequency as the apprentice becomes older, in order to help to control appetite and food cravings.

The high prevalence of food avoidance and energy restriction in this study was reflected by the low reported daily dietary energy intake (7088±2337kJ) and calculated energy availability (27.1±16.7 kcal/kg FFM over two training days and one rest day). The energy intake in the present study is comparable to the findings from Dolan et al. (2011), Leydon & Wall (2002), Greene et al. (2013) and Wilson, Sparks Drust, Morton, & Close, (2013), who reported total mean daily energy intakes of 7012±1842kJ, 6769±1339kJ, 7516±2272kJ and 7240±940kJ, respectively. Low dietary energy intakes often results in sub-optimal micronutrient intakes as shown in the present study as well as a number of studies on the jockey population (Leydon, & Wall, 2002; Labadarios et al., 1993; Dolan et al., 2011; Waldron-Lynch et al., 2010). In addition to sub-optimal energy, carbohydrate and micronutrient intakes in a group of New Zealand jockeys, Leydon and Wall (2002) reported that 20% of the jockeys showed signs of disordered eating including food avoidance, binging and purging or 'flipping'. A low energy availability does not only result from food restriction, food avoidance or disordered eating, but also from very high exercise energy expenditures that are not compensated for by a higher dietary energy intake (Manore et al., 2007). In the study, energy availability was especially low in 88% of the apprentices on specifically the training days. Wilson, Sparks et al. (2013), studied the energy expenditure of elite jockeys and estimated that the energy expenditure of a jockey during a typical non-racing work day to be approximately 11 260 kJ, much higher compared to the habitual dietary intakes of jockeys. If one considers that the majority of apprentices reported doing additional exercise apart from jockey-specific training, the true energy availability of these apprentices may even be lower.

Sub-optimal dietary intakes, and particularly a low energy availability is of great concern, especially for the younger apprentice jockey who is still growing. According to the 2010 IOC

consensus statement a low energy availability should be avoided and dieting in young athletes should be discouraged (IOC, 2010). Training with a low energy availability, with or without disordered eating, has previously been associated with decreased performance and adaptation to training, as well as possible changes in reproductive and metabolic function, a compromised immune function and poor bone health in athletes (Manore et al., 2007; Sundgot-Borgen et al., 2013). The jockey population have also been shown to exhibit the same characteristics associated with a low energy availability (Dolan, McGoldrick et al., 2012; Dolan, Cullen, McGoldrick, & Warrington, 2013; Greene et al., 2013; Waldron-lynch et al., 2010; Wilson, Sparks et al., 2013b). Warrington et al. (2009), examined a range of physiological health parameters, including bone health, in a group of elite male horse racing jockeys and demonstrated a high prevalence of osteopenia (52%) and reported racing related fractures (78%) in this group of jockeys. Dolan, Crabtree, McGoldrick, Ashley, McCaffrey, & Warrington (2012) highlighted the detrimental effects of weight control practices on the bone health in a group of 21 male jockeys, when they demonstrated that weight control methods particularly dehydration and sub-optimal nutrient intakes possibly resulted in low bone density (results indicated that both jump jockeys and flat jockeys had reduced bone mass at a number of sites when compared to an age, gender and BMI matched control group). A recent study by Greene et al. (2013), compared bone health of apprentice jockeys, aged between 15-18 years, (n=25), to a control group and also demonstrated a lower bone mineral density and a higher fracture risk in the apprentice jockeys compared to the control group. Studies in the literature involving jockeys and apprentice jockeys all emphasize the fact that a constant state of dehydration together with a continual sub-optimal energy intake is detrimental to their long term health and also has serious immediate consequences, (Caulfield, & Karageorghis, 2008; Dolan, Crabtree et al., 2012; Dolan, Cullen et al., 2013; Greene et al., 2013; Warrington et al., 2009; Wilson, Fraser, 2013).

More than a third of apprentices in the study have reported muscular injuries (38%) and back problems (38%), however none of the apprentices reported previous fractures or bone injuries. Furthermore, the most common long-term health issue perceived by the apprentices in the present study was joint problems (23.8%). The top three reported short-term side effects from making weight in the present study included thirst (80%), hunger (75%) and tiredness (75%). More than half (52%) of the jockeys from Dolan et al. (2011) also reported 'thirst' as a side effect and 38% reported 'hunger'. King and Mezey (1987) reported that all the jockeys in their study (100%), listed 'tiredness' as a side effect. The jockeys from the study of Labadarios et al. (1993) and Dolan et al. (2011), also reported 'tiredness' as a short-term side effect, however in a lower percentage (20 and 24% respectively).

In conclusion, almost all the South African male apprentice jockeys in the present study are practicing one or more weight control method and have indicated that they experience short-term side effects following weight control. Of concern is the mean low energy availability in this group. These apprentices are therefore at risk for long-term health consequences including low bone mineral density.

The authors acknowledge the limitations of working with dietary data and that under- and/or over-reporting can never be excluded. The difficulty in obtaining reliable actiheart data for all seven days, especially for race days and rest days, made it difficult to draw firm conclusions with regard to overall energy availability in this population. Furthermore, none of the apprentice jockeys were compliant in recording additional exercise, therefore the actual energy availability estimated on training days, taking into account only the jockey-specific training, could be even lower.

Further research is therefore warranted to determine actual energy availability in apprentice jockeys. A follow-up study on this particular group of apprentice jockeys would be very useful to explore the incidence of longer term health consequences, particularly low bone mineral density as a result of chronic weight making.

There is a need for more lenient weight categories for the apprentice jockey, and the Jockey Academy must try to ensure that the apprentices recruited are of a height and weight more optimal for a long term career. Furthermore, more education is needed in the training academies for the apprentice jockey to improve methods of weight control, regarding food intake and fluid control. In fact, Wilson et al. (2012) has demonstrated with a case study that a balanced well planned low energy intake combined with reasonable regular exercise over a continual period can control the body weight of a jockey and will decrease the need to dehydrate drastically to “make the weight”.

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CHAPTER 4: SUMMARY AND CONCLUSION

4.1 SUMMARY

This study is one of the first studies that investigated the dietary intake, energy availability and weight control practices in South African male apprentice flat jockeys. The majority of apprentice jockeys (91%) reported practicing one or more weight control method with the most common methods being food avoidance and restriction. More than half (55%) of the apprentices had a general mean low calculated energy availability (i.e. <30kcal/kg fat free mass) whilst 88% of the apprentices had a low energy availability on training days. Ninety one percent of the apprentices in the study used one or more weight control methods. They however, focused more on strategies to avoid and restrict food. The energy intake was low (7088±2337kJ per kilogram day or 35.5± 12.5kcal/kg/day), compared to that recommended by the ISSN and IOC, (Potgieter, 2013), as well as the recommendations by Sundgot-Borgen *et al*. (2013), for athletes competing in weight sensitive sports, and who have to control their body weight. The intake of protein and carbohydrate in the study was also below the recommended intake in the Sundgot-Borgen *et al*. (2013) study. The micronutrient intake was low for vitamin A, thiamine, vitamin C, vitamin D, calcium, phosphorus, selenium and zinc. These findings were similar to those of the studies on jockeys (Labadarios *et al*. (1993), Leydon and Wall (2002), Warrington *et al*. (2009) and Dolan *et al*. (2011).

The jockey, as an elite sportsman, has been shown to be at risk with regard to short-term and long-term health implications due to weight control methods that are frequently and commonly practised. The short-term consequences of the weight control methods used were documented in the studies by King and Mezey (1987:249), Labadarios *et al.* (1993:97), Leydon and Wall (2002:220), Caulfield and Karageorghis (2008:877) and Dolan *et al.* (2011:791): Thirst, hunger, irritability, tiredness, dizziness a state of anxiety and lowered sexual interest. Decreased cognitive function and negative mood profiles (using BRUMS scores), were also reported in these studies as well as by Wilson, Fraser *et al*. (2013:453) and Sundgot-Borgen *et al*. (2013:1012). These short-term side effects could have been as a result of impaired energy availability as well as dehydration. The long-term health complications sited by Labadarios *et al*. (1993:97), Leydon and Wall, (2002:220), Warrington e*t al.* (2009:543), Dolan *et al*. (2011:791), Waldron-Lynch *et al*. (2010:521), Dolan, McGoldrick *et al*. (2012:534), Greene *et al*. (2013:688) and Wilson, Drust *et al*. (2014:online), were muscular and skeletal, (low bone density), in nature due to the low macro- and micronutrient intake as well as the constant state of dehydration combined with a low body fat percentage.

There is limited data available with regard to the apprentice jockey, and there is also long bone growth and hormonal development to consider in the adolescent apprentice jockey. This study did show the correlation with the studies on jockeys, regarding the short-term health consequences and effects of the weight control methods on their health: The most common side effect was thirst (80%), hunger (75%) and fatigue (75%). The subjects in the study, had not experienced long-term side effects, but they were asked about their perceived long-term side effects which were: Joint problems such as arthritis (23%) and impaired kidney function (14.3%) as well as long-term metabolic problems due to the weight loss methods.

4.2 STRENGHTS AND LIMITATIONS

The study sample, although small (n=21), is representative of the South African apprentice jockey population, since all the apprentices from the only Jockey Academy in South Africa have been recruited. Dietary data was collected and analysed by a registered dietician, and lifestyle questionnaires were administered by a registered social worker.

The study was completed over a seven day period, during which it was difficult to monitor the apprentices 100% of the time. It was especially difficult to monitor the apprentices during race days and a number of apprentices removed the Actiheart® when travelling by air, and/or when racing. However, reliable exercise energy expenditure data were obtained for 17 of the 21 jockeys for jockey-specific training, making it possible to determine energy availability on a typical apprentice training day (excluding additional activity).

The exercise logs that were kept by the apprentices were not filled in correctly and therefore could not be used in the results.

The 24 hour dietary re-call, was possibly under-or over reported, which is a common flaw, however many of these participants did indeed skipped meals and did restrict their eating to control their weight. Ideally participants should have kept a 3-day weighed dietary record that included travelling days.

4.3 CONCLUSION AND RECOMMENDATIONS

It can be concluded that the mini-dissertation supported the hypothesis that the energy intake of the South African male apprentice jockey is poor, their energy availability is low, and that they are indeed practicing weight control methods.

It would also be wise for the Academies taking in apprentice jockeys to be more scientific in their selection of candidates, to ensure that the adolescent does not grow too tall and too

big, which would mean he has to control his weight very strictly. The weight cut off of 52kg is very low, considering that the apprentice jockey world-wide is taller than his counterpart 20 years ago. If no changes are made to the weight criteria, the apprentice jockeys should be taught to control weight with a scientifically planned healthy diet and should only be allowed to lose not more than 2% of body weight prior to a race.

Further research is warranted to determine the actual energy availability in apprentice jockeys. A follow-up study on this particular group of apprentice jockeys would also be very useful to explore the incidence of longer term health consequences, particularly low bone mineral density as a result of chronic weight making. With scientific help, the lifespan of the jockey as an elite sportsman, as well as maintaining health and well-being during their years as an apprentice and as a jockey can be greatly improved.

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ADDENDUM A

ETHICAL APPROVAL FORM

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

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Web: http://www.nwu.ac.za

Ethics Committee
Tel +27 18 299 4850
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Email Ethics@nwu.ac.za

Prof C Venter

11 July 2008

Dear Prof Venter

ETHICS APPROVAL OF PROJECT

The North-West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: The nutritional status of South African male apprentice jockeys registered with the South African Jockey Academy

Ethics number: N W U - 0 0 2 1 - 0 8 - A 1
(Institution – Project Number – Year – Status)

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Approval date: 11 July 2008 **Expiry date**: 10 July 2013

Special conditions of the approval (if any): None

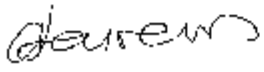
General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-EC:*
  - *annually (or as otherwise requested) on the progress of the project,*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-EC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-EC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-EC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*

The Ethics Committee would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely



Prof Amanda Lourens
(chair NWU Ethics Committee)

ADDENDUM B

INFORMATION SHEET

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

INFORMATION SHEET

Dear Subject

The Centre of Excellence for Nutrition is conducting a study to investigate the dietary intake, energy expenditure and weight control practices of male apprentice jockeys residing at the South African Jockey Academy (SAJA) in Shongweni, KZN. In order to examine these conditions, you will be asked to kindly donate some of your time to fill out a number of questionnaires and undergo a few testing procedures (see below):

What you need to know about the testing period

The research will be conducted at the SA Jockey Academy, Shongweni, KZN on the **23rd, 24th,25th,26th, 27th,28th, February and 1st and 3rd of March 2013.**

Information on the questionnaires that you will need to fill in

A nutrition, health and lifestyle questionnaire. This questionnaire is for the collection of demographic and lifestyle information and will also include questions on sport and physical activity participation, general health, diet and making weight practices. A trained Dietician will explain how to fill out this questionnaire and will be available to help with any questions;

- **Four 24-hour dietary recalls.** You will be asked to recall what you had to eat and drink during the previous 24-hours. A trained Dietician will administer this questionnaire and food models and photo books will be used to help estimate portion size. The 24-hour recall will be completed on the 25th and 27th of February as well as on the 1st and 3rd of March.
- **An Activity (exercise) Record form.** This questionnaire is for the collection of sport and exercise activity. You will be asked to record the type of activity, duration and intensity of the activity.

Information on the measurements/procedures on testing day

- **Height.** Your standing height will be measured with a standard Seca height meter. You will be measured barefoot.
- **Weight.** You weight will be recorded on an electronic scale, barefoot and dressed in minimal clothing
- **Body composition (fat free mass, fat mass and body fat%).** Your body composition will be measured with a Bodystat model 1500MDD electronic hardware device. The device will be connected with two cable leads and electrodes. You will be lying in a vertical position and a safe battery signal passes through the body measuring the flow of the current in the body.
- **Energy expenditure.** Energy expenditure will be measured with an Actiheart monitors that will be placed on each subject for a period of 7 days. The Actiheart is a small device that will be attached to a sticker on your chest.

Approximate duration of testing procedures and research involvement

Questionnaires	Duration	Measurements	Duration
Lifestyle	30 minutes	**Height + weight**	5 minutes
24-hour recalls	~20 min per recall	**Body Composition**	10 minutes
Activity Record	15 min briefing on testing day, Each day thereafter for 7 days	**Actiheart Monitors**	7 days 24hrs/day

Possible risks/discomforts participating in this trial

- All the testing procedures are non-invasive and there are no risks involved with any of the procedures.

- You may feel anxious when completing the making weight questionnaires , but all results will be handled confidentially.

Benefits to the subjects

♣ You will learn more about your energy expenditure and nutrient intakes (e.g. carbohydrates, protein, fat, minerals and vitamins) and receive a dietary feedback report from the research team after recording your four 24-hour recalls.

♣ You will learn more about your ideal body weight and body fat percentage.

Thank you for taking part in the study. If you have any questions about the study and/or testing procedures please do not hesitate to contact us.

Dr Lize Havemann-Nel (018) 299 2399 / Ms Kathy Krog (031) 265 1015

_____

As Project Head, I confirm to participants that the above information is complete and correct.

2 0 - -

c c y y m m d d

Signature of Project Head **Date**

Signed at Potchefstroom, South Africa

Place of Signature

ADDENDUM C

INFORMED CONSENT FORM

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

INFORMED CONSENT

"Dietary intake, energy expenditure and weight control practices of male apprentice jockeys residing at the South African Jockey Academy (SAJA) in Shongweni, KZN"

The **Information Sheet** contains ***all*** the relevant project information as well as a **detailed description** of all the testing procedures. You must read through the **Information Sheet** and ensure that you clearly understand the nature of the study as well as the extent of each procedure as described in the **Information Sheet before completing the Informed Consent.**

PART 1: Summary of General Project Information

The Centre of Excellence for Nutrition is conducting a study to investigate the dietary intake, energy expenditure and weight control practices of male apprentice jockeys residing at the South African Jockey Acdemy (SAJA), in Shongweni, KZN. The research will take place at the SAJA.

Participants must be male and currently enrolled at the SAJA as an apprentice 2nd, 3rd or 4th year jockey. They must be between the ages of 15-25 years old.

Participants in this research study will be required to fill out the following questionnaires:

- A Nutrition, Health and lifestyle questionnaire;
- Four 24-hour Dietary Recalls;
- An Activity Record form

In addition to the questionnaires, the following measurements will be conducted on the research participants:

- Anthropometrical measurements including body weight and height;
- Assessment of body composition (fat mass, fat free mass and body fat%);
- Energy expenditure will be measured by means of an "Actiheart monitor" attached to each subject for a period of 7days.

PART 2: General Principles

To the signatory of the consent contained in Part 3 of this document:

You are invited to take part in the research project as described in the Information sheet and outlined in Part 1 of this consent form. It is important that you also read and understand the following general principles, which are applicable to all participants in our research projects:

1. Participation in the project is completely voluntary and no pressure, however subtle, may be placed on you to take part.

2. It is possible that you may not derive any benefit personally from your participation in the project, although the knowledge that may be gained by means of the project may benefit other persons or communities. In exceptional cases where you do receive personal financial benefits, these are usually for transport to participate and for personal sustenance (e.g. meals) during your participation. You may not be bribed to participate.

3. You are free to withdraw from the project at any time, without stating reasons, and you will in no way be harmed by so doing. You may also request that your data no longer be used in the project and/or that any biological materials must be destroyed. However, you are kindly requested not to withdraw from the project without careful consideration, since it may have a detrimental effect on, inter alia, the statistical reliability of the project.

4. By agreeing to take part in the project, you are also giving consent for the data that will be generated to be used by the researchers for scientific purposes as they see fit, with the caveat that it will be confidential and that your name will not be linked to any of the data without your consent.

5. The NWU Ethics Committee, Medicines Control Council, Department of Health and/or a Court of Law may request access to information to ensure/inspect the ethical responsibility of practices, in the interest of participants and the public.

6. You will be given access to your own data upon request, unless the Ethics Committee has approved temporary non-disclosure (in the latter case, the reasons will be explained to you).

7. A summary of the nature of the project, the potential risks, factors that may cause you possible inconvenience or discomfort, the benefits that can be expected and the known and/or probable permanent consequences that your participation in the project may have for you as participant, are set out for you in the Information Sheet.

8. You are encouraged to ask the Project Head or co-workers any questions you may have regarding the project and the related procedures at any stage. They will gladly answer your queries. They will also discuss the project with you in detail.

9. If you are a minor, the written consent of your parent or legal guardian is required before you participate in this project, as well as (in writing if possible) your voluntary assent to take part – no coercion may be placed on you.

10. The project objectives are always secondary to your well-being and actions taken will always place your interests above those of the project.

11. No project may be commenced before it is approved by the Ethics Committee. Furthermore, the Project Head must report any detrimental effects experienced during the implementation of the project in full and without delay to the chairman of the Ethics Committee. If any unforeseen serious detrimental effects are observed during the project, it may be necessary to terminate the project immediately.

PART 3: Consent

Title of the Project:

Dietary intake, energy expenditure and weight control practices of male apprentice jockeys residing at the South African Jockey Academy, Shogweni, KZN

I, the undersigned

Full names, Surname and ID number

have read the preceding premises in connection with the project, as discussed in ***The Information sheet*** and ***Part 2*** of this informed consent form, and have also heard the oral version thereof and I declare that I understand it. I have also initialled every page of ***Part 1*** and ***Part 2***. I was given the opportunity to discuss relevant aspects of the project with the Project Head and I hereby declare that I am taking part in the project voluntarily.

2 0 _ _ - _ _ - _ _
c c y y m m d d

Signature of Participant **Date**

Signed at

Place of Signature

WITNESSES

2 0 _ _ - _ _ - _ _
c c y y m m d d

Signature of Witness 1 (translator, if applicable) **Date**

Signed at

Place of Signature

2 0 _ _ _ _ - _ _
c c y y m m d d

Signature of Witness 2 **Date**

Signed at

Place of Signature

ADDENDUM D

LIFESTYLE QUESTIONAIRE

SECTION A: PERSONAL INFORMATION

1. **Gender** (please ✓) Male ☐ Female ☐

2. **Age** _____ yrs **Year of birth** __ __ __ __

3. **Race** _____

4. **Highest level of formal education reached** (please ✓)

Primary school	☐
Intermediate/Junior certificate	☐
Leaving Certificate	☐
University or other 3rd level institution	☐

SECTION B: WEIGHT

5. **Current weight** _____ kg

6. **Minimum weight** _____ kg

7. **Maximum weight** _____ kg

8. **Average weight** _____ kg

9. **How much would you like to weigh?** _____ kg

1. SECTION C: EXERCISE

10. Apart from riding, what other exercise do you participate in regularly and for what reason? (please ✓)

	Recreation	Weight control	Fitness	To keep busy	Other (please specify)
a) Walking	☐	☐	☐	☐	_____
b) Running/jogging	☐	☐	☐	☐	_____
c) Tennis	☐	☐	☐	☐	_____
d) Golf	☐	☐	☐	☐	_____
e) Swimming	☐	☐	☐	☐	_____
f) Cycling	☐	☐	☐	☐	_____
g) Weight training	☐	☐	☐	☐	_____
h) Other (specify) _____	☐	☐	☐	☐	_____

2. SECTION D: GENERAL HEALTH QUESTIONS

11. Do you have difficulty in getting to sleep? (please ✓)

Always ☐ Most of the time ☐ Some of the time ☐ Never ☐

12. How many hours sleep, per night, do you typically get? _____ hrs

13. What health problems have you suffered in the last 12 months and how have you managed these problems (e.g. doctor, physiotherapist, nutritionist)? (please ✓)

	Self management	Doctor	Other (please specify)
Bone injuries (fractures)	☐	☐	_____
Muscular injuries	☐	☐	_____
Back problems	☐	☐	_____
Concussion	☐	☐	_____
Eye problems	☐	☐	_____
Asthma	☐	☐	_____
Digestive/Gall bladder	☐	☐	_____
Ulcer	☐	☐	_____
Diabetes	☐	☐	_____
Heart problems	☐	☐	_____
Cold/flu/virus	☐	☐	_____

Other (please specify)

_____

_____

_____

_____

14. Do you smoke? Yes ☐ No ☐

15. At what age did you start smoking <u>regularly</u>? _____ yrs

16. How much <u>do</u> you smoke?

_____ manufactured cigarettes <u>a day</u>

_____cigars <u>per week</u>

17. Which brand of manufactured cigarette do you usually smoke?_____

18. How often do you drink alcohol? (please ✓)

< once a week	1-2 days	3-4 days	5-6 days	every day	don't drink alcohol
☐	☐	☐	☐	☐	☐

19. When you drink, on average, how many units of alcohol do you have? (please ✓)

1-2 units	3-4 units	5-8 units	9-12 units	13-20 units	> 20 units
☐	☐	☐	☐	☐	☐

Note: 1 unit = one measure of spirits, one small glass of wine, one glass of beer/stout/ cider. 1.5 units=long neck bottle of beer/stout/cider. 2 units. =1 pint of beer/stout/cider etc.

3. SECTION E: PROFESSIONAL QUESTIONS

20. Did you take part in other activities/sports prior to specialising in horse racing?

Yes ☐ [*please complete Q.21*]

No ☐ [*go directly to Q. 22*]

21. Please outline briefly other sports you were involved in, how long you were involved in them, and to what level.

Sport	Length of time involved	Level reached
e.g. Athletics	*3 yrs*	*Provincial*
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

22. At what age did you start your apprenticeship? _____ yrs

23. How long have you been an apprentice jockey? _____ yrs

24. What reason(s) <u>most</u> influenced your decision to become a jockey?

If you choose more than one please rank you answer i.e. place the number 1 beside the most important reason, 2 beside the next most important etc. You do not need to rank all of these options.

	✓	Rank
Good lifestyle	☐	_____
Small stature (size)	☐	_____
Family involvement	☐	_____
Love of riding/horses	☐	_____
Like travelling	☐	_____
Publicity/media involvement	☐	_____
Felt I was unsuited to other occupations	☐	_____

Other (please specify) _____

_____

_____ Rank _____

25. What is the most difficult aspect of being an apprentice jockey?

_____

_____

_____

_____

_____

___

26. What is the best aspect of being an apprentice jockey?

_____

_____

_____

_____

_____

___

SECTION F: DIET QUESTIONS

27. Do you take vitamin/mineral supplements? Yes ☐ No ☐

If yes, please tick how often you take them.

	Daily	Weekly	Occasionally
a) Multivitamin	☐	☐	☐
b) Vitamin B	☐	☐	☐
c) Vitamin C	☐	☐	☐
d) Antioxidants	☐	☐	☐
e) Iron	☐	☐	☐
f) Zinc	☐	☐	☐
g) Other (please specify) _____	☐	☐	☐
_____	☐	☐	☐

28. How many meals do you have on a <u>race</u> day, if you are race riding?

Maximum _____ Minimum _____ Average _____

29. How many meals do you have on a <u>non race</u> day?

Maximum _____ Minimum _____ Average _____

30. How often do you eat on the morning of a race, if you are race riding?

Always	Often	Not that often	Never
☐	☐	☐	☐

31. What foods would you purposely avoid when trying to make weight (please ✓)

	Always avoid	Often avoid	Sometimes avoid
a) Milk	☐	☐	☐
b) Bread	☐	☐	☐
c) Rice/pasta	☐	☐	☐
d) Potatoes	☐	☐	☐
e) Oils/butter/mayonnaise	☐	☐	☐
f) Fried food/Fast food	☐	☐	☐
g) Nuts	☐	☐	☐
h) Fruit	☐	☐	☐
i) Soft drinks	☐	☐	☐
j) Red meat	☐	☐	☐
k) Chicken/Fish	☐	☐	☐
l) Eggs	☐	☐	☐
m) Cheese	☐	☐	☐
n) Cream	☐	☐	☐
o) Confectionary (sweets)	☐	☐	☐
p) Chocolate	☐	☐	☐
q) Other (please specify) _____	☐	☐	☐
_____	☐	☐	☐

32. Of these, or other foods, which 5 do you feel <u>most affects</u> your weight?

1. _____ 2. _____
2. _____ 3. _____
5. _____

33. If you skip meals, which do you most often skip? (please ✓)

	Always skip	Often skip	Sometimes skip	Never skip
Breakfast	☐	☐	☐	☐
Lunch	☐	☐	☐	☐
Dinner	☐	☐	☐	☐
Snacks between meals	☐	☐	☐	☐

34. Do you consume any food/drink <u>during a race meeting if you ARE race riding</u>?

Yes ☐ No ☐

If yes, please tick food and how often you eat/drink it

	Always eat/ drink it	Often eat/ drink it	Sometimes eat/ drink it	Never eat/ drink it
a) Sandwich	☐	☐	☐	☐
b) Fruit	☐	☐	☐	☐
c) Chocolate	☐	☐	☐	☐
d) Sports drink	☐	☐	☐	☐
e) Fruit juice	☐	☐	☐	☐
f) Hot food	☐	☐	☐	☐
g) Alcohol	☐	☐	☐	☐
h) Other (please specify) _____	☐	☐	☐	☐
_____	☐	☐	☐	☐

35. Do you consume any food/drink <u>during a race meeting if you are NOT race riding</u>? Yes ☐ No ☐

If yes, please tick food and how often you eat/drink it

	Always eat/ drink it	Often eat/ drink it	Sometimes eat/ drink it	Never eat/ drink it
a) Sandwich	☐	☐	☐	☐
b) Fruit	☐	☐	☐	☐
c) Chocolate	☐	☐	☐	☐
d) Sports drink	☐	☐	☐	☐
e) Fruit juice	☐	☐	☐	☐
f) Hot food	☐	☐	☐	☐
g) Alcohol	☐	☐	☐	☐
h) Other (please specify) _____	☐	☐	☐	☐
_____	☐	☐	☐	☐

36. On a scale of 0 to 10 rate your <u>average daily hunger</u> (please ✓)

0	1	2	3	4	5	6	7	8	9	10
Never hungry					Occasionally hungry				Constantly hungry	

37. On a scale of 0 to 10 rate you <u>average daily thirst</u> (please ✓)

0	1	2	3	4	5	6	7	8	9	10
Never thirsty					Occasionally thirsty				Constantly thirsty	

SECTION G: MAKING WEIGHT QUESTIONS

38. The following is a list of behaviours used by people to control their body weight or to lose weight. Which of the following do you <u>currently</u> use to make weight for a race?

a) Sauna Yes ☐ No ☐

b) Rub downs Yes ☐ No ☐

c) Wearing plastic Yes ☐ No ☐

39. The following is a list of behaviours used by people to control their body weight or to lose weight. Which of the following do you <u>currently</u> use to control or lose weight between races.

a) Sauna Yes ☐ No ☐

b) Rub downs Yes ☐ No ☐

c) Wearing plastic Yes ☐ No ☐

40. To <u>control weight</u> do you (please ✓)

	Yes	No
a) Not eat between meals	☐	☐
b) Not eat breakfast	☐	☐
c) Not eat lunch	☐	☐
d) Not eat dinner	☐	☐
e) Follow your own diet	☐	☐
f) Follow a magazine or other diet	☐	☐
g) Weigh yourself every day	☐	☐
h) Exercise to use up calories	☐	☐
i) Exercise to sweat	☐	☐
j) Exercise excessively	☐	☐
k) Select low calorie foods	☐	☐
l) Keep busy to avoid eating	☐	☐
m) Follow a vegetarian diet	☐	☐
n) Drink coffee	☐	☐
o) Drink fluids before meals to feel full	☐	☐
p) Restrict food intake	☐	☐
q) Fast	☐	☐
r) Prepare your own food	☐	☐
s) Avoid situations where there will be food	☐	☐
t) Avoid eating with the family	☐	☐
u) Take advantage of illness to avoid eating	☐	☐
v) Use natural laxatives e.g. prunes, bran	☐	☐
w) Use laxatives (commercial)	☐	☐
x) Vomit after meals	☐	☐
y) Smoke cigarettes	☐	☐
z) Smoke marijuana	☐	☐
aa) Use fluid tablets (diuretics)	☐	☐
bb) Chew food and spit it out	☐	☐
cc) Use slimming pills – prescription	☐	☐
dd) Use slimming pills – over the counter	☐	☐

	Yes	No
Q.40 contd…		
ee) Use herbal preparations	☐	☐
ff) Attend weight watchers (or similar group)	☐	☐
gg) Attend residential 'health farms'	☐	☐
hh) See a doctor/psychologist	☐	☐
ii) See a dietician	☐	☐
jj) Attend a support group	☐	☐
kk) Use stress management/yoga/ relaxation	☐	☐
ll) Use acupuncture	☐	☐
mm) Use hypnosis	☐	☐
nn) Other methods (please specify)		
_____	☐	
_____	☐	
_____	☐	

41. What <u>short-term</u> effects do you experience from your behaviour to make weight for a race (please ✓)

	Yes, I experience..		A lot	A little		**No, I don't experience..**
a) Headache	☐	→	☐	☐	**OR**	☐
b) Backache	☐	→	☐	☐	**OR**	☐
c) Fatigue/tiredness	☐	→	☐	☐	**OR**	☐
d) Dizziness	☐	→	☐	☐	**OR**	☐
e) Faintness	☐	→	☐	☐	**OR**	☐
f) Trembling	☐	→	☐	☐	**OR**	☐
g) Hunger	☐	→	☐	☐	**OR**	☐
h) Thirst	☐	→	☐	☐	**OR**	☐
i) Decreased performance	☐	→	☐	☐	**OR**	☐
j) Decreased concentration	☐	→	☐	☐	**OR**	☐
k) Decreased sexual interest	☐	→	☐	☐	**OR**	☐
l) Swollen glands	☐	→	☐	☐	**OR**	☐
m) Swelling of hands/feet	☐	→	☐	☐	**OR**	☐
n) Disturbed sleep	☐	→	☐	☐	**OR**	☐

Q41 contd.	**Yes, I experience..**		A lot	A little		**No, I don't experience**
o) Increased infection/illness	☐	→	☐	☐	**OR**	☐
p) Dry skin	☐	→	☐	☐	**OR**	☐
q) Dehydration	☐	→	☐	☐	**OR**	☐
r) Down in mood	☐	→	☐	☐	**OR**	☐
s) Light headedness	☐	→	☐	☐	**OR**	☐
t) Lack of coordination	☐	→	☐	☐	**OR**	☐
u) Tension	☐	→	☐	☐	**OR**	☐
v) Irritation/Agitation	☐	→	☐	☐	**OR**	☐
w) Hyperactivity	☐	→	☐	☐	**OR**	☐
x) Relaxation	☐	→	☐	☐	**OR**	☐
y) Euphoria (on a high)	☐	→	☐	☐	**OR**	☐
z) Sense of achievement	☐	→	☐	☐	**OR**	☐
aa) In control	☐	→	☐	☐	**OR**	☐
bb) Feeling psychologically good	☐	→	☐	☐	**OR**	☐
cc) Feeling physically good	☐	→	☐	☐	**OR**	☐

42. If you had 2 kilos to lose for a give race, when do you start losing weight? (please ✓)

7 or more days before	☐
5-6 days before	☐
2-4 days before	☐
1-2 days before	☐
the day before and the day of the race	☐
the day of the race	☐

43. What factors (if any) make it harder to make weight for a race?_____

_____

_____

_____

44. What <u>long-term effects</u> do you think <u>your lifestyle as a jockey</u> may have on your <u>health</u>? (please ✓)

	Very bad effect	Bad effect	Good effect	Very good effect
a) Length of life	☐	☐	☐	☐
b) Bone density (thickness)	☐	☐	☐	☐
c) Joints (arthritis)	☐	☐	☐	☐
d) Kidney function	☐	☐	☐	☐
e) Body's fluid balance	☐	☐	☐	☐
f) Ability to have children	☐	☐	☐	☐
g) Body's energy control (metabolism)	☐	☐	☐	☐
h) Brain function	☐	☐	☐	☐
i) Heart	☐	☐	☐	☐
j) Infection control (immune system)	☐	☐	☐	☐
k) Gastro intestinal function (gut)	☐	☐	☐	☐
l) Body's control of cancer	☐	☐	☐	☐
m) Psychological / mental health	☐	☐	☐	☐
n) Physical health	☐	☐	☐	☐

45. What effects do you think your lifestyle as an apprentice jockey has had on the following? That is how it <u>affected you</u> (please ✓)

	Very bad effect	Bad effect	No effect	Good effect	Very good effect	Not applicable
a) Relationships with partner	☐	☐	☐	☐	☐	☐
b) Relationship with family	☐	☐	☐	☐	☐	☐
c) Family life	☐	☐	☐	☐	☐	☐
d) Social life	☐	☐	☐	☐	☐	☐
e) Sexual responsiveness/ interest	☐	☐	☐	☐	☐	☐

Thank you for taking the time to complete this questionnaire

ADDENDUM E

24-HOUR RECALL FORM

Apprentice jockey study 24-hour recall dietary intake

Subject ID ☐☐☐☐ **Gender** ☐ ***Male*** ☐ ***Female***

Today's date: ☐☐☐☐ ☐☐ ☐☐
year ***month*** ***day***

24-hour completed by: _____

Subject DOB: ☐☐☐☐ ☐☐ ☐☐ **Age** ☐☐ **years**

What day was yesterday? (tick correct one)

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Would you describe the food that you ate yesterday as typical of your usual food intake?

Yes	1	No	2

Greetings!

Thank you for giving up your time to participate in this study. I hope you are enjoying it so far. Here we want to find out what apprentice jockeys at the South African Jockey Academy eat and drink. This information is important to know as it will tell us if apprentices are eating enough and if they are healthy.

There are no right or wrong answers.

Everything you tell me is confidential. Only your subject number appears on the form.

Is there anything you want to ask now? Are you willing to go on with the questions?

I want to find out about everything you ate or drank yesterday, including water, food you bought from food outlets/kiosks and supplements (e.g. Energade etc.). Please tell me everything you ate from the time you woke up yesterday up to the time you went to sleep. I will also ask you where you ate the food and how much you ate.

To help you to describe the amount of a food you eat, I will show you pictures and examples of different amounts of the food. Please say which picture or example is the closest to the amount you eat, or if it is smaller, between the sizes or bigger than the pictures.

Time	Place	Description of food and preparation method	Amount	Amount in gram

Time	Place	Description of food and preparation method	Amount	Amount in gram