The Health Benefits of Trail Riding

By Dr Sean Comber
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The Government recommends you take 150 minutes of moderate exercise per week to stay fit & healthy.

Trail Riding is classed as above moderate exercise.

How many minutes do you spend Trail Riding per week?
Summary

The Government recommends targets for exercise in order to remain healthy. It is advised to take either 150 minutes of moderate exercise, 75 minutes of vigorous exercise or a combination of both per week.

Exercise can also be measured in metabolic equivalents (METs) a scale between 1 (sit in a chair) and typically 12 (high intensity exercise) based on energy used over time. Most rides fall into the “Vigorous” category, with a mean of MET of 6.4 equivalent to downhill skiing or hill walking.

Examining the data in more detail show trail riding to provide both moderate and vigorous exercise. Regarding moderate exercise, data provided in this survey shows that on average a rider will achieve this after a trail ride of 218 minutes (~3.5 hours). The data show that the average ride is 230 minutes in length and that 70% of all rides provide the government recommended moderate exercise in a single outing.

In technical lanes, riders will also undertake vigorous exercise, for an average ride of 230 minutes, a trail rider spends approximately one quarter of their time (56 minutes or 23% of the ride) with their average heart rate working in the vigorous range.

In combination, the moderate and vigorous exercise per average ride adds up to considerably greater than the recommendations, averaging almost TWICE the recommendation (180%). In total 80% of 19 rides evaluated delivered the weekly recommended exercise.

Introduction

General Health in the UK

As we are all aware, amongst some people that we share the legal rights of way with, we are not the most popular user group and in combination with ignorant governance, it is a continual battle for the TRF to promote responsible use and to maintain vehicular rights of way on our unmetalled roads network.

In many ways this is at odds with Governmental claims of democracy, rights for minority groups and open access to the countryside. Furthermore, a significant amount of effort and money is being expended by the Government on promoting a healthy lifestyle and making use of the countryside around us. This is response to undeniable facts associated with an aging society, increasing obesity and the cost to the National Health Service (NHS) and carers of dealing with the side effects of an ever more sedentary society, including type 2 diabetes, heart disease, cancer and depression (Kim et al., 2007). The estimated direct cost of physical inactivity to the NHS across the UK is £1.06 billion (DoH, 2011).

The UK is officially the most obese nation in Europe (HSCIC, 2015) (Figure 1). Only 66% of males and 56% of women over 19 years of age achieve the recommended amount of moderate exercise per week (HSCIC, 2012).

HSCIC (2015) reports that there was a clear association between meeting the guidelines for aerobic activity and body mass index (BMI) category. 75 percent of men who were not overweight or obese met the guidelines, compared with 71 per cent of overweight men and 59 per cent of obese men.

The equivalent figures for women were 64 per cent, 58 per cent and 48 per cent, respectively. Men and women aged between 45 and 74 are particularly vulnerable to being overweight or obese (NHS, 2012).
Recommendations for a healthy lifestyle

This issue is recognized by the Government which has promoted a White Paper on healthy living (HM Gov, 2010) as well as reports such as “Start Active, Stay Active” (DoH, 2011), the report states that for adults between the age of 19 and 64:

1) Adults should aim to be active daily. Over a week, activity should add up to at least 150 minutes (2½ hours) of moderate intensity activity in bouts of 10 minutes or more – one way to approach this is to do 30 minutes on at least 5 days a week.

2) Alternatively, comparable benefits can be achieved through 75 minutes of vigorous intensity activity spread across the week or a combination of moderate and vigorous intensity activity.

3) Adults should also undertake physical activity to improve muscle strength on at least two days a week.

4) All adults should minimise the amount of time spent being sedentary (sitting) for extended periods. “Although this is a weekly target, it is recommended that adults should aim to be active every day and therefore spread the 150 minutes across the course of the week. This emphasis on daily activity is based on the scientific evidence indicating that changes such as improved mood, increased insulin sensitivity and favourable alterations in glucose and fat metabolism occur for up to 24–48 hours following activity. Given these acute or ‘last bout’ effects, adults looking for health benefits should aim to be active every day. Consistent with previous guidelines is the notion that physical activity should be at least moderate intensity.”

The report states benefits of exercise include “Activity also provides benefits for well-being, for example improved mood, a sense of achievement, relaxation or release from daily stress. These outcomes can play an important role in improving people’s adherence to activity programmes and ensuring that physical health benefits are maintained.”

The report draws on USA and Canadian documents:

- Review papers undertaken as part of the Canadian Physical Activity Guidelines review process.
- Review papers undertaken as part of the British Association of Sport and Exercise Sciences (BASES) consensus process.

Moderate Intensity Activity

Moderate intensity activity stimulates the body’s cardiorespiratory, musculoskeletal and metabolic systems and, over time, causes them to adapt and become more efficient. People can tell when their activity is moderate intensity because they will breathe faster, experience an increase in heart rate and feel warmer. They may even sweat on hot or humid days. The amount of activity needed to reach this varies from one person to another. An unfit or overweight person may only have to walk up a slope, whereas a very fit athlete may be able to run quite fast before he or she notices these signs. Over time, a person’s fitness level will improve so that in walking, for example, focusing on the perceived effort to reach moderate intensity may mean that their speed increases. Quantified as between 3 and 6 METs (Metabolic Equivalents) – see below for definition.

Vigorous Intensity Activity

Vigorous intensity activity can bring health benefits over and above moderate intensity. A person who is doing vigorous intensity activity will usually be breathing very hard, be short of breath, have a rapid heartbeat and not be able to carry on a conversation comfortably. Quantified as above 6 METs (Metabolic Equivalents) – see below for definition.

The report advocates the benefits of cycling and walking in safe environments. Unsurprisingly, motorcycling on unmetalled roads/green lanes is not listed. This therefore begs the question

“What are the health benefits of trail riding”? 

Metabolic Equivalents (METs)

- **Moderate Intensity Activity**
  - Quantified as between 3 and 6 METs
  - Stimulates the body’s cardiorespiratory, musculoskeletal and metabolic systems
  - Causes them to adapt and become more efficient
  - People can tell by increased heart rate, breathing faster, feeling warmer, and sweating

- **Vigorous Intensity Activity**
  - Quantified as above 6 METs
  - Brings health benefits over and above moderate intensity
  - Person will breathe very hard, be short of breath, have a rapid heartbeat, and not be able to carry on a conversation comfortably

**Definition of METs**

- **Metabolic Equivalents (METs)**: A unit of measurement indicating the rate at which metabolic processes are occurring in the body during physical activity).

**Calculation**

- **3 METs**: Walking, leisurely gardening, stretching, and light housework.
- **4 METs**: Cycling at a moderate pace, climbing stairs, vacuuming, and playing golf or tennis.
- **5 METs**: Running, stair climbing, and brisk swimming.
- **6 METs**: Jogging, tennis, and vigorous activity.
- **7 METs**: High-intensity exercise such as fast running or cycling.
- **8 METs**: Very high-intensity exercise such as sprinting or heavy lifting.
- **9 METs**: Extreme exercise such as weightlifting or running at maximum speed.

**Benefits**

- **Cardiorespiratory fitness**: Increased lung capacity, heart rate, and blood pressure.
- **Musculoskeletal health**: Stronger bones, muscles, and joints.
- **Metabolic health**: Improved insulin sensitivity, glucose and fat metabolism.
- **Mood and stress**: Reduced stress, improved mood, and increased self-esteem.
- **Cognitive function**: Improved memory and attention span.
- **Sleep**: Improved sleep quality and duration.
- **Morbidity and mortality**: Decreased risk of cardiovascular disease, diabetes, obesity, and premature death.
- **Quality of life**: Increased energy levels, enhanced well-being, and improved overall health.

**Adaptation**

- As physical activity becomes more intense, the body adapts by increasing its efficiency at using oxygen, improving cardiovascular function, and enhancing muscle and bone strength.

**Consistency**

- Regular exercise is crucial for maintaining these benefits over time.

**Guidelines**

- **Moderate Intensity Activity**: 150 minutes per week.
- **Vigorous Intensity Activity**: 75 minutes per week or a combination of moderate and vigorous activity.

**Adherence**

- Consistency and variety are key to maintaining physical activity levels and avoiding burnout.

**Conclusion**

Engaging in moderate to vigorous intensity physical activity is essential for maintaining health, improving fitness, and reducing the risk of chronic diseases.
Previous studies on the health benefits of trail riding.

There have been previous reports regarding the benefits of motorcycling.

Kawashima et al., (2014) have proved the following benefits:

**Brain function:** When riding a motorcycle, the brain of the rider is stimulated. Differences in brain use and level of brain stimulation can be observed in motorcyclists who ride regularly and in motorcyclists who have not ridden for extended periods (at least 10 years). Incorporating motorcycle riding into daily life improves various cognitive functions (particularly prefrontal cortex functions) and has positive effects on mental and emotional health such as stress reduction.

Other reports are available regarding reducing instances of Type 2 diabetes, strengthening knees and necks, mood enhancing, calorie burning and improved core strength, all of these are intuitively correct, though references to scientifically controlled experiments and observations are absent (TMB, 2007). When considering ‘off road’ riding, the majority of scientific literature pertaining to the physical demands of off-road vehicle riding is specific to “motocross” racing, which is a competitive form of off road motorcycling in which riders navigate a track consisting of obstacles and jumps over the course of approximately 30 minute races. Heart rate response associated with motocross racing indicate that this sport associated with a considerable metabolic demand and physiological stress (Ascensoa et al., 2007; Konttinena et al, 2007 and 2008).

Gobbi et al., (2005) concluded that motocross riders have more muscle mass, higher grip strength, and greater anaerobic power than both enduro and desert rally riders. These results are interesting given that enduro and rally riding are much more representative of typical recreational riding when compared to motocross. The research team also noted that desert rally riders tended to be overweight with maximum aerobic powers similar to those of normal, healthy individuals. This study further indicates that motocross-style riding is physically demanding, but may not represent a typical riding situation.

Brain function: When riding a motorcycle, the brain of the rider is stimulated. Differences in brain use and level of brain stimulation can be observed in motorcyclists who ride regularly and in motorcyclists who have not ridden for extended periods (at least 10 years). Incorporating motorcycle riding into daily life improves various cognitive functions (particularly prefrontal cortex functions) and has positive effects on mental and emotional health such as stress reduction.

Trail riders using unmetalled legal rights of way in the UK expend a significantly different pattern of exertion, being of generally lower impact, but extended over several hours with potentially more technical sections of lanes which are extremely muddy or present a technical climb up wet and slippery rocky steps for example. Early work by Burr et al., (2006) found that in comparing oxygen consumption rates measured while riding to those measured during an incremental treadmill test to maximum, it was determined that participants worked at a mean rate of approximately 60% of maximum, which was roughly equivalent to jogging in this population. Such a work rate would be considered by both the American College of Sports Medicine (ACSM) and The Canadian Society for Exercise Physiology to be of adequate intensity to increase maximal oxygen consumption, and if performed at sufficient frequency and duration could be associated with health related benefits (ACSM, 1998; Warburton, Nicol & Bredin, 2008).

A more detailed follow on survey was carried out by Burr et al in 2009. The purpose of the study was to characterize the physiological demands of recreational off-road vehicle riding under typical riding conditions using habitual recreational off-road vehicle riders (66 All Terrain Vehicle riders and 72 motorcyclists).

Riders performed strength assessments before and after a representative trail ride (48 ± 24.2 min), and ambulatory oxygen consumption was measured during one lap (24.2 ± 11.8 min) of the ride. The mean VO₂ 1 requirement while riding an off road motorcycle was 21.3 ± 7.1 mL/kg/min which is comparable to the VO₂ required of many common recreational activities. Mean speeds during the typically 24 minute lap of the trail was 25 km/h (15 mph) which is within the TRF recommendations and would not be considered excessive for a UK trail ride.

Analysis of activity intensity revealed approximately 38% of an Off Road Motorcycle riders are within the intensity range (>40% VO₂ reserve) required to achieve changes in aerobic fitness. Riding on a representative course also led to muscular fatigue, particularly in the upper body. It was concluded that on the basis of the measured metabolic demands, evidence of muscular strength requirements, and the associated caloric expenditures with off-road vehicle riding, this alternative form of activity conforms to the recommended physical activity guidelines and can be effective for achieving beneficial changes in health and fitness.

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When considering muscular force and power involvement, study results indicate a greater impact on muscular endurance as opposed to an increase in strength.

Off-road vehicle riders perform considerable physical work using their arms and upper body which could lead to beneficial training increases in musculoskeletal fitness.

Study findings also identified the psycho-social effects of riding, through enhanced quality of life and stress reduction effects of off-road riding.

Findings also reflected the importance of alternative physical activity such as off-road riding to promote physical activity in a group who might otherwise forego exercise altogether and that all physical activity is beneficial.
Trail Riding promotes physical activity in those who might otherwise forego exercise altogether. All physical activity is beneficial.

Group heart rate vs VO₂ relationship of ORM and ATV riders during a treadmill graded exercise test (Burr et al. 2007)
Methods

The effort expended whilst exercising can be measured in a number of ways; briefly:

Metabolic Equivalents (METS): One metabolic equivalent (MET) is defined as the amount of oxygen consumed while sitting at rest and is equal to 3.5 ml O2 per kg body weight x time (min). The MET concept represents a simple, practical, and easily understood procedure for expressing the energy cost of physical activities as a multiple of the resting metabolic rate. Examples of typical MET levels are shown below.

Measurement of oxygen use by the body, however, is not a simple measurement and so may be converted into calories burnt per unit of time (e.g. kcal/min). Therefore 1 MET = 1.25 kcal/min (Jette, 1990). Road motorcycling has been reported to expend 2.2 METs, which lies between walking at 3 km/h (1.8 METs) and 5 km/hr (3.2 METs) (Jette et al., 1990) and only just above car driving (2 METs).

An alternative to measuring calories burnt for each type of exercise, heart rate (beats per minute) normalised to age and rest can also be used. It is widely accepted that the following applies:

Maximum heart rate
= 220-age

Moderate exercise
= 50-69% of your maximum heart rate

Vigorous exercise
= 70-85% of your maximum heart rate

High intensity
= >85% of your maximum heart rate

Heart monitors are easily available and an accurate means of quantifying exercise.

Devon TRF purchased a Garmin Forerunner 15 to test a representative number of trail riders to establish the health benefits under ‘real world’ riding conditions, rather than around effectively an enduro loop used by Burr et al., (2009). By using a number of subjects and replication across numerous riding conditions it was possible to combine heart rate, calories burnt and BMI data to judge the health impacts of trail riding. The monitor provides data for heart rate linked to GPS details and converts the heart rate to kcal burnt. Based on data collected from trail riders using the heart monitor it is possible to determine calories and heart rates for each day ridden which includes metalled and unmetalled roads. It was also possible to break down the data further to calculate the energy expended within specific unmetalled lanes and varying degrees of technical difficulty (i.e. very muddy or steep and rocky).

The monitor takes average and maximum heart rate at 1 km intervals and also provides a summary for as long as it is activated. Heart rate and kCal burnt/min are related via an algorithm e.g.: Kcal/min = (0.1802 x Ave Heart Rate) – 12.769

It is therefore possible to estimate both the time spent during a ride at % of maximum heart rate or convert to METs via Kcal/min burnt (see Results).
Results

Data was collected over a 12-month period (2015) for 6 subjects aged between 50 and 65 across 19 varied rides. For some subjects more than 1 ride was recorded. Lanes were predominantly based in Devon, but for one subject (KG) the three rides were carried out in north Wales. Based on a previous questionnaire survey area and BMI of the subjects were typical of the UK trail riding TRF demographic (average age 55, BMI slightly above normal). The table opposite shows a summary of the data collected from 19 rides averaging 229 minutes.

The data show that significant exercise is being achieved whilst riding green roads. The amount of energy expended is variable and related to the technicality of the lanes and the ability of the rider. Some normalisation of data can be achieved by dividing the calories burnt by the time spent out on a ride, this provides a metabolic equivalent (MET) and in all but one ride, at least 3 METs are achieved, relating to moderate exercise, and for 12 of the 19 rides, over 6 METs are expended, equating to ‘vigorous’ exercise, which is supported by the heart rate data.

The data generated in this survey proves the exercise benefits of trail riding. Average exercise intensity data show that the trail bike rider is working at Moderate Rates of exercise for almost 3 quarters of the time and at Vigorous Intensity for 1 fifth of the time, although it should be noted that there is significant variability around these averages depending on the technicality of the lanes, density of lanes within any given ride and the ability of the rider in question.

Using the well established system of metabolic equivalents (METs), most rides fall into the “Vigorous” category, with a mean of 6.4 equivalent to downhill skiing or hill walking.

Based on the distribution of data, an average ride will deliver the recommended 150 minutes of moderate exercise alone after just over 3.5 hours of riding.

In combination with what is classified as vigorous exercise, an average ride delivers almost twice the weekly recommendation.

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“Promoting physical activity is a core part of our strategies to improve the health of the nation... In particular, encouraging inactive people to take up physical activity in any form, ranging from walking to sport, can have a hugely beneficial effect.”

JANE ELLISON MP
Minister for Public Health
Department of Health
**Wider Impact**

TRF members are definitely men and women of a certain age. The average being 54 years old ±3 years, older than the UK average of 38 years old. This is also a very narrow demographic, but one I believe is typical of the TRF membership. Average height is 5'9’’ give or take just over an inch which is pretty much the UK average height.

Average weight is 84 kg ±12 kg; which is about 13 stone is the UK average for a man (83.6 kg). From a health perspective, using the body mass index (BMI) calculated as weight in Kg divided by the square of height in metres, the mean BMI is 27. ‘Normal’ BMI extends to 25, with 27 being classified as overweight. The UK average is also 27. So from a health perspective, the average trail rider/TRF member is basically Joe Average, a tad older but nevertheless average height and weight, and slightly overweight. From this point of view, exercise is key to long term health and so trail riding can only be considered a benefit.

“**We want everyone to feel that sport is for them, no matter if they are a seasoned athlete or a complete beginner... We should also make sure that people who don’t want to be the next Bradley Wiggins or Nicola Adams still feel that sport is for them too. And by giving everyone the chance to participate, we can create a healthier and happier country to live in.”**

Rt Hon JOHN WHITTINGDALE MP OBE
Secretary of State Department for Culture, Media

**From a health perspective the UK trail rider is ‘Joe Average’**

**Exercise is key to long term health and trail riding can only be considered a benefit**
Conclusion

Overall what is clear is that a weekly trail ride of around 3.5 hours provides the government recommendation for exercise, albeit in a single day, rather than spread over the entire week.

As a bonus, around 73% of the alternative Government recommendation of 75 minutes of vigorous weekly exercise is also achieved during a typical trail ride.

Get out there and ride, it’s good for you!
References


Official Journal of the American College of Sports Medicine, 42, 7, 1345-1354. DOI: 10.1249/MSS.0b013e3181cd5c6d.


The Health Benefits of Trail Riding was researched and written by Dr Sean Comber.

It is part of the Trail Riders Fellowship mission to conserve Green Roads in the UK.

Find out more about the health, economic and social benefits of trail riding at www.trf.org.uk

Sean.comber@plymouth.ac.uk

Designed by Greg Villalobos for the TRF