

The health benefits of horse riding in the UK



Research undertaken by the University of Brighton and Plumpton College on behalf of The British Horse Society

Table of Contents

Page		Page	
5	Executive Summary	21	5 Findings – the psychological effects of horse riding
9	1 Introduction	5.1	Introduction
9	2 The Evidence Base – exercise, health and recreational horse riding	5.2	The feelings associated with horse riding – quantitative findings
2.1	The evidence base – physical exercise and health	5.3	The feelings associated with horse riding – qualitative findings
2.2	The evidence base – horse riding and health	5.4	The motivations for going horse riding – quantitative findings
13	3 Research Methods	5.5	The motivations for going horse riding – qualitative findings
3.1	Introduction	5.6	The psychological effects of horse riding – conclusion
3.2	Methods – scientific trials and the measurement of exercise intensity	31	6 Findings – key social groups
3.3	Methods – the questionnaire survey of recreational horse riders	6.1	Introduction
15	4 Findings – exercise intensity and frequency	6.2	Findings – gender
4.1	Introduction	6.3	Findings – disability
4.2	Exercise intensity – scientific trials	6.4	Findings – otherwise sedentary
4.3	Exercise intensity – questionnaire survey	6.5	Key social groups – conclusions
4.4	Exercise frequency – questionnaire survey	37	Bibliography
4.5	Measures of exercise frequency and intensity combined – questionnaire survey	43	List of appendices
4.6	Exercise intensity and frequency – conclusion		

The health benefits of horse riding in the UK

Executive Summary

Key findings

The physical health benefits of horse riding and associated activities

- Horse riding and activities associated with horse riding, such as mucking out, expend sufficient energy to be classed as moderate intensity exercise.
- Regular periods of trotting in a riding session may enhance the energy expended and associated health benefits.
- More than two thirds (68 percent) of questionnaire respondents participate in horse riding and associated activities for 30 minutes or more at least three times a week. Sport England estimate that such a level of sporting activity will help an individual achieve or exceed the government's recommended minimum level of physical activity.
- A range of evidence indicates the vast majority (90 percent plus) of horse riders are female and more than a third (37 percent) of the female riders who took part in the survey were above 45 years of age. Horse riding is especially well placed to play a valuable role in initiatives to encourage increased physical activity amongst women of all ages.
- Amongst the horse riders who took part in the survey, 39 percent had taken no other form of physical activity in the last four weeks. This highlights the importance of riding to these people, who might otherwise be sedentary.
- Horse riders with a long-standing illness or disability who took part in the survey are able to undertake horse riding and associated activities at the same self-reported level of frequency and physical intensity as those without such an illness or disability.

The psychological and social benefits of horse riding

- Horse riding stimulates mainly positive psychological feelings.
- Horse riders are strongly motivated to take part in riding by the sense of well-being they gain from interacting with horses. This important positive psychological interaction with an animal occurs in a very few sports.
- Being outdoors and in contact with nature is an important motivation for the vast majority of horse riders.

Study methods

The British Horse Society commissioned the University of Brighton in partnership with Plumpton College to research the physical health, psychological and well-being benefits of recreational horse riding in the United Kingdom.

Sport England UK have adopted a threshold value for the contribution of sport to meeting Government guidelines on the recommended intensity and frequency of exercise that is likely to achieve physical health benefits. The threshold value measures the degree to which an individual participates in sport of moderate intensity activity for at least 30 minutes or more, three times a week. The research, therefore, assessed whether horse riding can be classified as a moderate intensity exercise and examined the frequency with which individuals take part

The research also examined the psychological and social benefits of horse riding. Reliable existing evidence indicates that physical exercise produces well-being benefits linked to social interactions and changes in mood, anxiety, self esteem and other personal emotions.

Two scientific exercise testing trials were undertaken to analyse the physical exercise intensity of recreational horse riding using validated scientific measurements of energy expended and current definitions of what constitutes moderate intensity exercise in terms of energy expenditure measured in metabolic equivalents (METs).

The first trial involved 17 participants cycling in a laboratory to assess their aerobic fitness levels. Measurements were also taken of their descriptive anthropometric characteristics. In the second trial the same 17 participants rode a horse for 45 minutes at the Plumpton College equestrian centre following a protocol that replicated the pattern of a typical riding lesson.

A questionnaire survey was undertaken of 1,248 horse riders. The quantitative and qualitative data gathered by the questionnaire allowed an analysis of the respondents' self reported measures of exercise intensity and frequency, and their perceptions of the social and psychological benefits of horse riding.

Physical health benefits

The scientific trials indicated general horse riding energy expenditure was equivalent to 3.7 METs and trotting equated to approximately 5.0 METs. These levels are clearly within the moderate intensity exercise band recommended by the UK's ABC of Physical Activity for Health guidelines that considers moderate intensity to be typically characterized as between three-six METs.

The national compendium of physical activities¹ categorises energy expenditures for different recreational physical activities and reports levels of four METs for general horse riding and 6.5 METs for trotting, which are similar to those obtained in the scientific trials. The compendium also reports that the energy expenditure for saddling and grooming was 3.5 METs which is in the moderate intensity band

More than two thirds (68 percent) of questionnaire respondents achieved the government guidelines for exercise intensity and frequency (30 minutes for three times a week or more at moderate intensity) from horse riding and associated activities alone. Of these respondents 69 percent achieved this level of intensity and frequency through horse riding and the other 21 percent did so through associated activities such as mucking out and grooming.

Women have been identified in government studies as a social group with relatively low levels of participation in physical activity. Some 93 percent of questionnaire respondents were women and 49 percent of female respondents were aged 45 or above. These are comparable figures to a major Sport England survey which found that 90 percent of those participating in equestrianism are women and 37 percent of the female participants in equestrianism are aged 45 or above. The gender and age profile of equestrianism is not matched by any other sport in the UK².

Thirty nine percent of questionnaire respondents indicated that horse riding was the only form of physical activity in which they had participated during the last four weeks. These respondents, if they did not ride, would be sedentary people unless they changed their exercise habits, thus stressing the importance of horse riding for these individuals.

Qualitative data obtained in the questionnaire suggests that for some respondents with long-standing illnesses or disability, horse riding had actually improved their physical or mental condition.

1 Ainsworth, B. E., Haskell W. L., Whitt, M. C., Irwin, M., Swartz, A. M., Strath, S. J., O'Brien, W. L., Bassett, D., Schmitz, K., Emplainscourt, P., Jacobs, D. & Leon, A. (2000) Compendium of physical activities: an update of activity codes and MET intensities. *Medicine and Science in Sports Exercise*, 32(9 Suppl), 498-504.

2 Sport England (2010) Active People Survey (2010/11)

Psychological and social benefits

More than 80 percent of questionnaire respondents reported that horse riding made them feel 'quite a lot' or 'extremely' cheerful, relaxed, happy or active. Qualitative data suggests that horse riding can play a role in managing negative feelings relating to anxiety and depression. The experience of these psychological benefits amongst questionnaire respondents was not influenced by the frequency of participation in horse riding and most psychological benefits were experienced by riders who did not participate regularly.

Asked to rate different motivations for going horse riding 82 percent of questionnaire respondents rated the motivation of 'interaction with horses' as either 'very important' or 'extremely important'. No other motivation received such a high importance rating. Existing evidence suggests that companion animals can provide owners with certain psychological benefits. These findings suggest that the interaction with horses may be very positive psychologically for horse riders.

More than 80 percent of questionnaire respondents rated the motivations 'contact with nature' and 'scenery and views' 'important', 'very important' or 'extremely important'. Some personal development motivations identified as important by respondents included 'escape', 'develop skills', 'challenge myself', 'experience excitement', 'to be physically active' and 'to relax'. Participation in horse riding provides a range of psychological and social benefits, some of which are particular to the interaction with animals and nature and therefore would not be gained from other forms of sporting activity.





1. Introduction

There is limited evidence available on the physical health, psychological and well-being benefits of horse riding. Given this situation, the University of Brighton, in partnership with Plumpton College, were commissioned by The British Horse Society to carry out a study to identify the health and well-being benefits of horse-based sport and leisure.

The research was carried out by a multi-disciplinary research team that included sports scientists based at the University of Brighton Welkin Human Performance Laboratories, equine specialists from Plumpton College and social scientists from the University of Brighton with specialist expertise in leisure, health and outdoor environments. Members of the research team have conducted major studies recently on outdoor recreation for the Environment Agency, Defra and Natural England. The team was led by Professor Andrew Church who recently led the research into leisure and the environment for the recently published UK National Ecosystem Assessment that analyses the natural environment in terms of the benefits it provides for society and prosperity.

Evidence was collated using a variety of quantitative and qualitative research methods, including a literature search, physiological testing and a survey of recreational horse riders. The research focused on recreational horse-based sport and leisure and did not consider the health benefits that are obtained by professional equestrian sports people.

The key findings based on the quantitative and qualitative data are reported in the executive summary above as well as in the main report which is divided in to six main sections:

- Section 1 Introduction
- Section 2 presents a summary of the existing evidence base using the findings of the literature review
- Section 3 provides an overview of the methods of data collection used
- Section 4 outlines the results of the present study pertaining to the physiological benefits of recreational horse riding
- Section 5 outlines the results of the present study pertaining to the psychological benefits of recreational horse riding
- Section 6 provides a summary of findings for specific social groups.

The detailed findings of the research are presented in sections 4-6 and key findings are highlighted in bold. For people involved in horse riding some of the findings may be self-evident, such as the high level of female participants in horse riding or the importance of interacting with horses as a motivation for riding. Many of the physical health and psychological dimensions of horse riding, however, may not be well known amongst key partner organisations that can play an important role in the future development of horse-based sport and leisure. These organisations might include private business, the voluntary sector, government bodies and health sector organisations.



2. The Evidence Base – exercise, health and recreational horse riding (a more detailed version of this section is available in Appendix 1)

2.1 The evidence base – physical exercise and health

There is now an abundance of evidence indicating the physical health, mental health and social benefits of physical activity (Department of Health, 2004, Foresight, 2007). In particular, physical activity is associated with reduced risk of coronary heart disease, obesity, type 2 diabetes, and other chronic diseases and conditions (Department of Health, 2004).

An increasing body of research points to a positive effect of physical exercise on psychological health, including enhanced self-esteem, improved social networks and reduced anxiety and depression (Fox and Corbin, 1989; Martinsen, 1995; Landers, 1997; Farmer et al, 1998; Scully et al, 1998; Sonstroem et al, 1994; Pretty et al, 2003; Barton and Pretty, 2010).

Physical exercise, therefore, affects overall well-being not just physical health, with well-being defined in the UK as “a positive physical, social and mental state; it is not just the absence of pain, discomfort and incapacity” (Defra, 2007).

The existing evidence also indicates that the benefits of exercise, especially those relating to physical health, are in part influenced by the frequency and intensity with which an individual takes exercise (Blair et al, 1992; Blair et al, 1995).

As a result of existing evidence the Department of Health recommends that adults should participate in 150 minutes of moderate intensity physical activity per week, with the suggestion that this could be broken down into 30 minutes per day over five days (Department of Health, 2011). Sport England (2010) have adopted the rationale that the appropriate contribution from sport to this guideline is at least three, moderate intensity 30 minute sessions per week (three x 30). This is the threshold value for participation in the Sport England Strategy 2008-2011 and the measure used in their Active People survey, a major study of sports participation that has been running since 2005. There is also existing evidence to show that three x 30 minutes per week of moderate intensity exercise alone can be sufficient to produce some physical health benefits (Tully et al, 2007). This research project, therefore, examines both the intensity and frequency of exercise linked to horse riding. In keeping with the approach adopted by Sport England this project assessed the degree to which horse riders are achieving the threshold value (three x 30 minutes of moderate intensity activity per week) for participation in sport that will contribute to meeting government guidelines on levels of physical activity that are likely to achieve physical health benefits.

People who participate less regularly in sport may gain other psychological or social well-being benefits (Barton and Pretty, 2010) and society may benefit from the development of social capital and networks (Dekker and Uslaner, 2001). Consequently, another government survey called Taking Part (DCMS, 2007) has, since 2005, been measuring levels of voluntary participation in leisure, culture and sport in England in recognition of the social and cultural benefits of people being involved in sport on a regular basis even if the involvement is not of the frequency required to confer physical health benefits.

The research presented in this report was designed to explore not only the physical health benefits of riding but also the related mental health and social benefits. The research methods used were designed to explore the key issues of exercise intensity and frequency that influence the physical health benefits arising from exercise. In particular, the study aimed to assess using a variety of methods if recreational horse riding can be classified as a moderate intensity exercise and to examine the frequency with which individuals take part in horse riding and activities associated with horse riding such as mucking out and grooming.

There is also existing evidence that additional health and well-being benefits can occur through forms of exercise, such as horse riding, that involve outdoor natural environments, contact with nature and interaction with animals.

A number of studies have found that the presence of natural settings can actually act as a motivating factor for physical exercise and possibly increase the intensity of exercise and the energy expended. (Reynolds, 2002; Giles-Corti and Donovan, 2003; Netherlands Health Council 2004; Pretty et al. 2005; Pretty et al. 2007). There are some uncertainties associated with this evidence base as the additional benefits of outdoor exercise compared to that in indoor environments are not fully understood (Thompson Coon et al. 2010) and the research into the health benefits of interaction with animals very rarely considers horses as it has focused mainly on companion animals (see for example Folse et al., 1994; Garrity et al, 1989; Hoffman et al., 2009; Scouter and Miller, 2007; Seigel, 1990). The methods used in this study, therefore, explored the significance for horse riders of interactions with outdoor environments, nature and horses.

2.2 The evidence base – horse riding and health

Appendix 1 provides a detailed review of the evidence base on the health and well-being benefits obtained through horse riding. The existing evidence is both conflicting and limited with the relatively small number of studies available varying in terms of the health effects they identify as associated with horse riding (see Devienne and Guezennec (2000) and Ainsworth et al (2000) and, Meyers (2006)). This limited evidence highlights the importance of the research presented in this report.

The existing evidence base also indicates that issues of gender and disability may be of significance in considering the health and well-being benefits of horse riding. Horse riding is a sport where the vast majority of participants are women but nationally women have lower participation than men in moderate intensity sport (Sport England, 2007; 2010).

Current evidence also suggests that people with disabilities may receive some specific health benefits from horse riding due to the nature of the physical activity involved (Crane, 1999; Bertoti, 1988; Kubota et al, 2006; Bronson et al, 2010; Hosaka et al, 2010).

The evidence base also reveals that a high proportion of riders depend on horse riding for their moderate intensity exercise as they do no other form of exercise and unless they changed their exercise habits might otherwise be sedentary (Sport England, 2007). The research findings presented in this report, therefore, explore issues of gender, disability and the exercise characteristics of those who might otherwise be sedentary.



3. Research methods

(A more detailed version of this section is available in Appendix 2)

3.1 Introduction

This section sets out the two research methods used to collect and analyse primary data. The first method involved a group of 17 participants who took part in two scientific trials, one in a laboratory and another in an equestrian centre. This provided an in-depth analysis of the physical exercise intensity of recreational horse riding based on a series of validated and tested scientific techniques. The other primary data collection method used was a questionnaire survey of 1,248 horse riders. Appendix 2 provides full details of both the methods used.

3.2 Methods – scientific trials and the measurement of exercise intensity

The overall experimental design of the scientific trials used in this study is based on the national recommendations on what level of exercise intensity is associated with potential health benefits. The purpose of the scientific trials was to evaluate the energy cost of horse riding using a portable gas analysis system and ascertain whether the intensity of exercise was sufficient to be classified as 'moderate' and therefore, confer health benefits to individuals involved in this leisure activity.

Importantly, technical innovations in the development of portable gas analysis systems have enabled the valid measurement of expired air and energy expenditure in non-laboratory and outdoor environments (Hauswirth, 1997; Macfarlane, 2001; McLaughlin, 2001; Pinnington, 2001).

In order to ascertain the exercise intensity of recreational horse riding, the group of 17 participants were asked to carry out two trials; one cycling in the University of Brighton, Welkin Human Performance Laboratories and one riding for 45 minutes at the Plumpton College equestrian centre replicating the pattern of a typical riding lesson.

The exercise testing (see Appendix 2 for full details) was specifically designed to explore the issue of intensity using scientific measurements and current definitions of what constitutes moderate intensity exercise in terms of energy expenditure measured in metabolic equivalents (METs).

3.3 Methods – the questionnaire survey of recreational horse riders

The self completion questionnaire survey of 1,248 recreational horse riders was designed to gather both quantitative and qualitative data. It comprised 25 questions in total, took approximately 15 minutes to complete and obtained standard socio demographic data on gender, age, occupation and long term illness/disability (see Appendix 5).

Physical health issues were addressed through questions that obtained self reported measures of physical exercise intensity and frequency for horse riding, activities associated with horse riding (such as grooming and mucking out) and other sporting activities. Closed and open ended questions were used to investigate the social and psychological benefits respondents perceived they obtained from horse riding.

The population of interest for the survey were just recreational riders and it was not the aim to undertake a probability survey that would allow direct comparison with other groups of individuals such as non-riders. The questionnaire recruitment methods were designed, therefore, to obtain a sample of a sufficient size to allow disaggregation of the data to examine particular sub-groups of the sample. The recruitment methods proved to be successful in terms of responses and the target sample size of 600 was exceeded, with a total of 1,248 surveys deemed suitable for use in the analysis following a quality check.

The key demographic characteristics of the questionnaire respondents are summarised in Table 3.3 overleaf.

Table 3.3 Demographic summary data

	Frequency (as percentage of total sample of 1,248)
Gender	
Male	7
Female	93
Age	
16-24	14
24-44	38
45-64	42
65-74	5
75+	1
Longstanding illness/disability?	
Yes	23
No	77
Region where rode most regularly	
England	69
Wales	6
Scotland	15
N. Ireland	5
Outside the UK	5
Horse ownership	
Horse owner	79
Non-horse owner	21
Employment status	
Full-time employment	46
Part-time employment	22
Carer	1
Full-time student	11
Part-time student	1
Retired	10
Other	9
Riding Skill level	
Beginner	4
Intermediate	54
Advanced	37
Expert	5

4. Findings – exercise intensity and frequency

4.1 Introduction

This section uses data from the scientific trials and the questionnaire survey to examine the issues of exercise intensity and frequency associated with horse riding. The health benefits of physical activity are determined by the intensity and frequency with which exercise is undertaken. One key aim of this study was to assess if recreational horse riding can be classified as a moderate intensity exercise and the scientific trials were specifically designed to ascertain whether a 45-minute riding session was sufficiently intense to be considered a physical activity of 'moderate intensity', so that if riders were to take part with sufficient frequency horse riding would provide longer term health benefits. This section starts by analysing the findings from the scientific trials and is then followed by sections that examine the findings from the questionnaire survey based on respondents self reported measures of exercise intensity and frequency. In all sections key findings are highlighted in bold and summarised at the end of the section.

4.2 Exercise intensity – scientific trials

The 17 participants in the scientific trials undertook a cycling session in a laboratory and a 45-minute riding session, during which various physical characteristics affected by exercise were measured. Before and after both sessions the participants also completed a fatigue questionnaire on the effects of the exercise intervention.

Descriptive data on the metabolic effects of the horse-riding session is presented in Table 4.1, which highlights the peak and mean values throughout the session and the \pm figure indicates the standard deviation for each measure. Of specific interest, is the average rating of perceived exertion (RPE) which was above 13, the average percentage of VO_{2max} (oxygen uptake) which was 40 percent and the number of metabolic equivalent (METs) that riders were exercising at was between three and six. Comparative data for METs associated with other forms of physical activity are provided towards the end of this section. However, with an average energy expenditure of 5.42 kcal per minute, a horse riding session of 45-minutes would have an average energy expenditure of 244 kcal.

Table 4.1 Peak and Mean values \pm SD for heart rate (HR), percentage of age-predicted peak heart rate ($\%HR_{peak}$), rating of perceived exertion (RPE), absolute and relative oxygen consumption (VO_2), percentage of peak oxygen uptake from incremental test ($\%VO_{2max}$ minute ventilation (V_E), metabolic equivalent (MET), percentage of metabolic reserve ($\%MET-R$), respiratory exchange ratio (RER), and energy expenditure (EE) following the riding session.

	Peak	Mean
HR (b.min ⁻¹)	178 \pm 21.94	128 \pm 10.12
$\%HR_{peak}$ ^b	-	67.4 \pm 4.39
RPE	14.5 \pm 2.62	13.04 \pm 2.22
VO_2 (L.min ⁻¹)	1.672 \pm 0.496	0.930 \pm 0.346
VO_2 (ml.kg ⁻¹ .min ⁻¹)	24.6 \pm 4.00	13.8 \pm 4.06
$\%VO_{2max}$	70.0 \pm 14.6	40.3 \pm 13.99
V_E (L.min ⁻¹)	66.11 \pm 16.31	40.34 \pm 9.40
MET ^a	7.1 \pm 1.1	3.7 \pm 1.1
RER	-	1.085 \pm 0.12
EE (Kcal.min ⁻¹)	8.98 \pm 2.88	5.42 \pm 1.83

a MET = metabolic equivalent or $VO_2 = 3.5 \text{ ml.kg}^{-1}.\text{min}^{-1}$ b $HR_{peak} = 220 - \text{age}$

Table 4.2 presents data from the fatigue questionnaire data completed by the 17 participants and reveals, as might be expected, that following the incremental exercise test to exhaustion in the laboratory, participants moved from a state of vigour to a state of fatigue which was statistically significant ($P < 0.05$). Prior to the 45-minute riding session, fatigue scores were not significantly different to those in the laboratory, confirming that participants started each of the trials in the same perceptual state of vigour. Following the riding session, fatigue scores changed but this was not significantly different to pre scores. The post scores were however, different to post laboratory VO_{2max} scores ($P < 0.05$, Table 4.2).

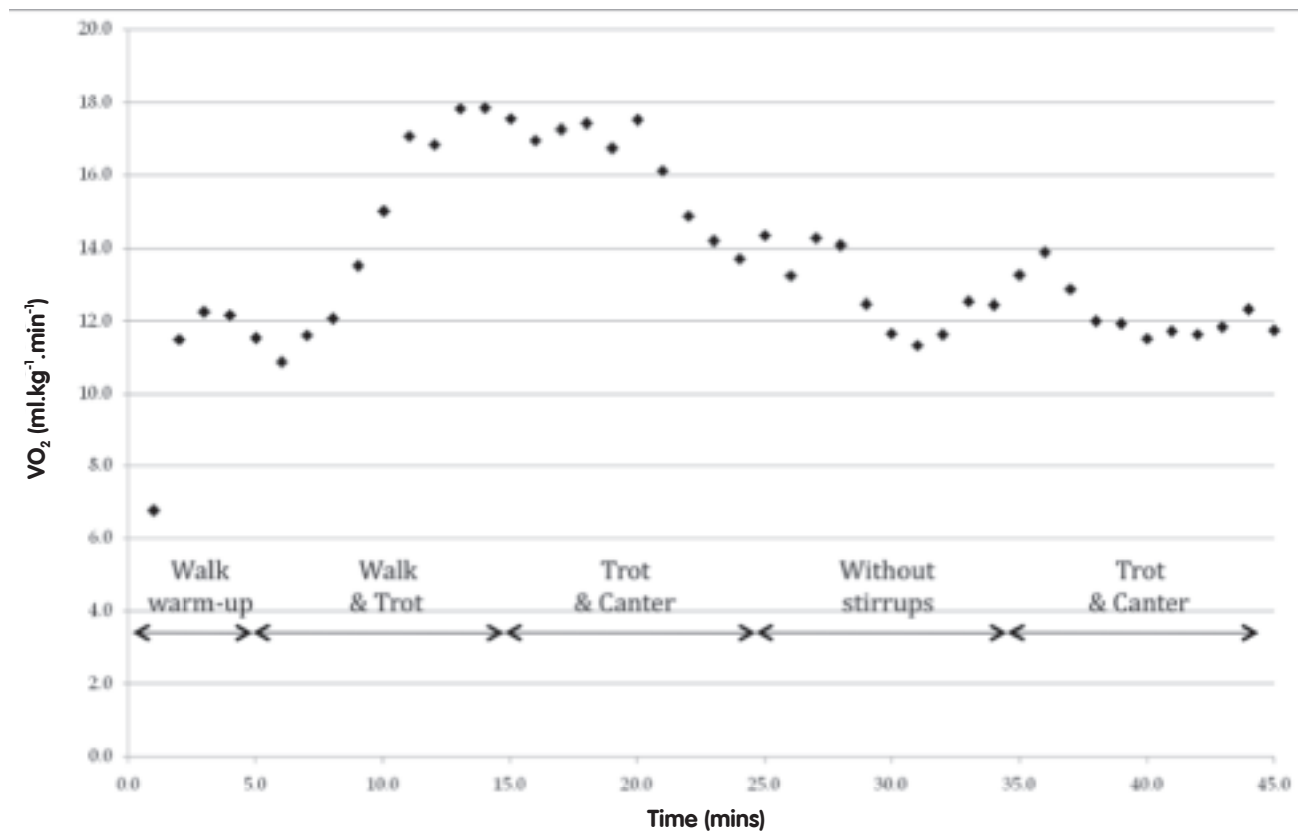
Table 4.2 Multidimensional Fatigue Symptom Inventory – Short form (MFSI-SF) scoring

	MFSI-SF Pre	MFSI-SF Post	MFSI-SF Pre Ride	MFSI-SF Post Ride
VO ₂ max				
Mean	-1.65*	6.9 ⁺	-2.06	1.47 ⁺
SD (±)	9.35	10.70	13.36	12.30

*Denotes significance in MFSI-SF pre vs. post VO₂max (p<0.05)

⁺Denotes significance in MFSI-SF between post VO₂max and post riding sessions (p<0.05)

Figure 4.1 displays the average oxygen cost of all riders during the 45 minute riding session with the different riding activities highlighted. The data clearly shows the higher oxygen cost of the 'Trot' to all other riding activities of the session.



The main finding from the scientific trials for the mixed group of riders assessed was that on average, they exercised at an intensity that would be classified as moderate and that trotting was the element that contributed the most to achieving this desired intensity of exercise.

There is now an abundance of evidence to show that physical activity is associated with reduced risk of coronary heart disease, obesity, type 2 diabetes, and other chronic diseases and conditions (Department of Health, 2004). The UK's ABC of Physical Activity for Health guidelines recommended that an activity considered to be moderate intensity, is typically characterised as 3-6 METs, a rating of perceived exertion of 12 or 13 and 40-59 percent of $VO_2\text{max}$ (O'Donovan et al, 2010). In our study, from the horse ride average METs (metabolic equivalent) were 3.7, average RPE (rating of perceived exertion) was 13 and the oxygen cost equated to 40 percent ($VO_2\text{max}$).

Comparative evidence on the respective energy expenditures for recreational physical activities have been categorised in the compendium of physical activities (Ainsworth et al, 2000) and some of this data, including that for horse riding, is presented in Table 4.3 alongside data from the scientific trials. The compendium reported general horse riding to be equivalent to 4 METs (Ainsworth et al, 2000), which would agree very closely with our findings of 3.7 METs.

The trotting element in the scientific trials equated to approximately 5.0 METs which is marginally lower to the 6.5 METs reported by the compendium (Ainsworth et al, 2000) but still clearly within the moderate intensity band.

The findings from the scientific trials and the data in the compendium (Ainsworth et al, 2000) both clearly suggest that horse riding and the associated tasks involved before and after a riding session are of a moderate intensity with the exception of walking while on the horse.

Table 4.3 Scientific trials measures of metabolic equivalents (METs) in relation to METs for other leisure-based physical activities as identified in the Compendium of Physical Activities (Ainsworth et al, 2000)

In the current research there was substantial biological variability amongst our group of 17 participants

Activity	Description	METs
Horse riding	Scientific trials for current Study	3.7
Horse riding	General	4.0
Horse riding	Saddling & grooming horse	3.5
Horse riding	Trotting	6.5
Horse riding	Walking	2.5
Cycling	< 10mph	4.0
Running	At 8 mph	13.5
Rowing	Moderate effort	7.0
Step aerobics	6-8 inch step	8.5
Fishing/hunting	Standing/Over undulating ground	3.0
Badminton	Recreational	4.5
Walking	Walking dog at 2.5 mph	3.0
Swimming	Laps at moderate effort	7.0

and the UK's ABC of Physical Activity for Health (O'Donovan et al, 2010) guidelines indicate the extent to which some activities are light, moderate, vigorous or very hard is dictated by the fitness levels of the individual. The variability amongst the 17 respondents is exemplified by the standard deviation (± 1.1) around the mean number of METs (3.7) during the horse riding session. Nevertheless, our variability is comparable with that reported by other studies looking at the energy expenditure of other physical activities (Bassett et al, 2000; Gunn et al, 2004, 2006).

It is likely that these between rider differences can be explained by people performing the activities at different intensities relative to their aerobic fitness levels and motivation towards the task. That is, the fitter and more motivated participants may have performed the riding session at a greater intensity. Similar to our data (see Figure 4.1), Devienne and Guezennec (2000) did note a large variability in $\%VO_2\text{max}$ (25-70 percent), suggesting that some elements of a riding session were of insufficient intensity to be classed as moderate, while others were of a vigorous intensity and this varied between riders. Guidelines suggest that exercise can be made up of a mixture of moderate and vigorous intensity which are associated with health benefits (O'Donovan et al, 2010).

4.3 Exercise intensity – questionnaire survey

The questionnaire of horse riders examined frequency and intensity of exercise using self reported measures that are similar to those used in other surveys undertaken by Sport England (2010) and DCMS (2007) to assess participation in moderate intensity sport and active sport. The questionnaire collected data on exercise intensity and frequency for activities associated with riding such as grooming and mucking out and the frequency of other forms of physical activity. All other forms of physical activity were included in the survey as the existing evidence base highlights that a high proportion of riders do no other sporting activity. In order to ascertain if such riders might be otherwise sedentary their participation in sporting activities and other forms of exercise, such as walking, needed to be determined. The possible psychological and social benefits of horse-based sport and leisure are also considered in the questionnaire.

The 1,248 respondents were asked, using a series of questions, to self report the typical physical intensity of their riding sessions and activities associated with horse riding during the last four weeks using two different measures. The first measure mirrored that used by the Sport England (2010) Active People survey and was based on questions asking respondents if the activity raised their breathing rate (a measure of moderate intensity exercise) or if the activity made them out of breath or sweat (a measure of high intensity exercise). The second measure followed the approach used in a major survey of physical activity amongst anglers (Stolk, 2009) that asked respondents to rate the intensity of the activity, low, moderate or high but did not give any indication as to what physical feelings (being out of breath for example) were associated with each of the three categories. In the survey of horse riders the terms low, medium and high were used as it was believed these terms were easier for respondents to interpret than low, moderate and high as they are terms more commonly used in social surveys. The reasons for using two measures of self reported intensity in the survey of horse riders was to allow the measures to be compared and to provide a check that self reporting amongst questionnaire respondents was a consistent judgement even when the questions changed slightly.

Data was collected on the frequency of participation by asking respondents how many times in the last four weeks they had undertaken for at least 30 minutes the following activities:

- horse riding,
- activities associated with horse riding,
- other sporting activities.

The four week period was used to follow the approach used in the DCMS (2010) Taking Part survey and the Sport England (2010) Active People survey, both of which identify the frequency of participation in moderate intensity sport required to obtain health benefits as involving 'participation on at least 12 separate days in the previous four weeks'. (DCMS, 2007)

To investigate the perceived social and psychological benefits of horse riding respondents were asked to rate on a scale some different motivations for participation and the degree to which horse riding made them experience certain feelings. There was also an open ended question that allowed respondents to provide qualitative data explaining their answers to questions on motivations and feelings. In order to provide further in-depth data two questions were also included asking respondents to rate what they believed to be the three main a) mental and physical and b) social benefits of participation.

The results for the two self reported measures of the exercise intensity of horse riding are shown in Table 4.4. Measure 1 mirrors that used by the Sport England (2010) Active People survey and indicates that 88 percent of respondents reported physical feelings (such as being out of breath) that indicated they were undertaking moderate (26 percent) or high (62 percent) intensity physical activity.

The second measure simply asked respondents to rate the exercise intensity low, medium or high and 73 percent of respondents reported it medium, and 16 percent high intensity. The two measures differ, however, when the separate moderate and high categories for Measure 1 are compared with the medium and high categories for Measure 2. Most respondents (73 percent) reported the intensity as medium on Measure 2 but for Measure 1 the descriptions of physical feelings meant the majority of respondents reported physical intensity as high. This indicates the influence question design can have on answers.

Nevertheless, the similar figures for both measures of 88 percent and 89 percent for the combined upper physical intensity categories (moderate/high and medium/high) are reassuring since they indicate that different self reporting measures of exercise intensity produce similar results for the key issue concerning the degree to which horse riding involves at least moderate intensity physical activity.

Both self report measures indicate the vast majority of riders (nearly 90 percent) are undertaking riding sessions that involve at least moderate/medium intensity exercise.

Table 4.4 Self reported measures of physical intensity of horse riding activity

The questionnaire survey also used the same two measures to examine the physical exercise intensity of activities associated with horse riding and the results are shown in Table 4.5. As with the measures for horse riding the measures differ when comparing the separate medium and moderate and high categories. Compared with horse riding a higher percentage of respondents – 22 percent compared to 12 percent – reported the intensity for activities associated with horse riding as low. Nevertheless, on both measures **78 percent of respondents self reported activities associated with horse riding as involving moderate or high physical intensity exercise.** This is a significant finding since it indicates involvement in horse riding may provide health benefits from activities associated with horse riding, not just riding.

Measure 1 – was the effort you put into horse riding usually enough to:	%	Measure 2 – How would you describe the physical intensity of your activity when you go horse riding?	%
No to either of the below (low)	12	Low	11
Raise your breathing rate (moderate)	26	Medium	73
Make you out of breath or sweat (high)	62	High	16
Total	100	Total	100

The scientific trials indicated that certain parts of a riding session, such as walking, may not involve sufficient metabolic impacts to constitute moderate intensity exercise. The self reporting measures, however, indicate that **riders may obtain the health benefits of moderate or high intensity physical activity not only from parts of a riding session but also through activities associated with horse riding.**

Table 4.5 Self reported measures of physical intensity of activities associated with horse riding (such as grooming, mucking out) ditto re this table

Measure 1 – was the effort you put into these activities usually enough to:	%	Measure 2 – How would you describe the physical intensity of these activities?	%
No to either of the below (low)	22	Low	22
Raise your breathing rate (moderate)	28	Medium	63
Make you out of breath or sweat (high)	50	High	15
Total	100	Total	100

T4.4 Exercise frequency – questionnaire survey

The health benefits of physical exercise are influenced not only by the exercise intensity but also the frequency at which exercise is undertaken. The review of existing evidence in chapter two noted that while government guidelines recommend 30 minutes of moderate intensity physical activity at least five days per week (Department of Health, 1995) or 150 minutes a week (Donovan et.al 2010) there is also evidence that even light exercise three times a week can produce health benefits (Tully et al. 2007). The Sport England (2010) Active People survey estimates the numbers of adults who take part every week in at least three, moderate intensity 30 minute sessions of physical activity (3x30) measured as participating on at least 12 separate days in the past four weeks. The analysis of the questionnaire results takes a similar approach to the Active People survey and assesses the proportion of respondents who took part for at least 30 minutes in horse riding or activities associated with horse riding 12 times or more in the last month. The findings are shown in table 4.7 and 53 percent of respondents had taken part for at least 30 minutes in horse riding activities 12 times or more in the last four weeks; 79 percent of respondents had taken part for at least 30 minutes in activities associated with horse riding 12 times or more in the last four weeks.

Table 4.7 Frequency of participation in horse riding and activities associated with horse riding in the last four weeks

Frequency	Horse riding	Activities associated with horse riding
Did not take part in the last four weeks	4	4
Less than 12 times in the last four weeks	43	17
More than 12 times in the last four weeks	53	79
Total	100	100

4.5 Measures of exercise frequency and intensity combined – questionnaire survey

Further analysis of both the frequency and intensity data generated by the questionnaire indicates that **47 percent of respondents participated for at least 30 minutes in horse riding twelve times or more in the last four weeks AND rated their physical exercise intensity as moderate or high.**

Furthermore, **21 percent of all respondents could be categorised as riding less than 12 times in the last four weeks BUT taking part in activities associated with horse riding more than 12 times in the last four weeks AND reporting the exercise intensity of these activities as moderate or high.** This group is likely to also be obtaining health benefits through the physical exercise gained by doing activities associated with horse riding.

Overall, therefore, **68 percent of respondents are likely to be achieving physical health benefits through riding and activities associated with horse riding since they are participating regularly enough (12 times per month) and they report their physical exercise intensity as moderate or high.**

4.6 Exercise intensity and frequency – conclusions

In summary, the scientific trials along with other existing evidence on the metabolic effects of physical activity indicate that horse riding expends sufficient energy to meet public health guidelines for moderate-intensity activity that will generate health benefits.

It is also noteworthy that regular periods of trotting in a riding session may enhance the associated health benefits.

The analysis of the self-reported measures of physical exercise intensity for horse riding obtained from the questionnaire adds clear support to the conclusions from the scientific trials and other studies that horse riding involves moderate intensity exercise. Nearly 90 percent of respondents self-reported that their horse riding in the last four weeks had involved moderate or high intensity physical activity.

In addition, just over three quarters of respondents (78 percent) indicated that activities associated with horse riding in the last four weeks, such as grooming and mucking out, involved at least moderate intensity activity which may further enhance the health benefits that can be obtained through involvement in riding.

Importantly, the self reported measures of physical exercise intensity and frequency indicate that 68 percent of questionnaire respondents are likely to be achieving physical health benefits through riding and activities associated with horse riding as this involves them undertaking moderate or high intensity physical exercise at least 12 times a month.

5. Findings – The psychological effects of horse riding

5.1 Introduction

The review of previous evidence in Appendix 1 indicates that there is growing evidence of the positive psychological effects of physical exercise, including positive impacts on self-esteem, social networks, anxiety and depression (Fox and Corbin, 1989; Martinsen, 1995, Landers, 1997; Farmer et al, 1998; Scully et al, 1998; Sonstroem et al, 1994; Pretty et al, 2003). There is also more tentative evidence that additional health and well-being effects, especially psychological benefits, arise when physical exercise involves interactions with outdoor natural environments, nature and the animals (Giles-Corti and Donovan, 2003; Hoffman et al, 2009; Thompson Coon et al, 2010; Barton et al, 2011). The discussion of findings in this section considers, therefore, not only the general psychological effects of horse riding but also any specific effects relating to interactions with outdoor environments, nature and horses.

Examining psychological issues in a self completion questionnaire raises a number of challenges since the questions may not necessarily fully interrogate the complex nature of emotions and feelings. The questionnaire for this study was designed, therefore, to examine the psychological effects of horse riding using different types of question including closed and open ended questions that generate both quantitative and qualitative data. Two Likert scale questions obtained quantitative data on the feelings associated with horse riding and the different motivations for going horse riding. An open ended question generated qualitative responses by asking respondents to enlarge on the effect of horse riding on their feelings.

This section examines the psychological effects of horse riding firstly by discussing the quantitative and qualitative findings on the feelings associated with horse riding. This is followed by an analysis of the motivations for going horse riding which provides further insights into the psychological impacts of horse riding.

The qualitative data included in this section in the form of quotes provided by questionnaire respondents adds further insights that confirm the quantitative findings.

5.2 The feelings associated with horse riding – quantitative findings.

Table 5.1 presents the results from the Likert scale question asking respondents to what extent riding made them experience certain feelings. The first ten rows of the table present the results for positive feelings that might be associated with horse riding such as feeling cheerful or inspired.

A number of positive feelings were strongly associated with horse riding by respondents. More than 90 percent of respondents reported that horse riding made them feel 'quite a lot' or 'extremely' cheerful and the equivalent figure is in excess of 80 percent for feeling relaxed, happy and active.

The final seven rows in table 5.1 show the results for negative feelings that might be associated with horse riding. Generally, negative feelings were not strongly associated with horse riding and more than 90 percent of respondents reported that when horse riding they experienced these negative feelings either 'a little' or 'not at all'. The majority of respondents (71 percent) were not at all dissatisfied with horse riding but 22 percent said it made them a little dissatisfied and five percent feel moderately dissatisfied. Few respondents experienced feelings associated with anger, guilt or boredom. However, nearly half (45 percent) respondents experienced at least 'a little' feeling of frustration and around a third indicated the same for lacking in confidence and being frightened. Feelings of fear may not only be associated with the activity of riding but may also reflect the high proportion of female respondents since many women feel fear in outdoor countryside spaces (Curson and Kitts, 2000).

Table 5.1 Feelings associated with horse riding – all respondents

Please note some rows do not equal 100 percent due to rounding to whole numbers

To what extent does horse riding make you feel the following?					
	Not at all (%)	A little (%)	Moderately (%)	Quite a lot (%)	Extremely (%)
Positive feelings					
Cheerful	0	0	9	46	45
Relaxed	1	3	14	45	37
Tired	10	21	34	24	11
Happy	0	1	7	36	56
Confident	1	3	20	48	28
Active	0.3	2	11.4	48	38.3
Excited	2	8.6	27.7	36.2	25.5
Proud	4	9	18	35	34
Energetic	1	7	25	41	26
Inspired	4	8	19	38	31
Negative feelings					
Dissatisfied	71	22	5	1	1
Angry	86	12	1	1	0
Guilty	80	15	3	1	1
Frustrated	55.4	36.2	6	1.4	1
Bored	95	4	1	0	0
Lacking in confidence	68	25.5	5	1	0.5
Frightened	61	33	5	1	0

The quantitative findings from the questionnaire on the psychological effects of horse riding were analysed separately for respondents who participated less than 12 times in the last four weeks and are presented in Table 5.2. A previous study concluded that some of the psychological effects of a number of forms of outdoor physical activity, including horse riding, did not vary by exercise intensity or frequency (Pretty et al, 2007). A comparison of the results presented in Tables 5.1 and 5.2 suggest that **the positive and negative feelings associated with horse riding do not differ markedly according to exercise frequency.**

The noticeable differences between Tables 5.1 and 5.2 that can be identified are intuitively correct since those who had taken part less than 12 times in the last four weeks had lower percentages in the 'quite a lot' and 'extremely' categories for feeling active and energetic. **While riders who regularly participate less than 12 times over four weeks may not obtain significant physical health benefits, they may still experience psychological benefits.**

Table 5.2 Feelings associated with horse riding for respondents who have participated in less than 12 riding sessions in the last four weeks

To what extent does horse riding make you feel the following?					
	Not at all (percent)	A little (percent)	Moderately (percent)	Quite a lot (percent)	Extremely (percent)
Positive feelings					
Cheerful	0	0	10	45	45
Relaxed	1	3	16	42	38
Tired	10	21	36	23	10
Happy	0	1	8	35	56
Confident	1	5	21	47	26
Active	0	2	12	53	33
Excited	2	8	28	37	25
Proud	5	9	19	35	32
Energetic	4.3	9	17.3	35	34.4
Inspired	5	11	19	36	29
Negative feelings					
Dissatisfied	76	18	4	1	1
Angry	88	10	1	1	0
Guilty	80	16	3	1	0
Frustrated	60	31	7	1	1
Bored	95	3	1	1	0
Lacking in confidence	64	27	7	1	1
Frightened	57.4	34	7.2	1.2	0.2

5.3 The feelings associated with horse riding – qualitative findings

The qualitative data obtained from the open ended questions tend to confirm the quantitative findings on the strongly positive feelings respondents associated with horse riding, although some answers did highlight the negative feelings that could arise. A number of respondents suggested that horse riding could not only make respondents feel happy and positive but also help riders manage more negative feelings and a sense of depression.

“Having experienced a bout of moderate depression working with my horses has been an integral part of both initial recovery and staying well”;

“I suffer from permanent anxiety and depression and the main thing that lifts me up is being, working and riding with the horses”;

“My riding and ownership of horses has got me through some extremely tough times in my life. My horses have the ‘power’ to cheer me up and keep me happy, motivated and striving to ‘be better’ no matter what else is going on”.

These quotes appear to agree with other studies which have shown that physical exercise generally can have a positive effect on depression in adults (Martinsen, 1995; Scully et al, 1998; Farmer et al, 1998).

It has also been found that if the amount of physical exercise undertaken by active individuals decreases then the risk of depression increases (Paffenbarger et al, 1994). Qualitative data from the survey point to a similar phenomenon, with some respondents describing how a break from horse riding, for example due to illness, a lame horse or other commitments, led to an increase in feelings of depression.

“I have suffered from depression from the age of 18 . . . there was a time when I couldn’t ride for a while due to a fractured knee, it was then that I realised how much horse riding had helped me cope with my depression”;

“I hate it when I can’t ride, riding makes me feel happy, healthier, relaxed and ready to cope with the rest of my life and work”;

“when I’ve been unable to take my horse out due to bad weather or when he’s been lame I notice a real difference and start to feel very depressed”.

There is also a body of evidence which states that regardless of anxiety measures taken (such as trait or state, behavioural or self-report), there is a consistent link between exercise and anxiety reduction (Landers, 1997). Some respondents also described how horse riding helped relieve stress or feelings of anxiety.

“Riding my mare helps me relax and brings me relief from stress and anxiety and I don’t feel so depressed which is something I suffer from. When we’ve had a good ride, it makes me feel much more confident in other areas in my life”;

“Even though horse riding required both physical and mental effort, I thoroughly enjoy the challenge. . . . It has played a significant role in helping me recover from stress, anxiety and depression”.

Previous studies have found that physical exercise can improve self-esteem (Fox and Corbin, 1989; Scully et al, 1998). Table 5.1 indicated that the vast majority (96 percent) of respondents felt riding made them feel confident to some degree (20 percent ‘moderately’, 48 percent ‘quite a lot’ and 28 percent ‘extremely’). A number of qualitative quotes also indicate how horse riding can improve confidence or self-esteem.

“I feel more confident around horses because they don’t judge me and no matter how ridiculous the stuff I’m saying might sound a horse won’t make me feel even worse and will certainly cheer me up”;

“Riding is really fantastic. You become very confident in life because of it. You gain respect from both horse and your instructor and this in turn you give back in life”;

“Horse riding and being involved with horses leads to a self-motivation and self-confidence. The bonding with and trust developed with a horse is second to none”.

Enhanced confidence or self-esteem was often attributed to the sense of achievement gained when performing a particularly difficult task or pushing boundaries.

“Most of the time, especially when working with one horse small achievements gives such a great sense of satisfaction and there is nothing like it. When you achieve things you didn’t think you could it makes you more confident and proud”.

It should be noted, however, that while horse riding appeared to have a positive impact on confidence or self-esteem generally, qualitative quotes suggest setbacks such as a major fall, difficult horse or simply a bad day out could sometimes have the undesired effect of knocking respondent’s confidence considerably.

“I love horses and love riding but I bought a ‘challenging’ mare who bolts when she gets scared. It trashed my confidence and I have been slowly building it up again alongside her trust in me and other humans”;

“Most of the time I feel the positive terms above for example happy, confident, proud and so on. Sometimes if I have a bad riding session I lose confidence and get frustrated as I know we’re capable I just can’t get it right at that time!”.

5.4 The motivations for going horse riding – quantitative findings

Tables 5.3 and 5.4 are based on the quantitative data obtained in the Likert scale question on the motivations for going horse riding. These motivations provide further insights into the possible psychological benefits of horse riding since they will give an indication as to what respondents enjoy about riding since these factors currently motivate them to go riding. The motivations are placed in three groups – social, personal development and interactions with nature/animals. The results for respondents who participated in horse riding less than 12 times in the last four weeks are presented in Table 5.4. There is little marked difference between the rows in the two Tables 5.3 and 5.4, indicating that motivations for going horse riding do not differ according to exercise frequency.

In both tables 5.3 and 5.4, however, there are marked differences in the ratings given to certain motivations. **The motivation of interacting with horses was rated by far the most important of all motivations and 82 percent of respondents rated this motivation as either ‘very important’ or ‘extremely important’.** No other motivation has a percentage of more than 50 percent when the ‘important’ and ‘very important’ ratings are combined.

The qualitative data presented in section 5.5 below provides some insights as to why interacting with horses is so important to respondents.

Other motivations involving interactions with nature also receive high ratings compared to other motivations. **Contact with nature and scenery and views were motivations rated as 'important', 'very important' or 'extremely important' by more than 80 percent of respondents.**

Certain personal development motivations including escape, develop skills, challenge myself, experience excitement, physically active and to relax were rated relatively highly compared to other motivations with in excess of 80 percent of respondents rating these as either 'important', 'very important' or 'extremely important'. By contrast, relatively few respondents rated weight loss or to improve fitness as 'very important' or 'extremely important' motivations for horse riding.

Social motivations were rated as less important compared to the other groups of motivations. For example, in Table 5.3 only 38 percent of respondents rated the motivation of meeting new people as either 'important', 'very important' or 'extremely important', indeed, there are contrasting social motivations with 54 percent of respondents rating spending time with friends as being 'important', 'very important' or 'extremely important' whereas the equivalent figure for 'be on my own' is 55 percent.

Table 5.3 Motivations for going horse riding – all respondents

To what extent do the following motivate you to go horse riding?						
	Very unimportant (percent)	Unimportant (percent)	Neither (percent)	Important (percent)	Very important (percent)	Extremely important (percent)
Social motivations						
Spend time with friends	3	12.5	31	38.5	13	2
Spend time with family	19	18	33	20	8	2
Be on my own	6	8	31	41	12	2
Meet new people	8	14	40	31	6	1
Interactions with nature motivations						
Scenery and views	3	3	13	47	31	3
Contact with nature	3	3	13	42	34	5
Interact with horses	2	0	2	14.5	64.5	17
Personal development motivations						
To escape	3	5	15	35	35	7
Develop skills	3	3	13	37.5	37	6.5
Challenge myself	2	3	12	36	39	8
Experience excitement	3	3	15.3	36.5	34	8.2
Physically active	2	1	6	43	40	8
To relax	3	1	7	41	40	8
To lose weight	11	14	40	22	11	2
To improve fitness	4	6	29	39	19	3

Please note some rows do not equal 100 percent due to rounding to whole numbers

Table 5.4 Motivations for going horse riding for respondents who have participated in less than 12 riding sessions in the last four weeks

To what extent do the following motivate you to go horse riding? *For those who participate in horse riding less than 12 times						
	Very unimportant (percent)	Unimportant (percent)	Neither (percent)	Important (percent)	Very important (percent)	Extremely important (percent)
Social motivations						
Spend time with friends	4	11	30	40	14	1
Spend time with family	18	17	33	20	10	2
Be on my own	7	9	32	38	10	4
Meet new people	7	14	41	31	6	1
Interactions with nature motivations						
Scenery and views	3	2	13	45	33	4
Contact with nature	3	2	13	45	33	4
Interact with horses	3	1	2	15	65	14
Personal development motivations						
To escape	4	5	13	34	38	6
Develop skills	3	2	15	39	35	6
Challenge myself	3	3	15	38	36	5
Experience excitement	3	3	16	39	33	6
Physically active	3	1	6	45	38	7
To relax	3	1.4	8	40.2	40.4	7
To lose weight	11	12	42	22	11	2
To improve fitness	4	5	29	40	19	3

Please note some rows do not equal 100 percent due to rounding to whole numbers

5.5 The motivations for going horse riding – qualitative findings

The qualitative data generated by the questionnaire survey also highlighted the importance of the relationship between riders and another sentient being (the horse) in the physical activity itself. This is an important difference between recreational horse riding and many other outdoor activities.

The quantitative and qualitative data both emphasise the importance of the relationship with horses for respondents. This suggests that contact with horses in itself might have a beneficial effect on riders' psychological well-being over and above the benefits gained simply through participating in an outdoor activity and taking physical exercise.

While there have been a few studies which have looked at the therapeutic benefits of horses for certain physical or mental disabilities, until now there has been little or no empirical evidence collated to support the claim that contact with horses can be beneficial to people's general mental well-being. There is however a multitude of research which suggests that being with animals generally can have certain psychological benefits (Folse et al, 1994; Garrity et al, 1989).

The relationship between horse and horse rider was cited by some respondents as a key mental health benefit of recreational horse riding, with many describing how being with horses had a profoundly positive effect on their mood and overall well-being.

"The emotional bonding with your horse and the physical exhilaration of exercise improves my psychological state. Riding and being with my horses completely de-stresses me. as well as helping me keep fit";

"Riding and being with my horse is one of the most important things to me. It keeps me mentally, physically and emotionally fit. A fantastic feel good factor";

"Spending time with my horses is always positive. I feel content, forget my body, live in the moment. I feel loving and happy".

A number of mechanisms underlying the ability of companion animals to improve psychological health have been proposed. One such example is attachment theory and according to Bowlby (1969; 1979) it is the attachments between pets and their owners which can often lead to improved psychological health. Qualitative data from the survey suggest this might be worthy of further investigation in the context of horse-rider relationships, as some respondents cited the close bond formed between them and their horse as an important contributor to their overall happiness and well-being.

"I love my horses and being with them is the best part of my day, I would do anything for them, treat them like my kids . . .";

"No matter what mood I am in, being around my horse always improves my mood . . . the bond between us is second to none";

"My horses give me everything I need to keep well. They lift my spirits on the darkest day . . . I love them intensely".

Many respondents also spoke of the relationship with their horse as a kind of partnership based on mutual feelings of trust, support and respect.

"Being at one with a prey animal in beautiful scenery is exhilarating to say the least. For me it is about the love for the horse, my partner, it is about the relationship I can build with them";

"A partnership with a horse is a matter of a trusting, two-way relationship between carer and horse – if it makes you bored, angry or dissatisfied then you shouldn't be doing it! It allows you to challenge yourself, your limits and your horse";

"No matter what mood I am in being around my horse always improves my mood, all my problems disappear and I feel extremely proud of all the new things my young horse does which I alone have taught him. The bond between us is second to none";

"Riding and, just as importantly, being around the horses provides a massive sense of well-being and is a calming influence. Horses do not judge, and thus the relationship is equal and respectful"

Previous studies have found similar feelings expressed by humans for companion animals such as dogs or cats. Collins and McNicholas (1998) have sought to explain this phenomenon in terms of the supportive functions of person-pet relationships and they argue that it is the social support that companion animals are perceived to provide that may explain why pet owners experience certain psychological health benefits. The qualitative quotes also highlighted how for some respondents recreational horse riding also provided an opportunity to participate in a form of physical exercise while also being able to enjoy the countryside and experience nature.

“Enjoyable exercise, it’s far more rewarding going for a hack than staring at a wall while on an exercise bike in a gym!”;

“I spend far too much time sat behind a desk during my working week so to be able to be active whilst being out with friends and experiencing the gorgeous countryside is a really attractive and enjoyable prospect”;

“The outdoors and . . . physical activity lifts the spirits, calms and relaxes while benefitting your health”.

The quantitative data in Table 5.3 also indicated that interactions with nature were either an ‘important’, ‘very important’ or ‘extremely important’ motivation for going riding for more than 80 percent of respondents. This, along with the qualitative quotes above, suggests that the opportunity provided by horse riding to be outdoors and interact with nature is an important psychological benefit of horse riding.

The qualitative quotes also confirmed the quantitative findings in Table 5.3 that there are contrasting social motivations for taking part in horse riding. For some respondents recreational horse riding was about having time alone.

“For me horse riding is about having time to myself to unwind and relax, the social aspects aren’t always so important”;

“I spend my whole day at work talking to people . . . being alone with my horse is me time away from everything and everyone”.

Nevertheless, a number of respondents indicated that the social benefits of horse riding could be quite varied. Some indicated how recreational horse riding made them feel like they belonged to a strong community.

“. . . feel part of a community where people share a common love of horses”.

Others felt it gave them the opportunity to spend time with ‘like-minded people’ with a shared passion for horses and horse riding, while also providing supportive social networks during times of need.

“I find horse riding great fun and when you feel like you are improving it feels fantastic and is a real confidence booster. When you have a set back or fall it can really help to be surrounded by friends and positive people”;

“One of the most important aspects is friendship with the other girls at the yard . . . an ear to bend/shoulder to cry on”.

Other socialising opportunities were also provided through competitions and other social events.

“Going to competitions and other horsey events is a great way to socialise and make friends”;

“I really enjoy the social aspects of horse riding and I have made so many new friends since I started”;

“. . . I go to horse riding events for the networking opportunities and to meet new clients”;

Finally, interacting with other people at the yard or at competitions and other social events was felt to improve people’s communication skills and to boost confidence.

“Interacting with people at the yard forces you to communicate with other people and you learn how to stay calm and focussed when things go wrong”;

“Horse riding is a great confidence booster socially. I used to be quite shy in social situations but now I find myself able to talk to other people easily”.

5.6 The psychological effects of horse riding – conclusions

The quantitative and qualitative data suggest that there are a range of psychological benefits that may arise from involvement in horse riding.

Horse riding mainly stimulated positive feelings amongst most questionnaire respondents and the proportion of respondents that associated negative feelings with riding was small. The vast majority of respondents (above 80 percent) reported that horse riding made them feel ‘quite a lot’ or ‘extremely’ cheerful, relaxed, happy or active. More than 90 percent of respondents reported negative feelings either ‘not at all’ or ‘a little’ when horse riding.

The qualitative data suggested that riding as well as stimulating positive feelings, such as happiness and self esteem, could also play a role in addressing more negative feelings associated with anxiety and depression.

The data on motivations for going horse riding highlight a distinct and important finding in that 82 percent of respondents rated the motivation of interaction with horses in the two categories of either 'very important' or 'extremely important'. No other motivation was rated anything like as important as this one and qualitative data confirmed the strength of positive relationships some respondent experienced with their horses.

Previous research into companion animals has argued that in some situations owner-companion animal relationships can have positive physical and mental health benefits for the owners. The survey data corroborates this, indicating that relationships with horses are central to the positive experiences respondents obtained from horse riding.

Another important motivation for going horse riding was interacting with nature and in excess of 80 percent of respondents rated the motivations contact with nature and scenery and views in one of the three categories 'important', 'very important' or 'extremely important'.

Important personal development motivations identified by respondents included escape, develop skills, challenge myself, experience excitement, physically active and to relax.

Social motivations were rated less important compared to psychological motivations (experiencing excitement for example) and the motivations involving interaction with nature or horses. Also there were contrasting social motivations with some respondents valuing being alone whilst others valued being with friends, family or meeting people.

The findings are based on a short self completion survey of horse riders, nevertheless, the quantitative and qualitative findings suggest that the positive feelings and motivations for horse riding reported by respondents could have psychological benefits that will have positive effects on the mental and social well-being of horse riders. Furthermore, horse riders experience these psychological benefits even if they do not participate regularly enough to obtain physical health benefits.





6. Findings – key social groups

6.1 Introduction

The review of existing evidence presented in Appendix 1 indicates that certain social groups could be of particular significance in a study of the health effects of recreational horse riding. Women make up the vast majority of horse riders (Sport England 2010) so will be the main gender group affected by the health benefits of riding. There is also evidence of specific health benefits from horse riding pertaining to people with certain types of disability (Crane, 1999; Bertoti, 1988; Bronson et al, 2010). In addition, existing evidence suggests a high proportion of riders depend on horse riding for their exercise as they do no other form of exercise and might otherwise be sedentary. The quantitative and qualitative data generated by the questionnaire was analysed, therefore, to explore issues of gender, disability and the exercise characteristics of those who might otherwise be sedentary.

6.2 Findings – Gender

Section 3 noted 93 percent of questionnaire respondents are women and this is a comparable figure to other major surveys of horse riding (Sport England 2010, see Appendix 2 for more details). As would be expected when the vast majority of survey respondents are from one gender group, the measures of physical exercise intensity and frequency based on the self reported answers from the questionnaire did not differ noticeably by gender.

The questionnaire results indicate that 49 percent of female respondents are likely to be gaining health benefits from horse riding as they reported it as medium/high intensity exercise and had participated 12 or more times in the last month.

The scientific trials and the questionnaire results indicate that there are physical and psychological health benefits associated with horse riding. Men and women of all ages can experience health and well-being benefits from horse riding. **The benefits of horse riding, however, are particularly relevant to women. This is a valuable aspect of horse riding, since at the national level women in general have been identified as a social group with below average levels of participation in sport and physical exercise** (Sport England 2007).

A further important dimension to horse riding as indicated by the Sport England (2010) Active People Survey and by the questionnaire results is that the mainly female participants are drawn from across the age range. Of the female respondents to the questionnaire, 49 percent were aged 45 or above. This is a different demographic profile to some other sports with high levels of female participation, such as netball and hockey, where participants tend to be concentrated in younger age groups (Sport England 2010). Indeed, the Sport England data for 2009 indicates that 37 percent of female participants in equestrianism are aged 45 or above, which is a female age profile not matched by any other sport (Sport England 2010).

Furthermore, as Table 6.1 indicates, **the frequency of participation amongst all survey respondents does not vary markedly by age, except for the 75+ age category.** While the percentage of respondents participating 12 times or more in the last four weeks was highest in the 16-24 age category it was still above 50 percent in the 45-64 age category and the 65-74 category.

Table 6.1 Frequency of participation in horse riding activities in the last four weeks by age

Frequency of horse riding activity	Age (percent)				
	16-24	25-44	45-64	65-74	75+
Less than 12 times in the last four weeks	37	48	49	45	89
More than 12 times in the last four weeks	63	52	51	55	11
Total	100	100	100	100	100

The qualitative results from the open ended questions in the survey indicate that some respondents perceive one of the benefits of recreational horse riding to be that it improves the well-being of older people. Some of the older female respondents described how recreational horse riding was a means of keeping fit and active, while being enjoyable and relaxing at the same time.

“Been riding for many years – getting outside and being active is what it is about at my age”;

“Horse riding and horse related activities have always been a part of my life and this has carried on into retirement. I am not as confident or flexible as I was, but this does not prevent participation in riding and other horse related activities. I believe it contributes to my physical and mental well-being”;

“I am a fit 76 years and I am sure that as well as keeping me poor, they help to keep me fit and healthy and happy. I can’t imagine life without them!”;

“I have just turned 79. So still being able to ride, on my equally aged horse (29 next January, we have been together for 21 years) is a great joy to me. I appreciate the relaxation and the exercise, and always feel happier after a ride, even if I feel a little tired beforehand!”.

Older respondents in the questionnaire survey tended to be active people generally, with 70 percent of respondents aged above 45 stating they had taken part in another form of physical activity other than recreational horse riding in the last four weeks compared to 61 percent for the sample as a whole.

The qualitative data also indicated that some older female respondents highlighted the social opportunities that recreational horse riding provides to older people often noting how riding provided them with an opportunity to interact with people in their family, across generations and from different backgrounds.

“Being a member of a bridleways association provides social opportunities, new friendships, builds confidence, and widens one’s interest and knowledge”;

“I get an enormous amount of pleasure from riding and working with horses as I spend a lot of time with my daughter and grandchild as we all ride together. I have competed in the show ring alongside my daughter and eldest grandson when he was approximately eight years old. Three generations of us ride together, all deriving much pleasure in each other’s company with our horses”;

“Love spending time with friends and family in shared activity (daughter competes our horse)”.

According to Age UK, people above the age of 65 are twice as likely as any other age group to spend more than 21 hours of the day alone and older people are more at risk of depression and ill-health caused by loneliness and isolation (Age UK, 2008). Also physical activity decreases with age, with only eight percent of the England population above the age of 55 participating in three or more sessions of moderate physical exercise per week (Sport England, 2008). The evidence from the questionnaire survey and other existing sources indicates that horse riding is a significant activity in terms of participation by older females. The qualitative data also indicates that horse riding may contribute to maintaining kinship and social networks amongst older participants and potentially avoiding isolation and loneliness.

6.3 Findings – disability

The analysis of the questionnaire results indicates that 23 percent of respondents self reported having a long standing illness or disability. Table 6.2 provides a cross tabulation of long standing illness or disability with one of the self reported physical exercise intensity measures for horse riding and activities associated with horse riding. Table 6.3 presents frequency of participation in horse riding and activities associated with horse riding according to whether respondents had a long standing illness or disability. The tables generally indicate similar percentages for those with a long standing illness or disability compared to those without. **The existence of a disability or long standing illness does not appear to affect the level of exercise intensity or frequency and 46 percent of respondents with a disability or long standing illness reported horse riding as medium/high intensity exercise and had participated 12 or more times in the last month, compared to 47 percent of the sample as whole.** This indicates that nearly half of the respondents with a disability or long standing illness are horse riding at a frequency and level of physical intensity that will generate health benefits.

Table 6.2 Physical intensity of horse riding and associated activity by respondents who considered themselves to have a longstanding illness or disability

	Horse riding		Activities associated with horse riding	
	Longstanding illness or disability (percent)	No longstanding illness or disability (percent)	Longstanding illness or disability (percent)	No longstanding illness or disability (percent)
Physical intensity Was the effort usually enough to:				
No to either of the below (Low)	9	13	18	23
Raise your breathing rate (Moderate)	28	27	27	29
Make you out of breath or sweat (High)	63	60	55	48
Total	100	100	100	100

Table 6.3 Frequency of participation in horse riding and activities associated with horse riding in the last four weeks by respondents who considered themselves to have a longstanding illness or disability

	Horse riding		Associated activity	
	Longstanding illness or disability (percent)	No Longstanding illness or disability (percent)	Longstanding illness or disability (percent)	No Longstanding illness or disability (percent)
Frequency				
Less than 12 times in the last four weeks	47	46	18	21
More than 12 times in the last four weeks	53	54	82	79
Total	100	100	100	100

However, of the respondents with a long standing illness or disability, 59 percent agreed that it limited their activities to some degree. Nonetheless, respondents with a long standing illness or disability were generally very positive when describing their experiences of recreational horse riding. The qualitative data from the open ended questions in the questionnaire provided the quotes below, **some respondents with a long standing illnesses or disability indicated that horse riding had actually improved their physical or mental condition in some way.** For example, participants described how horse riding helped them to cope with a variety of conditions, including Arthritis, Lyme Disease, Chronic Fatigue Syndrome, Asthma and Multiple Sclerosis.

“I have rheumatoid arthritis (diagnosed in 2001) which although well controlled with medication does tend to cause stiffness and pain . . . I’m absolutely sure involvement with horses has kept me active and fit and means that I’m not disadvantaged by my illness”;

“I had Lyme Disease for nine years which caused pain/fatigue/stress. I am now 98 percent recovered, but riding takes away ALL my aches and pains! My long illness made me understand how important riding for the disabled is!”;

“Arthritis in pelvis, have reduced medication with regular riding”;

“I have had ME for the last two years. Having horses has helped me immensely in helping to build up my muscles, helping to keep my mental state positive and focused on getting better, and given me an opportunity to get out of the house and meet people”;

“Riding helps me remain fit and active as I suffer from mild MS”.

Other respondents described how recreational horse riding improved their posture and muscle strength, helping to relieve pain or discomfort caused by back problems or a previous injury.

“My dislocated shoulder means I cannot jump any more, also I have a bad back but riding helps keep my posture and keeps it more supple”;

“I have a crushed disc in my lower back which causes me some low grade pain, especially first thing in the morning, around my hip area. This has improved considerably since returning to riding”;

“Suffer from back pain . . . horse riding helps you reach good posture and be relaxed”.

Another important benefit that was highlighted by respondents who stated they had limited mobility but that recreational horse riding was a means of accessing the outdoors and participating in a physical activity which they would otherwise be unable to do.

“I have just completed your riding survey and wanted to add that riding is great physio for me. It also gives me, as a person with limited mobility, a sense of freedom that I can't get from wheelchairs or any other aids I have found”;

“Walking very limited, crutch and wheelchair user. Riding enables outings in countryside”;

“Now that my knees are very painful the only time that I am pain free is when on the back of my horse. It is the only means I have of taking air and exercise”.

A number of respondents referred to the positive impact of horse riding on mental illnesses, with a number of participants describing how caring for horses and horse riding had motivated them to get better and been an important contributor to their recovery.

“I suffer from depression so sometimes I feel unable to leave the house. Having my horse gives me an extra incentive and I always feel much better after I've spent time with him”;

“If it wasn't for the horses I'd have given up work and social stuff long ago”;

“After living with crippling anxiety for almost five years I sought help and have now developed the skills required to deal with it. Throughout the worst of my anxiety I continued to ride/spend time with horses and believe they were a massive part in my recovery”.

These qualitative findings tend to support current evidence on the use of equine assisted therapy to treat specific conditions. There are a number of studies which show how horse riding may result in the improved physical conditioning of both adults and children with specific physical disabilities (Crane, 1999; Bertoti, 1988; Bronson et al, 2010). Only a handful of studies have been conducted on the psychosocial or mental health benefits of horse riding, thus research in this area is very limited. For example, a study by Mackinnon (1995) found that equine assisted therapy resulted in significant improvements in confidence, self-perception and motivation with children with cerebral palsy. Two other studies found an increase in people's social, occupational and psychological functioning (Shultz et al, 2007) and a decrease in behavioural problems in children (Kaiser et al, 2006). The qualitative findings from this research and the existing evidence available do point to a potential link between horse-riding as a form of therapy for improving mental health.

6.4 Findings – the otherwise sedentary

Results from the questionnaire survey indicate that 61 percent of riders have participated in a form of physical activity other than recreational horse riding in the last four weeks. Table 6.6 indicates the most common other activities undertaken by these respondents. Walking was the most commonly cited form of alternative exercise, with 34 percent of people stating that they had walked for at least 30 minutes in one continuous session during the last four weeks. This was followed by exercise classes such as aerobics, yoga or pilates (12 percent) and by running (10 percent). Other forms of physical exercise included gardening, team sports (such as hockey, netball or football) tennis, dance classes, farming, hill walking, golf, sailing, rowing, fencing and housework.

Table 6.6. Other forms of physical exercise undertaken for at least 30 minutes in the last four weeks

Type of activity	percentage of respondents who undertook some other form of activity
Walking	34
Exercise classes	12
Running	10
Swimming	8
Cycling	8
Gym	7
Misc/other	21
Total	100

This suggests some riders may benefit from moderate or high intensity exercise involving activities in addition to riding. Nevertheless, 39 percent of respondents indicated that horse riding was the only form of physical activity in which they had participated during the last four weeks. These respondents, if they did not ride, would be sedentary people unless they changed their exercise habits. It is also important to consider if these people who rely on riding for their physical exercise are participating at a frequency and intensity necessary to gain health benefits.

Tables 6.7 and 6.8 compare physical exercise intensity and frequency measures for respondents whose only form of physical activity was riding with those who undertook other forms of physical activity. The tables indicate that 91 percent of the otherwise sedentary reported physical exercise intensity as moderate or high and 56 percent took part more than 12 times in the last month. These figures are higher than those for respondents who undertook other forms of physical activity. Thus, 50 percent of the otherwise sedentary respondents, **compared to 47 percent for the whole sample, reported horse riding as medium/high intensity exercise and had participated 12 or more times in the last month, so they are likely to be achieving physical health benefits.**

As noted in the review of existing evidence in Appendix 1 horse riding is similar to bowls, golf and angling in having a high proportion of participants who do no other form of exercise and might otherwise be sedentary. The survey results suggest, quite positively, that many of this group of riders who might otherwise be sedentary are undertaking riding at frequency and physical exercise intensity levels that will produce health benefits.

Table 6.7 physical intensity of horse riding activity by whether respondents took part in any other form of physical activity

Physical intensity horse riding: Was the effort you put into horse riding usually enough to:	Other physical activity (percent)	No other physical activity (percent)
No to either of the below (Low)	15	9
Raise your breathing rate (Moderate)	27	24
Make you out of breath or sweat (High)	58	67
Total	100	100

Table 6.8 frequency of horse riding activity by whether respondents took part in any other form of physical activity

Frequency of riding activity	Other physical activity (percent)	No other physical activity (percent)
Less than 12 times in the last four weeks	49	44
More than 12 times in the last four weeks	51	56
Total	100	100

6.5 Key social groups – conclusions

In summary, the analysis of key social groups based on the quantitative and qualitative data generated from the questionnaire reveals a number of positive dimensions to the health benefits of recreational horse riding.

Existing Sport England evidence suggests 90 percent of people who participate in equestrianism on a weekly basis are female and 37 percent were aged above 45. The questionnaire respondents had a similar profile with 93 percent being female and 49 percent of the females respondents were aged above 45. Nearly half (49 percent) of female respondents are likely to be gaining physical health benefits from horse riding as they had participated 12 or more times in the last month and reported it as medium/high intensity exercise. Other female riders who participate less frequently or at a lower intensity may also be experiencing an improvement in their health and well-being through the psychological benefits of riding discussed in section 5.

The physical health and psychological benefits of horse riding identified in this report will be largely experienced by women spread across the age profile from 18-65 which makes riding distinctive from virtually any other sporting activity.

Respondents in the questionnaire survey who had a long standing illness or disability often reported that this affected their activity but they were able to achieve exercise intensity and frequency of participation levels comparable to those without. The qualitative results also revealed some very positive views amongst respondents about the therapeutic benefits of riding for physical and mental illnesses.

The respondents who relied on riding for their physical exercise also had self reported levels of physical exercise intensity and frequency of participation that were similar to those who took other forms of exercise.

Bibliography

- Ainsworth, B. E., Haskell W. L., Whitt, M. C., Irwin, M., Swartz, A. M., Strath, S. J., O'Brien, W. L., Bassett, D., Schmitz, K., Emplaincourt, P., Jacobs, D. & Leon, A. (2000) Compendium of physical activities: an update of activity codes and MET intensities. *Medicine and Science in Sports Exercise*, 32(9 Suppl), 498-504.
- All, C. A., Loving, G. L. & Crane, L. L. (1999) Animals, Horseback Riding, and Implications for Rehabilitation Therapy. *Journal of rehabilitation*
- Allen, K. M., Blascovich, J., & Mendes, W. B. (2002) Cardiovascular reactivity and the presence of pets, friends and spouses: The truth about cats and dogs. *Psychosomatic Medicine*, 64, 727 – 739.
- Allied Dunbar National Fitness Survey (1992). Main Findings. Sports Council and Health Education Authority.
- Anderson, W. P., Reid, C. M., & Jennings, G. L. (1992) Pet ownership and risk factors for cardiovascular disease. *Medical Journal of Australia*, 157, 298 – 301.
- Åstrand, P.O. and Rodahl, K. (1986). Textbook of work physiology, Physiological Bases of Exercise, 3rd ed., McGraw-Hill, New York, 295-348.
- Barton, J. & Pretty, J. (2010) What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science and Technology*, 44, 3947–3955.
- Beck, A. M., Katcher, A. H. (1984) A new look at pet-facilitated psychotherapy. *Journal of the American Veterinary Medical Association*, 184: 414-421.
- BETA (2006) National Equestrian Survey. BETA [online] available at: <http://www.beta-uk.org/> accessed on 5.04.11.
- Bertoti, D. (1988) Effect of Therapeutic Horseback Riding on Posture in Children with Cerebral Palsy. Paper presented at the *6th International Therapeutic Riding Congress*, Toronto, Canada, 23-27 August.
- Bowlby, J. (1969). *Attachment*. Harmandsworth, UK: Penguin.
- Bird, W. (2004) Can green space and biodiversity increase levels of physical activity? *Report for the Royal Society for the Protection of Birds*.
- Blair, S. N., Kohl, H. W., Barlow, C., Paffenbarger, R. S., Gibbons, L. W. & Macera, C. A. (1995) Changes in physical fitness and all cause mortality: a prospective study of healthy and unhealthy men. *Journal of the American Medical Association*, 273, 1093-1098.
- Blair, S. N., Kohl, H. W., Gordon, N. F. & Paffenbarger, R. S. (1992) How much physical activity is good for health? *Annual Review of public health*, 13, 99-126.
- British Association of Sport and Exercise Science (1997). Guidelines for the physiological testing of athletes. Eds. S. Bird and R. Davidson. BASES, Leeds, UK.
- Bronson, C., Brewerton, K., & Ong, J. (2010) Does hippotherapy improve balance in persons with multiple sclerosis: a systematic review. *European Journal of Physical Rehabilitation Medicine*, 46, 347-53.
- Buchanan, H. C., Bird, W., Kinch, R. & Ramsbottom, R. (2000) The Metabolic and Physiological demands of brisk walking in older men and women. *Health walks research and development unit symposium: Oxford Brooks University*.
- Brandt, K. (2004) A Language of Their Own: An Interactionist Approach to Human-Horse Communication. *Society and Animals*, 12, 299-316.
- British Horse Society (2011) <https://www.bhs.org.uk/> accessed 5.4.2011.
- Brock, B. J. (1989) Therapy on horseback: Psychomotor and psychological change in physically disabled adults. *Unpublished Conference presentation, March, 1989. American Camping Association National Conference*.
- Campbell, R. N. (1984) *The New Science: Self-Esteem Psychology*. Lanham, MD: University Press of America.
- Cobb, S. (1976) Social support as a moderator of life stress. *Psychosomatic Medicine*, 38, 300-314.
- Collins, G. M., & McNicholas, J. (1998) A theoretical basis for health benefits of pet ownership. In C. C. Wilson & D. C. Turner (eds), *Companion Animals in Human Health*. London: Sage.
- Curson, T. & Kitts, c. (2000) Women's Use and Perceptions of the Outdoors: A Case Study of Urban Parks in b. Humberstone (ed), *Her Outdoors: Risk, Challenge and Adventure in Gendered Open Spaces*. Eastbourne, Leisure Studies Association.
- Dekker, P., Uslaner, E. M. (2001) Social Capital and Participation in Everyday Life. London and New York, Routledge.
- Defra (2007) *Well-being: International policy interventions*. London: Department for Environment, Food

and Rural Affairs

Department of Health. (1995) *How much physical activity should we do? The case for moderate amounts and intensities of physical activity*. Health Education Authority and Strategic Statement on physical activity.

Devienne and Guezennec (2000) Energy expenditure of horse riding. *European Journal of applied psychology*, 82, 499-503.

DCMS (2007) *Taking Part: The National Survey of Culture, Leisure and Sport. Progress report on PSA3: Provisional estimates from the first six months of year two*. Statistical Release June 2007. DCMS.

DCMS (2010) *Taking Part: The National Survey of Culture, Leisure and Sport*. Statistical release, December 2010. DCMS.

De Guzman, A. B., Cucueco, D, S. Cuenco, I, V, B. (2009) Petmanship: understanding elderly Filipino's self perceived health and self-esteem captured from their lived experiences with pet companions. *Educational Gerontology*, 35, 963-989.

Eddy, T. J. (1996). RM and Beaux: Reductions in cardiac activity in response to a pet snake. *The Journal of Nervous and Mental Disease*, 184, 573 – 575.

Eurodiet. (2001) The Eurodiet Reports and Proceedings. *Public Health Nutrition: Special Issue*.

Farmer, M., Locke, B., Moscicki, E., Dannenberg, A., Larson, D. & Radloff, L. (1998) Physical activity and depressive symptoms. *The American Journal of Epidemiology*, 128, 1340-1341.

Folse, E. B., Mindler, C. C., Aycok, M, J., & Santana, R, T. (1994) Animal-assisted therapy and depression in adult college students. *Anthrozoos*, 7, 188-194.

Foresight (2007) Tacking obesities: future choices project. Foresight, UK.

Fox, K, R. & Corbin, C, B. (1989) The Physical self-perception profile: development and preliminary validation. *Journal of Sport and Exercise Psychology*, 11, 408-430.

Friedmann, E., Thomas, S, A. & Eddy, T, J. (2000) Companion animals and human health: Physical and cardiovascular influences. In A. Podberscek, E. S. Paul, & J. A. Serpell (Eds.) *Companion animals and us*. Cambridge: Cambridge University Press.

Fritz, C, L., Farver, T, B., Kass, P, H., & Hart, L, A. (1995). Association with companion animals and the expression of noncognitive symptoms in Alzheimer's patients. *The Journal of Nervous and Mental Disease*, 183, 459 – 463.

Garrity, T, F., Stallones, L., Marx, M. & Johnston, T, P. (1989) Can pet dog presence reduce human cardiovascular responses to stress? *Anthrozoos*, 3: 35-44.

Giles-Corti, B. & Donovan, R. (2003) Relative influences of individual, social environmental and physical environmental correlates of walking. *American journal of public health*, 93, 1583-1589.

Hauswirth C, Bigard AX, Le Chevalier JM. (1997). The Cosmed K4 telemetry system as an accurate device for oxygen uptake measurements during exercise. *Int J Sports Med*;18:449-53.

Hawes, M.R and Martin, A.D. (2001). Human Body Composition, In R.Eston and T. Reilly (eds). *Kinanthropometry and exercise physiology laboratory manual: Tests, procedures and data* (2nd ed.)

Headey, B. (1998). Health benefits and health cost savings due to pets: Preliminary estimates from an Australian national survey. *Social Indicators Research*, 47, 233 – 243.

Herzog T, R. (1992) A cognitive analysis of preference for urban spaces. *Journal of environmental psychology*, 12, 237-248.

Herzog, T, R. & Bosley, P, J. (1992) Tranquillity and preferences as affective qualities of natural environments. *Journal of environmental psychology*, 12, 115-127.

Hosaka, Y, Nagasaki, M., Bajotto, G., Shinomiya, Y., Ozawa, T. & Sato, Y. (2010) Effects of daily mechanical horseback riding on insulin sensitivity and resting metabolism in middle-aged type 2 diabetes mellitus patients. *Nagoya Journal of Medical Science*, 72, 129-137.

Hildebrandt, V, H., Proper K., Urlings I., (2002) Physical activity and Work Performance: Results from the National Worker fitness test in the Netherlands. In Ooijendijk W T M, Hildebrandt V H, Stiggelbout M (eds) Trendrapport Bewegen en Gezondheid Hoofddorp.

Hoffman, A., Lee, H., Wertenaar, F., Ricken, R., Jansen, J., Gallinat, J. & Lang, U. (2009) Dog-assisted intervention significantly reduces anxiety in hospitalized patients with major depression. *European Journal of Integrative Medicine*, 1, 145-148.

Hull, R, B. & Harvey, A. (1989) Explaining the emotion people experience in suburban parks. *Environment and Behaviour*, 21, 323-345.

Hunt, S, J., Hart, L, A., & Gomulkiewicz, R. (1992) Role of small animals in social interactions between

strangers. *Journal of Social Psychology*, 132, 245-256.

James, D.B., Sandals, L.E., Wood, D.M. & Jones, A.M. (2007). Pulmonary gas exchange. In E.M. Winter, A.M. Jones, R.C. Richard Davison, P.D. Bromley & T.H. Mercer (eds.). *Sport and Exercise Physiology Testing Guidelines, The British Association of Sport and Exercise Sciences Guide, Volume I: SportTesting*. London, Routledge, 101 – 111.

Jette M, Sidney K & Blumchen G (1990): Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. *Clin.Cardiol.* 13, 555-565.

Kaiser, L., Smith, K, A., Heleski, C, R., & Spence, L. J. (2006) Effects of a therapeutic riding program on at-risk and special education children. *Journal of the American Veterinary Medical Association*, 228, 46-52.

Kaplan and Kaplan (1989) *The experience of nature: A psychological perspective*. Cambridge University Press.

Katcher, A, H. (1981) Interactions between people and their pets: Form and function. In Fogle, B (Ed) *Interrelationships between people and pets* (pp. 41 – 67). Springfield, IL: Charles C Thomas.

Katcher,A, H., Friedmann, E., Beck, A, M. & Lynch, J, J. (1983) Talking, looking, and blood pressure: Physiological consequences of interaction with the living environment. In Katcher, A, H & Beck, A, M. (Eds.) *New perspectives on our lives with companion animals* (pp. 351 – 359). Philadelphia: University of Pennsylvania Press.

Kidd, A, H., & Kidd, R, M. (1985) Children's attitudes toward their pets. *Psychosocial Reports*, 57, 15-31.

Kubota, M., Nagasaki, M., Tokudome, M., Shinomiya, Y., Ozawa, T. & Sato, Y. (2006) Mechanical horseback riding improves insulin sensitivity in elder diabetic patients. *Diabetes Research and Clinical Practice*, 71, 124–130.

Kuo, F, E., Bacaicoa, M. & Sullivan, W, C. (1998) Transforming inner-city landscapes. *Environment and Behaviour*, 23, 285-304.

Lee, M. & Skerret, P. (2001) Physical activity and all-cause mortality: what is the response relation? *Medicine and Science in sport and exercise*, 33, 459-471.

Levinson, B, M. (1972) *Pets and human development*. Springfield, IL: Charles C Thomas.

Lim, A, K., Patel, N., Eckersley, R, J., Taylor-Robinson, S, D., Cosgrove, D, O. & Blomley, M, J. (2004) Evidence for spleen-specific uptake of a microbubble contrast agent: a quantitative study in healthy volunteers. *Radiology*, 231, 785-788.

Macfarlane DJ. (2001). Automated metabolic gas analysis systems. A review. *Sports Medicine*, 31:841–61

Mackay, G. & Neil, J. (2010) The effect of 'green exercise' on state anxiety and the role of exercise duration, intensity, and greenness: A quasi-experimental study. *Journal of Psychology of Sport and Exercise*, 11, 238-254.

Martinsen, E, W. (1995) Effects of exercise on mental health in clinical populations. In Biddle, S (ed) *European perspectives on exercise and sport psychology*. Human Kinetics Europe Ltd.

McGibbon, N, H., Benda, W., Duncan, B, R. & Silkwood-Sherer, D. (2009) Immediate and long-term effects of hippotherapy on symmetry of adductor muscle activity and functional ability in children with spastic cerebral palsy. *Archives in Physical and Medical Rehabilitation*, 90, 966-974.

McLaughlin JE, King GA, Howley ET, et al. (2001). Validation of the K4 b2 portable metabolic system. *Int J Sport Med*, 22, 280–4.

McNicholas, J. & Collis, G, M. (2000) Dogs as catalysts for social interactions: Robustness of the effect. *British Journal of Psychology*, 91, 61 – 70.

Miller, M. & Lago, D. (1990) The well-being of older women: The importance of pet and human relations. *Anthrozoos*, 3, 245 – 252.

Morris, N. (2003) Health Well-being and Open Space, Literature Review. *OPENspace: The Research centre for inclusive access to outdoor environments*.

Nakano, T., Shirasawa, N., Sasaki, H., Mihara, I., Moritani, T. & Niwa, S. (2006) Relationship between riding posture and muscle activities during physical exercise on horseback-riding simulation equipment. *Japanese journal of Physical Fitness and Sports Medicine*, 55, 103-107.

Netherlands Health Council (2004) The influence of nature on social, psychological and physical well-being. *Gezondheidsraad: Health Council for the Netherlands*.

Newton, J. (2007) Well-being and the Natural Environment: A brief overview of the evidence. Unpublished.

Office of National Statistics (2008) Publication Hub: Gateway to UK National Statistics. [online] available at: <http://www.statistics.gov.uk/hub/population/index.html>

- Paffenbarger, R. S., Hyde, R. T., Wing, A. L., Lee, I., Jung, D. L. & Kampert, J. D. (1993) The association of changes in physical activity level and other lifestyle characteristic with mortality among men. *New England Journal of Medicine*, 328, 538-45.
- Pinnington HC, Wong P, Tay J, et al. (2001). The level of accuracy in measures of FEO₂, FECO₂ and VE between the Cosmed K4b2 portable, respiratory gas analysis system and a metabolic cart. *J Sci Med Sport*; 4:324–35
- Pretty, J., Murray, G., Sellens, M. & Pretty, C. (2003) Green exercise: Complementary roles of nature, exercise and diet in physical and emotional well-being and implications for public health policy. University of Essex.
- Pretty, J., Peacock, J., Sellens, M. & Griffin, M. (2005) The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*, 15, 319-337.
- Pretty, J., Peacock, J., Hine, R., Sellens, M., South, N. & Griffin, M. (2007) Green exercise in the UK countryside: effects on health and psychological well-being and implications for policy and planning. *Journal of Environmental Planning and Management*, 50, 211-231.
- Reynolds, V. (2002) Using the countryside as a health resource to promote physical activity. A summary of the UK. Walking the way to Health and the Green Gym Initiatives. [online] available at: www.whi.org.uk.
- Reynolds, V. (2002) Well-being comes naturally. An evaluation of the BTCV Green Gym at Portslade, East Sussex. *Oxford: Centre for Health Care Research and Development*, Oxford Brookes University.
- Roberts, C. A., McBride, E. A., Rosenvinge, H. P., Stevenage, S. V. & Bradshaw, J.W. S. (1996) The pleasure of a pet: The effect of pet ownership and social support on loneliness and depression in a population of elderly people living in their own homes. In J. Nicholson & A. Podberscek (Eds.), *Further issues in research in companion animal studies* (pp. 64). Callander: The Society for Companion Animal Studies.
- Robin, M., & Bensel, R. (1985) Pets and the socialization of children. *Marriage and Family Review*, 8, 63 – 78.
- Schultz, P. M., Remick-Barlow, G. A. & Robbins, L. (2007) Equine-assisted psychotherapy: A mental health promotion/intervention modality for children who have experienced intra-family violence. *Health and Social Care in the Community*, 15, 275-281.
- Souter, M, A. & Miller, M, D. (2007) Do animal-assisted activities effectively treat depression? A meta-analysis. *Anthrozoös*, 20, 167–180.
- Scully, D., Kremer, J., Meade, M., Graham, R. & Dudgeon, K. (1998) Physical exercise and psychological well-being: a critical review. *British journal of sports medicine*, 32, 111-120.
- Serpell, J. A. (1991) Beneficial effects of pet ownership on some aspects of human health and behaviour. *Journal of the Royal Society of Medicine*, 84, 717 – 720.
- Siegel, J. M. (1990). Stressful life events and use of physician services among the elderly: The moderating role of pet ownership. *Journal of Personality and Social Psychology*, 58, 1081 – 1086.
- Siegel, J, M., Angulo, F, J., Detels, R., Wesch, J. & Mullen, A. (1999). AIDS diagnosis and depression in the multicenter AIDS cohort study: The ameliorating impact of pet ownership. *AIDS Care*, 11, 157 – 170.
- Siri, W, E. (1961) Body composition from fluid space and density. In Brozek, J & Hanschel, A (Eds) *Techniques for Measuring Body Composition* (pp. 223-244). Washington, DC: National Academy of Science.
- Shiloh, S., Sorek, G., & Terkel, J. (2003) Reduction of state-anxiety by petting animals in a controlled laboratory experiment. *Anxiety Stress and Coping*, 16, 387 – 395.
- Sheets, V, L. & Manzer, C, D. (1991) Affect, Cognition and Urban Vegetation. Some effects of adding trees along city streets. *Environment and Behaviour*, 23, 285-304.
- Sonstroem, R, J., Harlow, L. & Josephs, L. (1994) Exercise and self-esteem: validity of model expression and exercise association. *Journal of Sport and Exercise Psychology*, 16: 29-42.
- Sproston, K., and Primetesta, P. (1999) *Health Survey for England 1997*. London: the stationary office.
- Sport England (2007) Active People Survey (2007/8) [online] available at: http://www.sportengland.org/research/active_people_survey/active_people_survey_2.aspx
- Sport England (2009) Health Survey for England- 2008: Physical activity and fitness. Summary of key findings. [online] available at: <http://www.ic.nhs.uk/pubs/hse08physicalactivity>
- Sport England (2010) Active People Survey (2010/11) [online] available at: http://www.sportengland.org/research/active_people_survey.aspx
- Stolk, P. (2009) The Social and Community Benefits of Angling. Manchester, Substance.
- Tower, R. B. & Nokota, M. (2006) Pet companionship and depression: Results from a United States Internet

sample. *Anthrozoos*, 19, 50 – 64.

Tribet, J., Boucharlat, M. & Myslinski, M. (2008) Animal-assisted therapy for people suffering from severe dementia. *Encéphale-Revue de psychiatrie Clinique biologique et thérapeutique*, 34, 183-186.

Tully, M. A., Cupples, M. E., Hart, N., McEneny, J., McGlade, K., Chan, W. & Young, I. (2007) Randomised controlled trial of home-based walking programmes at and below current recommended levels of exercise in sedentary adults. *Journal of Epidemiology and Community Health*, 61, 778-783.

Ulrich, R. S. (1983) Aesthetic and affective responses to natural environments. In Altman, I and Wohlwill, J, F., (eds) *Behaviour and the natural environment*. Springer, UK.

Urlings, I., Proper, K. & Hildebrandt, V. (2000). Werk(druk) stimuleert én belemmert Nederlander. *Beweging Arbeidsomstandigheden*, 76, 39-43.

Wilson, C. (1991) The pet as an anxiolytic intervention. *Journal of Nervous and Mental Disease*, 179, 482 – 489.

Wipfli, B. M. & Rethorst, C. D., (2008) The anxiolytic effects of exercise: a meta-analysis of randomized trials and dose-response analysis. *Journal of Sport and Exercise Psychology*, 30, 392-410.

World Health Organisation, the Food and Agriculture Organisation of the United Nations, or the United Nations University (FAO/WHO/UNU) (1985). *Energy and protein requirements: technical report series 724*. Geneva: World Health Organisation.



LIST OF APPENDICES

- 1 The Evidence Base – recreational horse riding, exercise and health (Section 2 in full)**
- 2 Research methods (Section 3 in full)**
- 3 Subject Information Sheet**
- 4 Consent Form and Medical Questionnaire**
- 5 Survey of Riders**



Appendix 1

The Evidence Base – recreational horse riding, exercise and health

A 1.1 Introduction – uncertainties and the evidence base

There is now an abundance of evidence indicating the physical health, mental health and social benefits of physical activity (Department of Health, 2004, Foresight, 2007, Sandercock et al., 2009). In particular, physical activity is associated with reduced risk of coronary heart disease, obesity, type II diabetes, and other chronic diseases and conditions (Department of Health, 2004). An increasing body of research points to a positive effect of physical exercise on psychological health, including enhanced self-esteem, improved social networks and reduced anxiety and depression (Fox and Corbin, 1989; Martinsen, 1995 Landers, 1997 Farmer et al, 1998; Scully et al, 1998; Sonstroem et al, 1994; Pretty et al, 2003). One study suggests if the amount of physical exercise undertaken by active individuals decreases then the risk of depression increases (Paffenbarger et al, 1994). There is also evidence that regular physical activity can improve survival rates amongst elderly people (Lim and Taylor, 2004). Physical exercise, therefore, affects overall well-being not just physical health, with well-being defined in the UK as “a positive physical, social and mental state; it is not just the absence of pain, discomfort and incapacity” (Defra, 2007).

There are, however, a number of uncertainties and debates in the existing evidence base that need to be taken into account in an examination of the health and well-being effects of horse-based sport and leisure. Of most significance, is that the evidence available on the physical health, psychological and well-being benefits of horse-based sport and leisure is both limited and conflicting. Furthermore, there are uncertainties in the evidence concerning the additional health and well-being benefits that can arise from exercise that involves being in outdoor natural environments, having contact with nature (Thompson Coon et al. 2010) or contact with animals (Seigel et al. 1999). These are all issues that are particularly relevant to horse riding and these uncertainties were considered when designing research into the health benefits of recreational horse-based sport and leisure. The next three sub-sections, therefore, discuss the existing evidence on the health benefits of recreational horse-based sport and leisure. This is followed by two sub-sections that examine the evidence base concerning the well-being benefits of exercise involving the outdoor environments, contact with nature and contact with animals. The existing evidence presented was gathered through an extensive literature search to identify relevant research whose reliability has been assessed through some form of peer review process and is published in academic journal papers, commissioned government studies or PhD theses. The section as a whole not only summarises existing evidence, but also identifies from the evidence base certain key factors that influenced the design of the primary research presented in this report to ensure the study addressed the issues of key significance for research into the health and well-being benefits of recreational horse-based sport and leisure.

A 1.2 The health and well-being benefits of horse riding – physical intensity

The physical health benefits arising from physical exercise is determined in part by what is termed the exercise intensity. This refers to the effort put into the activity and the energy expended. Consequently, the small number of physiological studies of the health benefits of horse riding have focussed on the issue of exercise intensity.

Two studies assessing the physiological impacts of horse riding argue that it can be categorised as moderate intensity activity and, thus, if undertaken regularly and for an appropriate length of time will confer health benefits. Devienne and Guezennec (2000) studied the metabolic cost for horse riders of a dressage and jumping horse riding session, with both known and unknown horses, and confirmed that riding can induce a significant increase in energy expenditure that constitutes moderate intensity exercise. The limitation of this study was that it was undertaken with only five riders and did not look at the most common forms of recreational equestrianism such as hacking or schooling. Nevertheless, the study is important as it involved scientific measurement of the metabolic costs and two equestrian activities that vary in terms of the effort required. A study of 12 able bodied women aged between 40-46 also found that training on a mechanical horse for 30 minutes per day, four times per week for eight weeks has also been found to improve muscle strength in the trunk and hips (Nakano et al, 2005), which is important for carrying out daily physical activities.

Ainsworth et al (2000) analyse a wide range of evidence in existing studies to identify comparisons in the intensity of different forms of physical activity. The existing studies examined included those that measure the energy cost of physical activity and those that rely on self reported measures of the exercise intensity³. These different forms of evidence were used to produce a compendium of six hundred and five physical activities and their contributions to daily energy expenditure. Coding of the energy expenditure of the

³ Self-report measures are operational definitions in which a person is asked to report his or her own behaviour or mental contents (asking people if exercise raised their breathing rate, for example). Self-report measures can also include questions like ‘how happy are you on a scale of 1 to 5’.

physical activities was in metabolic equivalents (METs) in order that researchers, clinicians, and practitioners could use them to identify examples of moderate intensity, physical activities. MET is a standard unit and long-standing, validated measure that estimates the amount of oxygen used by the body during physical activity (Jette and Blumchen 1990). Ainsworth et al (2000) report that general horseriding, involves four METs, while trotting rises to six METs; both within the range to be classified as moderate intensity exercise.

A scientific study that drew different conclusions was one by Meyers (2006) who quantified the effects of a horse riding training programme on health and physical fitness among 15 college females. Measures of cardio-respiratory fitness, body composition, muscular power, muscle strength, blood chemistry and coronary risk were taken before and after a 14-week semester, riding five days per week for an hour each time. In contrast to Devienne and Guezennec (2000) and Ainsworth et al (2000)'s findings, Meyers (2006) concluded that their riding programme did not provide an adequate stimulus to improve health and fitness in young adults and recommended the need to supplement this activity with alternative, aerobic and load-bearing training (Meyers, 2006).

There are very few studies into social and psychological benefits arising for horse riding and those that do exist are based on in-depth qualitative studies with a limited number of participants. One such study by Burr (2009)⁴ sought to investigate the nature of the relationship formed between horses and recreational horsewomen, through a series of in depth interviews. It was found that the knowledge and skills gained through participating in recreational horse riding had the ability to enhance ones' self esteem and made women 'feel good about themselves' (Burr, 2009). It was also found that owning or riding horses contributed to feelings of inclusion and offered horsewomen a sense of community. The existing evidence base on the health benefits of recreational horse-based sport and leisure clearly has some limitations. The UK government bodies Sport England (2010) and DCMS (2007) now include horse riding in their list of sports that involve moderate intensity exercise. There is, however, limited scientific evidence to support this as there are only a small number of studies that use validated scientific techniques to measure the exercise intensity of horse riding and they produce conflicting results (Devienne and Guezennec 2000; Ainsworth et al, 2000; Meyers, 2006). There is clearly a need for the research undertaken for this report which involves the use of scientific measures to assess the exercise intensity of horse riding with a group of 17 participants which is larger in number than the Devienne and Guezennec (2000) study of five riders and measures the intensity of an individual riding session as opposed to the Meyers study looking at possible benefits of longer term participation. In particular, given the lack of consensus within the current evidence, the exercise testing undertaken on the 17 riders for this report was designed to ascertain accurately whether a 45-minute riding session was sufficiently intense to be considered a physical activity of 'moderate intensity'; thus if riders were to take part regularly there would probably be associated longer term health benefits.

The existing evidence base also indicates it is important to consider issues of disability as some previous studies indicate riding can have specific physical health benefits for people with disabilities (Bronson et al, 2010). The analysis of the questionnaire of riders presented in this report, therefore, examines findings for riders who reported they had a long standing illness or disability. Furthermore, the general evidence on the well-being effects of physical exercise indicates that it is important to examine psychological and social impacts as well as physiological impacts. The previous research into the psychological and social benefits of horse riding has relied on mainly qualitative studies with relatively small numbers of respondents. This study, therefore, included in the questionnaire of riders closed attitudinal questions concerning the psychological and social benefits of horse riding to generate quantitative data on these issues. In addition, the questionnaire also included open ended questions where respondents could write about their feelings towards horse riding and this produced qualitative material that could be used to support the quantitative analysis of the psychological and social benefits

⁴ This study is part of the unpublished PhD thesis 'Woman and horses: a study of Australia's recreational horsewomen'. Sandra Burr (2009), University of Canberra. [online] available at: <http://erl.canberra.edu.au/uploads/approved/adt-AUC20100414.131547/public/05whole.pdf>

A 1.3 The health and well-being benefits of horse riding – frequency of exercise

The benefits of exercise, especially those relating to physical health, are in part influenced by the frequency that an individual takes exercise (Blair et al, 1992; Blair et al, 1995). As a result of existing evidence the Department of Health recommends that adults should participate in 30 minutes of moderate intensity physical activity at least five days per week (Department of Health, 1995), and if undertaken with suitable intensity it has been argued this can be achieved through activities including brisk walking, cycling, swimming, gardening, horse riding and conservation work (Bird, 2004). In a similar vein, the Sport England (2010) Active People survey is a major study of sports participation that has been running since 2005 and seeks to identify the numbers of adults who take part in at least three, moderate intensity 30-minute sessions of sport and physical activity every week (3x30)⁵ since this is also seen as sufficient exercise to produce physical health benefits.

There are, however, uncertainties and debates in existing research regarding the frequency of participation required to achieve health benefits. For example, Tully et al. (2007) measured the physical health of sedentary people aged between 40 and 61 involved in a walking programme compared to a similar group who were not and concluded that while the goal should be for adults to take exercise five days a week there were still benefits in terms of blood pressure and fitness associated with even light exercise three days a week.

People who participate less regularly in sport may gain other psychological or social well-being benefits. In addition, society may benefit from the development of social capital defined as 'the value (capital) of social networks bonding similar people and bridging between diverse people with norms of reciprocity' (Dekker and Uslaner, 2001). Consequently another government survey called Taking Part (DCMS 2007) has been measuring levels of voluntary participation in leisure, culture and sport in England since 2005. This survey, like the Sport England Active People Surveys, assesses levels of participation in 'moderate intensity sport' defined as people taking part in sport on at least 12 separate days in the previous four weeks. It also measures levels of participation in 'active sport' defined as people with one instance of participation during the past four weeks. This recognises the social and cultural benefits of people being involved in sport on a regular basis even if this is not of the frequency required to confer physical health benefits.

These and other surveys provide existing data on the frequency of participation amongst people involved in horse riding in England, which indicates its popularity as a form of physical activity. In the UK 42 percent of households have at least one member with an interest in equestrianism (including racing), the number of people estimated to go horse riding at some point over the course of a year is 4.3 million with 2.1 million participating on a regular basis (BETA, 2006). The British Horse Society has more than 74,000 members and in 2010 there were 995 British Horse Society approved riding establishments worldwide, an increase of 278 on 2009 (The British Horse Society, 2011). The number of riding clubs affiliated to The British Horse Society exceeds 430, with 21 riding centres and more than 34,000 members (The British Horse Society, 2011).

The Active People Survey 4 (APS4) (Sport England 2010) found the number of people participating in equestrianism at least once a week in England (aged 16 and above) to be 337,800. This survey does not include participation in other countries within the UK and therefore comparisons cannot be made between the participation rates of this survey and the work carried out by BETA.

The first Active People Survey (Sport England 2007) also examined the other sports, if any, in which people participated. As can be seen in Table 1 horse riding is distinctive as it is one of a number of sports where a high proportion of those people participating (48 percent) take part in no other sporting activity. Only bowls, angling and golf have higher percentages⁶. This is an important feature of horse riding since a high proportion of riders rely on horse riding for moderate intensity physical exercise and unless they changed their exercise habits would be otherwise sedentary.

⁵ Three separate occasions per week is defined as participation on at least 12 separate days in the previous four weeks.

⁶ Note that this does not include some other forms of physical exercise that Sport England does not class as sport, such as walking.

Table A 1 percentage of people who only participate in no other sporting activity by type of sport

Sport	Percentage of participants who do no other sporting activity
Bowls	67.1 percent
Angling	58.7 percent
Golf	50 percent
Horse riding	48.0 percent
Dance exercise	47.9 percent
Shooting	47.4 percent
Swimming	46.7 percent
Archery	37.8 percent
Football	35.0 percent
Taikwando	34.2 percent
Fencing	33.3 percent
Judo	32.6 percent
Cycling	30.1 percent
Badminton	29.63 percent
Weightlifting	29.3 percent
Skiing	28.2 percent
Gymnastics	27.7 percent
Athletics	25.4 percent
Netball	24.6 percent
Hockey	22.6 percent
Rowing	22.2 percent
Tennis	21.8 percent
Canoeing	21.3 percent
Squash	21.3 percent
Cricket	21.0 percent
Rounders	20.7 percent
Mountaineering	20.0 percent
Rugby Union	19.4 percent
Baseball/softball	18.4 percent
Boxing	18.2 percent
Basketball	16.5 percent
Volleyball	13.1 percent

The survey of riders discussed in this report examined the issue of whether respondents would be otherwise sedentary if they did not ride, by collecting data on the frequency of participation not only in horse riding but also other activities associated with horse riding (such as mucking out and grooming) and other forms of physical activity. The discussion of frequency in the analysis section of this report recognises, as do some of the studies discussed above, that while regular participation (12 separate days every four weeks) is normally required to generate physical health benefits, less regular participation (once every four weeks, for instance) may produce social and psychological benefits.

A 1.4 The health and well-being benefits of horse riding – key social groups

The current evidence base on the health benefits of riding and the participation patterns in horse based sport and leisure suggests that attention should be paid to specific social groups when examining the health and well-being effects of horse-based sport and leisure.

There are a number of studies that measure the physical health of participants which show how horse riding exercise is of an intensity and form to result in the improved conditioning of both adults and children with specific physical disabilities (Crane, 1999; Bertoti, 1988; Bronson et al, 2010). The general rationale behind using horse riding as a form of therapy for people with disabilities has focussed on the concept that riding provides the person with a disability a normal sensorimotor experience that contributes to the maintenance, development, rehabilitation and enhancement of physical skills (Crane, 1999). Research involving the measurements of the health of those taking part has also identified that the regular use of a mechanical horse improves insulin in middle-aged (Hosaka et al, 2010) and elderly (Kubota et al, 2006) type II diabetic patients.

The Sport England APS4 survey reveals there are some important distinctive features of participation in equestrianism that are significant in relation to health. The survey indicates that of those who participate in equestrianism in England on at least a weekly basis 90 percent were female. This shows a far higher percentage of female participation in comparison to the overall participation rates for all sports combined where only 40 percent of those participating in at least three sessions a week of moderate intensity were female. Women are identified as one of the key social groups with participation levels in sport well below the average. The Taking Part survey for England in 2009/10 found that 59 percent of men had participated at least once in 'active sport' in the past four weeks, compared to 48 percent of women (DCMS 2010). Policy initiatives such as Active England supported measures to encourage more women to participate regularly in sport (Sport England 2007). A valuable dimension of horse-based sport and leisure, therefore, will be that the health benefits will be largely experienced by women as they make up the vast majority of participants and are a social group with below average levels of participation in sport as a whole. The survey of riders considered issues of gender and disability.

A 1.5 The well-being benefits of exercise in outdoor environments and contact with nature

There has been a recent growth in the body of evidence arguing that exercise, such as horse riding, which involves outdoor natural environments and contact with nature can confer additional benefits. There are, however, some uncertainties in the evidence that need to be acknowledged. A number of studies have found that the presence of natural settings can actually act as a motivating factor for physical exercise and possibly increase the intensity of exercise and the energy expended. For instance, a report by the Netherlands Health Council (2004) cites a series of Dutch studies which found that fresh air and 'simply being outdoors' as increasing motivation for exercise (Urlings et al, 2000; Hildebrandt et al, 2002) and similar conclusions were drawn from a study in Australia that found the quality of the physical environment influenced exercise levels (Giles-Corti and Donovan, 2003). There is also some evidence to show that exercising in an outdoor environment can improve adherence to exercise in the longer term. In the UK, an evaluation of the walking the way to health initiative (WHI), a national scheme that encourages people to do regular short walks within their local community to improve their level of fitness, found that group walking in natural environments gave people an extra incentive to continue taking part (Reynolds, 2002). A similar finding occurred in an evaluation of the 'green gym' project, an initiative of the British Trust for Conservation Volunteers, which promotes participation in local nature activities with a view to improving physical fitness and health. These evaluations also revealed that schemes promoting indoor sports are the least successful in the long term with a 50 percent dropout rate after the first six months. By contrast, the study of BTCV green gym project found that 70 percent of people were still participating six months after enrolling on the programme (Reynolds, 2002).

Not only is there some evidence that access to natural environments appears to increase the incentive to exercise and to continue to be active in the medium to longer term, but some studies have argued that exercise outdoors has an impact on the intensity of physical activity. A study by Buchanan et al (2000) found that when comparing the level of physical activity in adults, the percentages of their maximum heart rate and walking speed were significantly higher when walking outdoors compared to indoor walking on a treadmill. What is more, the rate of perceived exertion was similar for both, showing that when outdoors, people walked faster and used up more energy without feeling any additional exertion (Buchanan et al, 2000). Varied scenery and the natural environment were cited as possible reasons for this as they 'may provide a positive distraction from the actual exercise' (Buchanan et al, 2000).

While these studies suggest there are additional physical benefits to be gained from outdoor exercise, other research is more cautious. Thompson Coon et al (2011) undertook a systematic review of previous research and argued that uncertainties still exist over the extent to which exercise in outdoor environments produces a greater physical and mental well-being benefit compared to using indoor environments

(Thompson Coon 2011). Recent research, however, suggests that for clinical populations suffering mental ill-health there is an additional benefit of outdoor over indoor activity (Barton et al, 2011).

A related body of evidence argues that there are psychological benefits of viewing or having direct contact with nature, including enhanced emotional well-being, improvements in mood and reduced stress and anxiety (Morris, 2003). Various theories have been devised to explain this phenomenon, including the idea that humans are biologically disposed to affiliate with and respond positively to nature (Wilson, 1984); that viewing natural environments can help people recover from attention fatigue (Kaplan, 1989) or that natural environments can enable recovery from any form of stress through the triggering of positive emotional responses (Ulrich, 1999) Given this, it has been hypothesised that there may be synergistic psychological benefits in adopting physical activities whilst at the same time being exposed to nature (Mackay and Neil, 2010). This has been termed 'green exercise' by Pretty et al (2005) and refers to physical activities undertaken whilst exposed to natural environments (Pretty et al, 2005).

There is an emerging body of research into the benefits of 'green exercise' and its effects on people's psychological health. Pretty et al (2007) looked at the effects of green exercise on mood and self-esteem using 10 pre-existing outdoor activity groups as case studies (these included, horse-riding, walking, cycling, fishing, canal boating and conservation activities). It was found that green exercise leads to a significant improvement in both mood and self-esteem, and these results were consistent across all 10 activity case studies, indicating that the psychological benefits of green exercise do not vary significantly by age, gender, exercise intensity or type of exercise group (Pretty et al, 2007). This study indicates that frequency of exercise, which is seen as important in influencing physical health impacts from exercise, maybe less of an influence on the experience of psychological benefits.

There is also a limited body of evidence to suggest that contact with nature can enhance social well-being. Indeed, it has been shown that the presence of nature or green spaces can create the opportunity to increase quality of life and heighten social interaction, 'and thus helps to enhance community spirit and foster a more socially inclusive society' (Scottish Natural Heritage, 2002).

The current evidence base suggests to a reasonable level of certainty that contact with nature and the outdoors is valuable for psychological well-being. The degree to which exercise that involves contact with the outdoors and nature confers additional health and well-being benefits compared to indoor environments is less certain (Thompson Coon et al. 2010). Consequently, the survey of horse riders undertaken for this report was designed to produce some quantitative data on the importance to riders of the outdoors and contact with nature. The open ended question in the survey produced qualitative data on this issue as a large number of respondents chose to write about the contribution of the outdoors and nature to their horse riding experiences.

A 1.6 The well-being benefits of exercise involving contact with animals

An important difference between recreational horse-riding and most other outdoor activities is the presence of another sentient being (i.e. the horse) in the physical activity itself. Whilst there have been a few studies which have looked at the therapeutic benefits of horses for people with certain physical or mental disabilities (Brock, 1989; Bertoi, 1988; Bronson et al, 2010; Hameury et al, 2009; Kaiser et al 2006; McKinnon et al, 1995; Shultz et al; 2007), there is very limited evidence examining how being with horses can be beneficial to people's general physical and/or mental well-being (Brandt, 2004). The evidence discussed earlier on the physical health benefits of riding did not consider the interaction between horse and rider.

There is, however, a multitude of research which suggests that being with animals generally can have a positive effect on human health and well-being. 'Companion animals' such as dogs and cats may be able to improve our short-term physical health (offer health benefits lasting for seconds or minutes, for example). Indeed, the action of stroking an animal has been shown to decrease blood pressure and/or heart rate (Eddy, 1996; Katcher, 1981; Katcher et al 1983; Shiloh et al, 2003, Wilson, 1991), while merely being in the presence of a companion animal has been revealed to reduce autonomic responses to conditions of moderate stress. For example, there have been a series of studies which show that when exposed to psychological stressors in a controlled environment, the presence of a companion animal can reduce heart rate and/or blood pressure (Katcher et al, 1983, Friedman et al. 1983, Allen et al 1991).

There is less research on the effects that companion animals can have on physical health over the longer term (over weeks, months or years, for instance) but there are a few studies which indicate that animals may also hold long term therapeutic benefits, such as preventing illness or even facilitating recovery from serious physical ailments. For example, two studies by Headey (1998) and Seigel (1990) revealed that pet owners have been discovered to visit the doctor significantly less than individuals who do not own a companion animal. There is also evidence to suggest that pet ownership may reduce people's chances of developing more chronic conditions. Anderson et al (1992) found that the risk factor for coronary heart disease was significantly lower for pet owners than non-pet owners; this was particularly true of males.

A long standing body of evidence suggests that contact with animals can also have certain psychological benefits, such as the potential to reduce levels of anxiety and depression (Folse et al, 1994; Garrity et al, 1989; Hoffman et al, 2009; Scouter & Miller, 2007; Seigel, 1990), and enhance feelings of autonomy, competence and self-esteem (Beck and Katche, 1984; de Guzman et al, 2009; Kidd and Kidd, 1985; Levinson, 1972; Robin and Bense, 1985; Tribet et al, 2008). One possible reason for this might be that companion animals facilitate social contact between people and therefore reduce feelings of loneliness or isolation. For example, it was found in a study by McNicholas & Collins (2000) that walking with a dog results in a significantly higher number of chance conversations with strangers than walking alone. A number of studies have also explored the effect of companion animals on depression in humans. Some of these have found a positive correlation between pet ownership and reductions in depression. For example, Siegel et al (1999) discovered that when comparing self-reported levels of depression in men infected with AIDS, those men who were pet owners reported less depression than those who did not have a companion animal. Elderly people with pets have also been shown to have fewer symptoms of depression than those without pets (Roberts et al, 1996).

Other studies in this area have not been so conclusive. For example, Seigel et al (1999) found no relationship between pet ownership and depression in men infected with HIV. What is more, similar negative findings have been reported in studies of people with Alzheimer's (Fritz et al, 1995), unmarried men (Tower & Nokota, 2006) and elderly women (Miller & Lago, 1990). It has been suggested that this conflict in findings is perhaps due to a lack of consistency with regards to the methodology used and participants recruited (Wells, 2009). Therefore further work needs to be done in this area before conclusions can be made regarding the link between pet-ownership and depression

The mental and physical interaction between horse and rider will be complex and highly personalised (Brandt 2004). A number of questionnaire respondents also raised their very complex interactions with horses in the open ended questions that allowed them to discuss their feelings about riding.

A 1.7 Conclusion – key issues for research into the health and well-being benefits of horse-based sport and leisure

This appendix has highlighted that there is abundant evidence indicating that physical exercise can lead to physiological, psychological and social benefits. The evidence base on the degree to which such benefits are obtained through horse riding is both conflicting and limited highlighting the importance of the research presented in this report and the need for the research to focus on the issues of exercise intensity and frequency since these are important determinants of physical health benefits. The exercise testing was specifically designed to explore the issue of intensity using scientific measurements and using current definitions of what constitutes moderate intensity exercise in terms of energy expenditure measured in metabolic equivalents (METs). The questionnaire of horse riders examined frequency and intensity of exercise using self reported measures that are similar to those used in other surveys undertaken by Sport England (2010) and DCMS (2007) to assess participation in moderate intensity sport and active sport. The questionnaire collected data on exercise intensity and frequency for activities associated with riding such as grooming and mucking out and frequency of other forms of physical activity. All forms of activity were included in the survey for this piece of work as the existing evidence base highlights that a high proportion of riders do no other sporting activity. In order to ascertain if such riders might be otherwise sedentary their participation in sporting activities and other forms of exercise, such as walking, needed to be determined. The possible psychological and social benefits of horse-based sport and leisure are also considered in the questionnaire.

The existing evidence base suggests that issues of gender and disability may also be of significance in considering the health and well-being benefits of horse riding. Horse riding is a sport where the vast majority of participants are women but nationally women have lower participation than men in both active sport and moderate intensity sport. Thus it is important to identify if women are receiving health benefits from horse riding. Existing evidence also suggest that people with disabilities may receive some specific health benefits from horse riding due to the nature of the physical activity involved.

There is also existing evidence that additional health and well-being benefits can occur through forms of exercise, such as horse riding, that involve outdoor natural environments, contact with nature and interaction with animals. There are some uncertainties associated with this evidence base as the additional benefits of outdoor exercise compared to that in indoor environments are not fully understood and the research into the health benefits of interaction with animals does not consider horses as it has focussed mainly on companion animals. **The questionnaire explored the significance for riders of interactions with outdoor environments, nature and horses and produces qualitative data on these issues.**



APPENDIX 2 Research methods

A 2.1 Introduction

This appendix sets out the two research methods used to collect and analyse primary data. The first method involved a group of 17 participants who took part in two scientific trials, one in a laboratory and another in an equestrian centre. This provided an in-depth analysis of the physical exercise intensity of recreational horse riding based on a series of validated and tested scientific techniques. This first method, therefore, focused on a key issue for this study to examine the degree to which horse riding can be considered moderate intensity activity and thus beneficial to physical health if undertaken frequently. The other primary data collection method used was a questionnaire survey of 1,248 horse riders. This survey also examined physical exercise intensity and the related issue of exercise frequency. In addition, the survey collected data on the psychological effects of horse riding.

A 2.2 Methods – Scientific trials and the measurement of exercise intensity

Existing scientific research into the health benefits of physical exercise often assesses the metabolic process linked to exercise which involves the breaking down of substances in the body to create energy. The resting metabolic rate in addition to the metabolic cost of different physical activities, such as walking, running, working, and other sporting activities, is useful for assessing the energy expenditure of an individual during a representative day (World Health Organisation, the Food and Agriculture Organisation and the United Nations University (FAO/WHO/UNU) (1985). In 2004 the Department of Health reported that 30 minutes of moderate intensity, physical activity for five or more days a week should be recommended for promoting physical activity and the prevention of diseases associated with inactivity (i.e. coronary heart disease, osteoporosis, hypertension, obesity and type II diabetes, Department of Health, 2004). In 2010 the ABC of Physical Activity for Health was produced in the UK that extended these recommendations. The guidelines stated that all healthy adults aged 18-65 years should aim to take part in at least 150 minutes of moderate-intensity, aerobic activity each week [or exercise at three to six metabolic equivalents (METs), where a MET is described as the ratio of work metabolic rate to a standard resting metabolic rate]. Vigorous-intensity, aerobic exercise for 75 minutes each week, or equivalent combinations of moderate- and vigorous-intensity aerobic activities were also recommended (O'Donovan et al, 2010). Aside from METs being used as an indicator of moderate intensity exercise, the percentage of $VO_2\text{max}$ (a marker of aerobic fitness based on maximal oxygen uptake) has also been used, with exercise performed at 40-59 percent of $VO_2\text{max}$ being classified as moderate intensity (O'Donovan et al, 2010).

The overall experimental design of the scientific trials used in this study, therefore, is based on the national recommendation on what exercise intensity is associated with potential health benefits. The purpose of the scientific trials was to evaluate the energy cost of horse riding using a portable gas analysis system and ascertain whether the intensity of exercise was sufficient to be classified as 'moderate' and therefore, confer health benefits to individuals involved in this leisure activity. Importantly, technical innovations in the development of portable gas analysis systems have enabled the valid measurement of expired air and energy expenditure in the field (Hausswirth, 1997; Macfarlane, 2001; McLaughlin, 2001; Pinnington, 2001).

In order to ascertain the exercise intensity of recreational horse riding, a group of participants were asked to carry out two trials, one cycling in the laboratory and one riding for 45 minutes in an equestrian centre replicating the pattern of a typical riding lesson; both involved the assessment of aerobic fitness parameters. This experimental design was chosen to achieve a blend of internal and external validity within this investigation. It was important for the horse riding activity to take place on a 'real' rather than a 'simulated' horse, thereby ensuring strong ecological validity. The experimental design also included a level of criterion validity where the horse riding activity and associated metabolic costs were compared to exercise carried out during the cycling trials in a laboratory environment, where there was good control of extraneous variables and the direct determination of maximal oxygen uptake – the principle outcome fitness measure. The measurement of maximal oxygen uptake has traditionally been used as the criterial standard of cardiorespiratory fitness, as it is considered to be the single physiological variable that best defines the functional capacity of both the cardiovascular and respiratory systems (Åstrand and Rodahl, 1986). The precision of oxygen uptake determination is calculated to be less than 1.5 percent (James et al 2007), suggestive that only small errors are associated with this measurement technique.

Participants in the trials visited the University of Brighton, Welkin Human Performance Laboratories where procedures were explained verbally to ensure understanding of a subject information sheet provided to volunteers prior to the visit (Appendix 4). Written informed consent was obtained, in addition to written parental consent for those volunteers aged under 18 years (Appendix 5). Height (m) and mass (kg) were obtained and body mass index (BMI) was calculated by dividing body mass by the square of the subjects' height. Skin fold thickness was measured and used to calculate body density and percentage body fat

was estimated from body density values using the Siri equation (Siri, 1961). The Siri equation, which is based upon a two compartment model of body composition, represents the simplest and most commonly used fat estimating formula. Like many equations that estimate body fat there are assumptions, such as the uniformity in the density of human fat, but the use of the Siri equations are still accepted and encouraged (Hawes and Martin, 2001).

Participants were introduced to the Multidimensional Fatigue Symptom Inventory – Short Form (MFSI-SF) (Stein et al, 1998; Stein et al, 2004) in advance of the main testing. This is a 30-item questionnaire designed, validated and frequently used to assess the severity, frequency, and daily pattern of fatigue as well as its perceived interference with quality of life (Stein et al, 2004). As this investigation was interested in evaluating the potential health benefits of horse riding, which would impact on quality of life indices, the MFSI was considered an appropriate measurement tool. Participants were asked to complete the questionnaire before the horse riding and laboratory cycling trials to ascertain baseline values. Post riding and cycling questionnaires were also completed to determine the effect of the respective exercise interventions. Items were rated on a five-point Likert-scale indicating how true each statement is for the subject (0 = not at all; 4 = extremely). The score [range, -24 (full of vigour) to +96 (fatigued)] provided an overall indication of fatigue.

Subjects performed an incremental cycling test to volitional exhaustion on an SRM cycle ergometer (SchrobererRadMeBtechnik, Weldorf, Germany) using a protocol and criteria recommended by the British Association of Sport and Exercise Science (1997). Following a five-minute warm-up, the power was set to increase incrementally. Prescribed starting power and increments were determined based on the answers by participants to the MFSI-SF survey. Expired air was analysed using a portable cardiopulmonary exercise system (MetaMax[®]3X, Cortex Biophysik, Leipzig, Germany) to obtain peak oxygen uptake ($\dot{V}O_2\text{max}$) values. The system was calibrated against known gases and volumes prior to every laboratory test. Heart rate was also recorded continuously by the Metamax[®]3X system via a heart rate monitor (Polar Electro, Tampere, Finland). Ratings of perceived exertion (RPE, a scale that evaluates perception of effort) were recorded in the last four-five seconds of each one minute stage (Borg, 1970). Participants completed the MFSI-SF pre and post the incremental cycling test.

Participants subsequently completed a standardised 45-minute horse riding session at the equestrian centre at Plumpton College, led by an instructor. This consisted of a protocol equivalent to a British Horse Society Stage 2 riding lesson, as outlined in Table A 2.1.

Table A 2.1 Horse-riding protocol used in horse riding trial

Time	Activity
0-5 minutes	Walk warm up
5-15 minutes	Trot (with stirrups)
15-25 minutes	Trot and canter work
25-35 minutes	Work without stirrups – sitting trot and walk
35-45 minutes	Trot and canter work

The MFSI-SF was also completed pre and post horse-riding session. RPE was recorded at 15 minute intervals without disruption to the horse riding session. Heart rate and expired air were analysed throughout the 45 minute protocol via the previously mentioned portable metabolic measurement system, which was calibrated using ambient air prior to every horse riding session. A range of variables were obtained during subsequent download and analyses of the collected data, including oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$), respiratory exchange ratio (RER, a measure of fat and carbohydrate breakdown) minute ventilation (\dot{V}_E , the volume of air ventilated) before energy expenditure was calculated.

Seventeen mixed-ability recreational horse riders participated in this study. The group consisted of one male and sixteen females, ranging in age from 17 to 54 years. The participants were limited to volunteers with no contra indications to exercise as determined by a medical questionnaire (Appendix 6) and their descriptive anthropometric characteristics are presented in Table A 2.2.

Table A 2.2 Anthropometric and peak oxygen uptake characteristics of participants mean \pm standard deviation]

	Age	Height	Mass	BMI	Body Fat	Power @ VO ₂ max	Absolute VO ₂ max	Relative VO ₂ max
	(years)	(cm)	(kg)	(kg.m ⁻²)	percent	(W)	L.min ⁻¹	ml.kg ⁻¹ .min ⁻¹
Mean	25.8	165	68.3	24.9	30.5	189	1.672	24.6
SD(\pm)	11.6	8.7	18.8	5.3	6.2	45.7	0.496	4.00

BMI, Body Mass Index; VO₂max, Maximum amount of oxygen you can utilise during an incremental test to exhaustion

The results in Table A2.2 indicate quite large variation amongst the participants in the scientific trials in terms of age and body size, although not gender. The results of the Allied Dunbar National Fitness Survey (1992) where maximal oxygen uptake (VO₂max) was estimated over 1,700 men and women in the UK, produced average values of 55 and 40 ml.kg⁻¹.min⁻¹ for men and women aged 16-24 years, respectively. After this time, VO₂max declined steadily with increasing age, resulting in average values of 30 and 25 ml.kg⁻¹.min⁻¹ for men and women aged 65-74 years, respectively. Aerobic fitness levels of the participants in the current study (~ 25 ml.kg⁻¹.min⁻¹) might be considered lower than average, although this is in part due to the nature of the cycling activity which requires a smaller muscle mass to be recruited than when running. Nevertheless, this is useful group of participants since they are a larger number compared to previous scientific studies (Devienne and Guzenec 2000, Meyers 2006) and also more heterogeneous in terms of age and body size.

A 2.3 Methods – the questionnaire survey of recreational horse riders

The self completion questionnaire survey of recreational horse riders was designed to gather both quantitative and qualitative data. It comprised 25 questions in total, took approximately 15 minutes to complete and obtained standard socio demographic data on gender, age, occupation and long term illness/disability (see Appendix 5).

Physical health issues were addressed through questions that obtained self reported measures of physical exercise intensity and frequency for horse riding, activities associated with horse riding (such as grooming and mucking out) and other sporting activities. A series of questions generated two self reported measures of exercise intensity. The first measure mirrored that used by the Sport England (2010) Active People survey and was based on questions asking respondents if the activity raised their breathing rate (a measure of moderate intensity exercise) or if the activity made them out of breath or sweat (a measure of high intensity exercise). The second measure followed the approach used in a major survey of physical activity amongst anglers (Stolk, 2009) that asked respondents to rate the intensity of the activity, low, moderate or high but did not give any indication as to what physical feelings (being out of breath, for example) were associated with each of the three categories. In the survey of horse riders the terms low, medium and high used as it was believed these terms were easier for respondents to interpret than low, moderate and high as they are terms more commonly used in social surveys. The reasons for using two measures of self reported intensity in the survey of horse riders was to allow the measures to be compared and to provide a check that self reporting amongst questionnaire respondents was a consistent judgement even when the questions changed slightly.

Data was collected to show frequency of participation by asking how many times in the last four weeks the respondent had undertaken for at least 30 minutes horse riding, activities associated with horse riding and other sporting activities. The four-week period was used to follow the approach used in the DCMS (2010) Taking Part survey and the Sport England (2010) Active People survey, both of which identify the frequency of participation in moderate intensity sport required to obtain health benefits as involving 'participation on at least 12 separate days in the previous four weeks'. (DCMS, 2007)

To investigate the perceived social and psychological benefits of horse riding respondents were asked to rate on a scale some different motivations for participation and the degree to which horse riding made them experience certain feelings. There was also an open ended question that allowed respondents to provide qualitative data explaining their answers to questions on motivations and feelings. In order to provide further in-depth data two questions were also included asking respondents to rate what they believed to be the three main a) mental and physical and b) social benefits of participation.

The survey was piloted and quality checked using a sample of 50 staff and students at Plumpton College to confirm that all the questions could be easily understood and that the completion time was approximately 15 minutes to ensure low rates of failure to complete all questions. As a result of the pilot some minor changes were made to the survey but it was decided not to add further questions so as not to lengthen completion time.

A 2.4 Methods – the sample for the questionnaire survey of recreational horse riders

The population of interest for the survey were just recreational riders and it was not the aim to undertake a probability survey that would allow direct comparison with other groups of individuals such as non-riders. The questionnaire recruitment methods discussed below were designed, therefore, to obtain a sample of a sufficient size to allow disaggregation of the data to examine particular sub-groups of the sample. The recruitment methods proved to be successful in terms of responses and the target sample size of 600 was exceeded so that a total of 1,248 surveys were completed that after quality checking were deemed suitable for use in the analysis. This figure is a valuable sample size since it is equivalent to 0.35 percent of the 337,000 people that according to the Sport England (2010) Active People survey take part in equestrianism each week in England. The Sport England Active People survey is based on a sample of 0.3 percent of the national population.

A variety of methods were used to recruit respondents between September 2010 and February 2011. An on-line questionnaire was placed on the Plumpton College website and a web link to the questionnaire was made available from The British Horse Society website. Respondents who did not wish to complete the questionnaire on-line could download a copy that could be returned via email or in hard copy through the post. Hard copies of the survey were posted to those who did not have access to the internet. A press release was issued to promote the web link amongst horse riders and the survey was advertised at a British Horse Society volunteer event. The link was also forwarded through The British Horse Society volunteer network. The British Horse Society membership is large, but to ensure respondents were drawn from a wide range of non-British Horse Society members, respondents were recruited via recreational riding establishments. Using The British Horse Society 'Where to Ride' database a sample of riding centres, trekking centres, riding holiday centres and approved centres were contacted to see if they would be willing to take part. The establishments that agreed were sent hard copies of the survey for their clients to complete. In addition, the research team attended Blenheim Horse trials to distribute the survey in hard copy to individuals attending and exhibiting.

The recruitment methods were not, however, designed to obtain quotas for particular sub-groups of riders but response checking was used to achieve a sufficient sample size of people who rode regularly in each country within the UK to enable separate analysis in future for England, Northern Ireland, Scotland and Wales. A question asked respondents in which country they most often took part in riding. At the mid-point of the recruitment period a count was taken of the answers to this question and in the UK countries that at the mid-point of the survey had small sample sizes approaches were made to establishments in the 'Where to Ride' database so that they would take part by issuing questionnaires to clients.

The key demographic characteristics of the sample are summarised in Table 2.3. Some comparisons can be made between the characteristics of survey respondents and the characteristics of those who participate once a week in equestrianism as identified in the Sport England (2010) Active People Survey. These comparisons must be treated cautiously since the Sport England survey only covers England and, importantly differs from the survey of horse rides because it does not report findings for those who participate less than once a week. In the survey of horse riders 93 percent of respondents are female, which is similar to the figure of 90 percent in the Sport England survey. The survey of horse riders has a higher percentage of respondents aged above 45 (48 percent) than the Sport England survey (33 percent). This age profile may be linked to the fact that in the survey of riders 23 percent of respondents indicated they had a longstanding illness/disability compared to 10 percent in the Sport England survey. The percentages of horse riders that ride most regularly in each UK country shown in Table 3.3 are not dissimilar to the percentage of the UK adult population that lives in each country.

The discussion of the current evidence base in Appendix 1 noted the need to understand issues associated with women and people with disabilities as part of an analysis of the health and well-being benefits of horse-based sport and leisure. The comparisons and the data in Table A 2.3 indicate that both of these key demographic groups are well represented in the sample of horse riders obtained for the questionnaire survey. The demographics also indicate a mix of respondents in terms of employment status that includes people working full time or part time, retired people and students. The questionnaire also used a self reported measure of riding ability and 91 percent of respondents rated themselves as intermediate/advanced with only small proportions reporting they were beginners.

There are certain caveats associated with the survey that need to be taken into account when considering the findings presented in sections 4-6 of this report. The recruitment methods were not designed to produce a strictly representative sample as this would have required a very expensive and large national survey of both riders and non-riders. The survey was targeted at people who ride, so the recruitment methods were designed to ensure a large number of riders completed the survey to provide confidence in the findings. The recruitment methods also aimed to ensure a range of riders took part in terms of key demographics such as age, disability and employment status and Table A 2.3 below suggests this aim has been achieved. Another key caveat is that the survey collected self reported assessments of the

physical health and psychological effects of horse riding. The questionnaire was designed, however, to assess the reliability of the self reported measures as it contained a number of such measures that could be compared. As noted above, more than one self reported measure of physical exercise intensity was included. The self reported measures of the psychological effects of horse riding were also examined in more than one question and respondents were asked not only how riding made them feel but also what motivated them to go riding.

Table A 2.3 Demographic summary data

		Frequency (as percentage of total sample of 1,248)
Gender		
Male		7
Female		93
Age		
16-24		14
24-44		38
45-64		42
65-74		5
75+		1
Longstanding illness/disability?		
Yes		23
No		77
Region where rode most regularly		
England		69
Wales		6
Scotland		15
N. Ireland		5
Outside the UK		5
Horse ownership		
Horse owner		79
Non-horse owner		21
Employment status		
Full time employment		46
Part time employment		22
Carer		1
Full time student		11
Part time student		1
Retired		10
Other		
Riding Skill level		9
Beginner		4
Intermediate		54
Advanced		37
Expert		5



Appendix 3



University of Brighton

Participant Information Sheet

Investigators	Telephone	Email
Dr Neil Maxwell	01273 643755	n.maxwell@bton.ac.uk
Oliver Gibson	01273 643743	o.r.gibson@bton.ac.uk
Rosie Twomey	01273 643743	r.twomey@bton.ac.uk

Project title:

Investigating horse-riding as a qualifying period of physical activity in recreational horse riders from adolescents to adults.

Note: This participant information sheet is a guide to the study, informing you, as a potential subject, of the study's rationale, aim, protocol, potential risks, discomforts and possible subject exclusions. This will help you make an informed decision as to whether you wish to be a subject for this study.

Background to the study:

Although there is anecdotal evidence available on the physical and psychological well-being and health benefits of horse-based sport and leisure there is a lack of empirical evidence to support, or challenge, these claims.

The objectives of this project are to:

1) review the current literature on horse-based recreation and health and well-being;

and

2) assess the impact of participation in recreational equestrianism on the well-being and general health of those taking part.

It is proposed that the focus of the project will be on recreational activity as opposed to competitive equestrianism.

Purpose of the study:

The study aims to identify whether or not an individual's heart rate is at, or above, a certain percentage of their maximum oxygen uptake (VO_2 max) as determined by a maximal aerobic test (VO_2 max) for a sufficient time period to qualify as one of the five recommended periods of 30-minute physical activity session recommended each week by Sport England.

Subjects and methodology:

The project will involve you visiting the Sports Science laboratories at Brighton University's Chelsea School in Eastbourne once for a period of approximately two hours (visit 1). It will require one further visit to the riding school at Plumpton College (visit 2).

Visit 1

The initial visit to the labs will involve a maximal test, measuring your aerobic capacity. The test will be performed on a static bike, and the test duration is usually between 8-15 minutes – it is termed a ramp test. The test is used to assess your level of fitness and will be used to compare the values recorded in the following session at the riding school. During this visit height, mass and body fat through skinfold measurement will all be recorded.

You will begin with a five minute warm-up period on the static bike. You will have a heart rate monitor fitted as well as a mask so that gas analysis can occur – the mask fits over your nose and mouth and allows expired gases to be analysed in real time. Once the warm up period is complete, the ramp test protocol will begin. The starting power output will be assessed according to your gender and mass; this will increase incrementally until volitional exhaustion is reached. Throughout the testing protocol, rating of perceived exertion will be recorded (how hard or easy you are finding the test at a given time). A period of recovery will be undertaken until the subject is ready to finish.

Visit 2

The second and final visit will occur at Plumpton College within the riding school facility. During this visit, you will be required to follow instruction from an experienced horse-riding teacher for a period of 45 minutes. Throughout this session you will be required to wear a heart rate monitor and also the portable gas analysis system, which involves wearing a small waistcoat into which two receivers are placed. This will be connected to a mask which is worn over the nose and mouth for the duration of the session. The 45-minute session will mimic a typical horse-riding lesson undertaken by recreational horse riders. The heart rate monitor will utilise Firstbeat technology to measure heart rate variability and therefore indirectly predict energy expenditure.

Should you require any further information on any part of the testing protocol, the investigators will be more than happy to supply this.

Subject exclusion and consent

All subjects will be required to complete an informed consent form and a medical questionnaire to check that you have not undertaken heavy exercise or consumed any alcohol in the 24 hours prior to testing, and that you are physically fit to participate in the testing protocols. We will check that you have understood the testing protocol and any possible risks or discomforts that you might experience as a result of participating. You will be informed that you are free to withdraw at any time without the need for explanation.

You may be excluded from the testing if you have one or more of the following:

- You are unsure of the test protocol and the possible risks and discomforts designated on the subject information sheet
- Answers given on the medical questionnaire do not meet the required criteria for participation

Possible risks and discomforts

The initial visit to the sports science laboratories requires you to exercise to volitional exhaustion, whereby you feel you cannot cycle anymore, or your age-predicted maximal heart rate is reached. This may cause some distress, however, this is a routine measurement in our laboratories, which has been carried out by the experimenters many times before. Nevertheless, the experimenters are vigilant at all times and you can stop this test at any time.

During the second visit, to Plumpton College, you will be required to wear a mask over your nose and mouth for approximately 45 minutes continuously. This may cause the area over which the mask is placed to become very warm, however participants are reminded that they are entitled to terminate the test at any point, and experimenters will be aware of this situation, and if and when appropriate, will try to ensure participants are able to remove the mask for short periods throughout the 45-minute period.

Key information

If you decide that you would like to participate in this study then you are asked to consult your GP with details of the study to ensure that they approve and there are no further reasons as to why you should not take part. If you have private medical insurance, you are also advised to consult the insurance company to ensure that taking part in this study does not invalidate any future insurance claim.

If you are ill during the study, simply phone the experimenter and you can withdraw as a subject, or the testing can be postponed until you are fully recovered. You are urged to maintain your normal diet and activity/training throughout the study. Please do not eat less than two hours prior to each exercise session, perform heavy exercise less than 24 hours prior to testing, or consume alcohol less than 24 hours prior to testing. You are urged to maintain hydration from at least 24 hours prior to testing, through regular drinking. You will be entitled to know the results of your testing as they become available, and you will have access to any published papers resulting from the testing.

Data protection

Your test data will be anonymous and stored on a secure computer, locked by passwords only known by the investigators. Only the investigators will be aware of the data and thus it will remain confidential. The raw data will be kept for one year and then deleted appropriately.

Location

All testing will occur at either the research laboratory in Welkin Laboratories, Chelsea School, Eastbourne

Campus, University of Brighton, BN20 7SN or at Plumpton College, Ditchling Road Lewes, East Sussex BN7 3AE.

Subject privacy

All data will be kept private and will remain safe on a PC, purely for investigator use only. When the data is presented, your identity will remain anonymous at all times.

This study relies on volunteers like yourselves and you are reminded that you are free to withdraw from the study at any time and without justification. Thank you for your time.

Protocol for maximal aerobic cycling test

The protocol for this test involves cycling at a fixed cadence against an increasing resistance until volitional exhaustion is reached. Resistance varies according to gender and mass – for reference see Table 1.

Table 1: Reference value for maximal aerobic cycling test

Mass (kg)	Male		Female	
	Start (W)	Incremental increase (W/min)	Start (W)	Incremental increase (W/min)
<45			100-120	13
45-49			110-130	14
50-54	140-160	17	120-140	15
55-59	150-170	18	130-150	16
60-64	160-180	19	140-160	17
65-69	170-190	20	150-170	18
70-74	180-200	21	160-180	19
75-79	190-210	22		
80+	200-220	23		

Physical Activity Questionnaire

The following questionnaire is designed to assess the level and frequency of physical activity undertaken in a typical week. Please answer all questions. If you do not understand what is meant by any question, please request further explanation from the experimenters.

Name:

Date of Birth:

Contact number:

How many times per week do you perform physical activity on average?

What type of physical activity do you undertake? (specific sport, exercise, weights training, for instance)

How long do your physical activity sessions typically last?

At what intensity do you typically perform these sessions? (Please circle appropriate answer)

Appendix 4
UNIVERSITY OF BRIGHTON
CHELSEA SCHOOL
SPORTS SCIENCE VISIT

PHYSIOLOGY INFORMED CONSENT & MEDICAL QUESTIONNAIRE

Name: Age:

Address:

..... Tel. no.:

Emergency contact name: Tel. no.:

Are you in good health? (if no, please explain) Yes/No

How often do you currently participate in vigorous physical activity? (running, cycling, team sports and so on)

< once per month once per month 2-3 times per week 4-5 times per week > 5 times per week

Have you suffered from a serious illness or accident? (if yes, please give particulars) Yes/No

Do you suffer, or have you ever suffered from:

Respiratory problems (such as asthma, bronchitis)	Yes	No
High or low blood pressure	Yes	No
Fainting, light-headedness or dizziness	Yes	No
Heart problems	Yes	No
Diabetes	Yes	No
Epilepsy	Yes	No
Bone, joint or muscle problems	Yes	No

Are you currently taking medication or dietary supplements? Yes/No

If yes, please give particulars:

In the last three months, have you consulted your GP for any condition? Yes/No

If yes, please give particulars:

Do you have any other medical conditions not previously mentioned? Yes/No

Do you know of any other reason why you should not participate in physical activity? Yes/No

My replies to the above questions are correct to the best of my belief. The assessor has fully informed me of, and I have understood, the purposes of the assessment(s)/training and possible risks involved. I understand that I may withdraw from the assessment(s)/training at any time and that I am under no obligation to give reasons for withdrawal or to attend again. I undertake to obey the instructions of the assessor regarding safety, subject only to my right to withdraw declared above.

Signature of Subject: Signature of Assessor:

Date:

Parent/guardian's consent (if subject is under 18 years of age):

I (parent/guardian's name) hereby give consent for

..... (child's name) to take part in the fitness assessment(s)/training

Signature of parent/guardian Date:

Appendix 5



Plumpton College

The Health Benefits of Horse Riding

Thank you for agreeing to participate in this survey

Plumpton College and the University of Brighton are conducting research into the potential health benefits of recreational horse riding. The answers you give to the following questions will be collated with those of other respondents and your responses will remain anonymous. The data will be treated securely and stored on a PC with password protection.

The final report with the findings from the work will be available on the BHS website in Autumn 2011.

Please answer all the questions. It should take you no longer than 15mins to complete.

1 In what country do you most often take part in horse riding?

Wales/Scotland/Northern Ireland/England /outside the UK

If England which region?

South West/South East/London/Midlands/North West/North East

2 For how many days in the last four weeks have you been horse riding for at least 30 minutes?

3 Do you ride (please circle as appropriate)

your own horse/a borrowed horse/shared horse/riding school horse/other?

If other please state

4 For how long have you been participating in horse riding activity?

.....yrs.....months

5 What motivated you to take up horse riding?

6 How would you rate your skill level?

Beginner/Intermediate/Advanced/Expert

7 Do you take any other form of exercise on a regular basis?

Yes/No

If yes then what exercise do you take and how many times have you participated for at least

30 minutes in the last four weeks?

Activity	Times in last four weeks
1	
2	
3	
4	

8 What type of equestrian activity do you most commonly take part in? Please circle just one
Hacking/instruction/schooling/competitions/other

If other please state.....

9 During the last four weeks, was the effort you put into horse riding usually enough to raise your breathing rate?
Yes/No

10 During the last four weeks, was the effort you put into horse riding usually enough to make you out of breath or sweat?
Yes/No

11 How would you describe the physical intensity of your activity when you go horse riding?
Low/Medium/High

12 For how many days in the last four weeks, have you engaged in associated activities such as grooming and mucking out when you go horse riding?

13 During the last four weeks, was the effort you put into these activities usually enough to raise your breathing rate?
Yes/No

14 During the last four weeks, was the effort you put into these activities usually enough to make you out of breath or sweat?
Yes/No

15 How would you describe the physical intensity of these activities?
Low/Medium/High

16 To what extent do the following motivate you to go horse riding?

	Very important	Unimportant	Neither important nor unimportant	Important	Very important	Extremely important
Spend time with friends						
Spend time with family						
Be on my own						
Meet new people						
Enjoy scenery and views						
Contact with nature						
Interact with horses						
To escape						
Develop skills						
Challenge myself						
Experience moments of excitement						
To be physically active						
To relax						
To lose weight						
To improve fitness						

17 In general to what extent does horse riding make you feel the following?

	Not at all	A little	Moderately	Quite a lot	Extremely
Cheerful					
Relaxed					
Tired					
Happy					
Confident					
Active					
Excited					
Proud					
Energetic					
Inspired					
Dissatisfied					
Angry					
Guilty					
Frustrated					
Bored					
Lacking in confidence					
Frightened					

Please explain in general terms your answers to the previous question

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

18 What do you believe to be the main three mental or physical health benefits of participating in horse riding?

1

2

3

19 What do you believe to be the main three social benefits of participating in horse riding?

1

2

3

Finally just a few of questions about you.

20 What is your age?

21 Are you Male/Female (please circle as appropriate)

22 Do you have any long standing illness/disability? By long standing we mean anything that has troubled you over a long period of time or that is likely to affect you over a period of time

If yes

Does this illness or disability limit your activities in any way?

23 What is your home postcode?

24 Are you currently (please circle as appropriate)

in full-time employment/part-time employment/retired/carers/full-time student/part-time student/
other

If other please state

25 If in employment what is your current occupation?

The British Horse Society
Abbey Park
Stareton Lane
Kenilworth
Warwickshire CV8 2XZ

Tel: 02476 874599

Fax: 02476 840501

www.bhs.org.uk
enquiries@bhs.org.uk



Registered Charity Nos. 210504 and SC038516