

## **Heart Rates of Endurance Horses – Effect of Weight**

The importance of body weight and body condition to athletic performance has received considerable attention in humans but not in horses. While carrying excess weight, humans perform submaximal exercise at a higher energy rate, which may result in earlier fatigue. Although the relationship between body fatness and running performance has not been studied extensively in horses, the effect of weight carrying on energy expenditure has been examined. In 1987, American equine scientists demonstrated the addition of 10 percent load to horses running on a horizontal treadmill increased the amount of oxygen usage of the horses by 15 percent. This increase in oxygen usage or consumption also goes hand in hand with the amount of energy used or required. For example, each litre of oxygen used generates 20.1 units of energy (known as kilojoules or kJ), with 75-80% of this energy released as heat. The amount of energy released during exercise depends on the horse's oxygen usage, its weight and how long it exercises for. For example, a 450 kg endurance horse trotting for 30 minutes at a heart rate of approximately 125 bpm will generate about 13,500 kJ of energy, of which 75-80% is released as heat. The amount of heat production in an endurance horse has obvious implications to performance with possible overheating, dehydration and slower recovery heart rates becoming an issue. The amount of energy released as heat in a bout of exercise could be decreased by:

1. Reducing the oxygen usage or consumption of the horse (by reducing the load carried or the oxygen cost of the exercise; riding at a slower speed)
2. Reducing the body mass of the horse

The relationship between altered body weight and performance has been used for decades in the horse racing industry. Altering the 'body mass' by loading horses with small amounts of lead weight is known to handicap their performance. In fact racing bookmakers determine betting odds on the basis of an estimated decrease in performance, usually in horse body lengths for each additional kilogram allocated to the horse. For example, an estimated decrement of 1.25 horse lengths for each additional kilogram of weight is used as a basis for adjusting performance. In summary, the above information, suggests that even small changes in carrying and / or body weight could affect performance of certain athletic horses.

In Part III of his series, Dr Pollitt examined the effect of weight and heart rate response in two endurance horses. He conducted an experiment where the heart rates of a heavyweight horse carrying its heavyweight rider (a 475 kg horse carrying a 100 kg rider, i.e., 21.1% of the horse's

own bodyweight) were logged and compared with the heart rates of a lightweight horse with a lightweight rider (a 390 kg horse carrying a 60 kg rider, i.e., 15.4% of the horse's own body weight) when working side by side. Three days later, the exercise session was repeated with the riders switched. Both horses were near peak physical condition when the rides took place.

During the first ride, despite a 40 kg carry weight difference, the working heart rates were very similar. When the riders switched for the second ride, the effect of the 40 kg weight difference became much more obvious. The heavyweight horse was now carrying only 12.6% of his bodyweight, while the lightweight horse was carrying 25.6% of his bodyweight. In terms of heart rate response, the heavyweight horse's heart rate was clearly lower than the lightweight's. On a steep climb, the heavyweight horse (with the light rider) left the lightweight horse (with the heavy rider) behind, trotted easily to the top, and rested for a few minutes. His heart rate peaked at 140 bpm. In contrast, the lightweight horse started at the trot but quickly fatigued and had to walk up most of the hill. This sent his heart rate above 200 bpm and seemed to affect his heart rate for the remainder of the ride. Uncharacteristically for this horse, when the ride was completed, his recovery heart rate was slow – just dropping to below 55 bpm after 30 minutes of cooling down with cold-water washing.

It would seem that other things being equal, performance of horses in events of long duration would be maximized if the horse carries a light weight, has a low body mass, and an efficient gait (low oxygen cost of exercise). It should be remembered that body weight of the horse should not be lowered before such events by reducing the water content. Dehydration will limit performance in prolonged events because it reduces the volume of water that can store heat and transport it to the skin and respiratory tract. In addition, there may be a case for all you riders to start paying attention to those body fat levels!

### **Reference and Additional Reading**

Pollitt, C. Monitoring the heart rates of endurance horses: Part 3. **The Equine Athlete** 5: 7-9  
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