

To Whom it May Concern;

I am a third year veterinary student at University of California Davis with a particular interest in performance horse medicine. I've participated in endurance riding since 2010 and distance running since 2016. This summer, I competed in the Ride and Tie Championships with Dr. Melinda Newton and Jelly Bean, a miniature horse. While taking Jelly Bean to Ride and Tie Championships wasn't the original plan by any means, after both my and my partner's mare had lameness issues, we went for it. I had an incredible experience running with Jelly Bean, even if I was wishing for a bigger horse on some of the longer hills. I am excited to do my first Ride and Tie on a full size horse as soon as I can. I have attached my essay "Benefits of Sprint Work - for both Horse and Human" for consideration in the Ride and Tie Association Veterinary Student Scholarship.

Sincerely

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Benefits of Sprint Work - for both Horse and Human.

I have a love-hate relationship with sprint work. On horseback I love it. Is there anything better than charging up a hill at a hand gallop? On foot, it's another story. I've gotten better at forcing myself to do intervals, but I am still more of a slow and steady runner than a sprinter. However, sprint work, or if you want to get fancy about it, High Intensity Interval Training (HIIT), isn't just for CrossFit athletes - endurance athletes can also gain many performance benefits from it.

At first, this seems counterintuitive - when you would ever sprint during a long distance race? The answer relates back to the two main states of metabolism, anaerobic and aerobic. Both of these pathways turn glucose from the food we eat into Adenosine Triphosphate (ATP), the form of energy muscles use. Aerobic metabolism is what we use most of the time, when we burn glucose with oxygen present to make ATP. Aerobic metabolism is fairly efficient - you make about 30 molecules of ATP per molecule of glucose. Anaerobic metabolism occurs when you are burning glucose without oxygen present. Anaerobic metabolism is the result of working so hard that your lungs and circulatory system can't keep up with the demand for oxygen to your muscles. While it's advantageous that we can work without enough oxygen for short periods of time, anaerobic metabolism has some metabolic disadvantages for prolonged work. First, it is much less efficient than aerobic metabolism as it only produces 2 molecules of ATP per molecule of glucose. Anaerobic metabolism produces 15 times less ATP than aerobic metabolism from the same amount of glucose. Another drawback is that a byproduct of anaerobic metabolism is lactic acid, which is responsible for that nasty burning feeling in your

muscles after a hard workout. As you can guess, for the vast majority of distance events the goal is to stay in the aerobic metabolism zone both because it is highly efficient and does not produce lactic acid.

There are three critical physiological factors that affect distance running performance - VO₂max, lactate threshold and running economy. VO₂max is a measure of the maximum aerobic capacity or the maximum amount of oxygen an individual can take in and use. Essentially, the higher the VO₂max, the faster you (or your horse) can run without becoming anaerobic. The lactate threshold is the point where lactic acid starts to build up faster than it can be removed, contributing to muscle fatigue. Running economy is a bit trickier to measure, but it is essentially how much energy you require to run at certain speed. I think about it as the difference between a very flashy dressage horse trotting and an average horse trotting - the dressage horse has to use more energy to trot the same speed since they move their legs higher than the average horse. The dressage horse may be pretty to look at, but the average horse is more efficient. When looking at these variables and attempting to apply them to performance horse training, VO₂max is not only the easiest to assess, but also the easiest to improve.

In humans, a great deal of research has been done on ways to improve distance performance. These studies have shown that high intensity interval training (HIIT) increases VO₂max. One study compared several exercise programs - long slow distance training for 45 minutes, moderate exercise for 25 minutes, short 15 second intervals and 4x4 intervals - 4 minutes of running at high intensity and 3 minutes of recovery. Over an eight week training period, the 15 second interval group increased their VO₂max by 5.5% and the 4x4 group increased their VO₂max by 7.3%. In comparison, the long slow distance and the moderate exercise group did not increase their VO₂ max.

Studies on endurance horses are a bit harder to come by. Most studies are done on thoroughbred racehorses -- and as we know, their training is a bit different from a horse competing in a ride and tie! Application of these results to endurance horses may be limited because of the differences in exercise type and training regimens between racing Thoroughbreds and endurance horses. However, the data we have suggests that similar improvements in VO₂ max in horses occur as the result of high intensity exercise. One study placed young race horses into one of three training programs - conventional training for 8 months, conventional training for 8 months, with 2 months of once per week high intensity interval training, and a group that only received high intensity training once a week for 8 months. Both of the groups that performed high intensity interval training had greater increases in their VO₂ max compared with the group that did not. A common concern among equestrians is that higher speed training can increase injury risk. The above study initially investigated HIIT as a way to reduce injury risk as it required less time under saddle, but this is where the differences between flat track racing and endurance become clear - our horses will be competing at much longer distances and need to be

conditioned for such. While we cannot replace all of our traditional long slow distance work with HIIT, we should consider its place as part of balanced training regime.

All training must be a balance between improving fitness and minimizing injury risk together with the time available to train. HIIT has the definite advantage of requiring less time than other training methods, which can certainly be convenient. However, it can come with a higher injury risk, particularly if it is not done carefully. That said, research suggests that by including some HIIT in our conditioning programs for both horse and human we can improve our overall fitness and our capacity for endurance. For these reasons, HIIT is certainly worth adding into your training routine, whether your distance work is done on two legs or four.

Sources

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