Monitoring the Elite Horse: Implications for Performance Enhancement and Injury Prevention – A Recap

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Last month I had the opportunity to present at the USEA Annual Meeting in Boston on the broad topic of equine athlete monitoring to improve performance and minimize injury risk. My talk covered key concepts that should be considered in the daily lives of competition horses, and I tried to provide some insight regarding what I think works (and doesn't) in a training program. I always love discussing training ideas with a group because it is a great way to tackle issues from different perspectives and to see what topics generate engagement – whether it is positive or negative. In this article, I will cover four areas from my talk that generated the most discussion.

Concept 1: Training different systems and abilities in your horse

The purpose of high-performance training is to achieve the highest possible result for a horse while minimizing the risk of injury. To achieve this goal, we need to find what exercises and activities stimulate the horse to grow (both mentally and physically), which results in the horse becoming the best athlete that it can be. The idea is that when we apply a training stimulus (i.e. an exercise or workout) the horse's body will adapt to that stimulus to become a better athlete.

What separates a great trainer from a good trainer is that a great trainer has a special ability to know exactly what a horse needs at any given time. The best training programs take a holistic approach - they have the best support teams (grooms, vets, therapists, farriers, etc), they methodically ensure all aspects of the horse are developing (i.e. strength, speed, endurance, flexibility and coordination), and they customize their program to fit the needs of each individual horse.

At the start of my presentation, I spoke briefly about some of the different bodily systems we can target with training. I listed the nervous system, cardiovascular system, muscle, bone, tendon, ligament and so on. One of the things I wish I had conveyed more during my talk is that there is no single exercise that can train the different bodily systems simultaneously. For example, there is often an inverse relationship between endurance and strength; as an athlete performs more and more intense endurance work, they will begin to lose muscle mass and struggle to maintain maximal strength and power for a variety of reasons (energy allocation and efficiency, muscle fiber transitions, altered gene expression, etc). *This is true at an elite level – at lower levels it is possible to train endurance while also putting on muscle* Therefore, when you look at your training program, you need to be sure that each week you are doing exercises that are training the different components of the body (the heart, muscle, nervous system, etc) to the level required of your sport. If you neglect one of these components for a prolonged period, the horse will become 'weaker' in this ability, and you may start to see your performance drop off.

Most of what we know about training the body, in both humans and horses, is research that was performed examining the cardiovascular system and muscle. Thus, a lot of the training programs that exist were created to optimize the development of these systems. We know very little about

training the nervous system, bones, ligaments, tendons, and so on. Recently, there has been some interesting work coming out looking at how we can train these previously neglected to make them stronger. We know that weight bearing and movement in horses is important for training these structures. In humans, it appears that short intense bursts of activity can increase ligament strength, and it is interesting to think about applying these ideas to horses.

Concept 2: How do we monitor horse fatigue and performance readiness?

This is something I have been thinking a lot about lately and it has been my main research focus for the past few months. Our goal is to produce a horse that is the best athlete possible while also ensuring it has a high quality of life. Thus, a horse's program must be designed such that we are putting it in the best possible position for success and reducing the risk for injury. To ensure this occurs, we need robust ways of monitoring how a horse is feeling each day so that we can adapt the program accordingly. At the elite level, it is impossible for a cookie-cutter approach to training to produce top results. If you aren't listening to the horse's body and making changes accordingly, then the horse will be unable to reach its' potential and will likely become injured.

The training program must be highly individualized to the horse, and how the horse responds to each training session needs to drive future decision-making. If we don't have a way to measure a horse's physical state each day, we cannot i) reliably determine if the horse is advancing, and ii) anticipate an injury that may be on the horizon. I will examine both points more closely below:

i) Like any other sport, we need some measure (or a group of them) in horses that can provide information about progress in a training program. Whether you have been working with a horse for a few months or many years, it is important to track progress to learn if what you are presently doing in training is creating a better eventing horse. One option would be to monitor heart rate each day, and to see if the horse is able to do the same amount of work at a lower heart rate after weeks or months of training. Another option would be to video parts of each training session and critically assess the horse's movement – for example, is the core getting stronger which allows the horse to execute a jumping gymnastic with excellent technique or is the body still collapsing between jumps?

ii) Similarly, it is critical to have ways to monitor the horse each day to identify if something is 'off'. One way to do this is to assess how the horse moves as it leaves its' stall in the morning or when warming up on the flat – are there any asymmetries or range of motion changes that are abnormal? Often, personality changes such as a reluctance to work or general disinterest can be indicative of underlying problems that should be addressed. Additionally, when completing a workout, it is important to be mindful of fatigue – which is widely accepted to be a major contributor to injury. As the body gets tired (especially during periods of extreme fatigue), a number of maladaptive changes will occur, such as altered movement mechanics, a reduced ability to produce force, and poor sensory feedback. These changes produce a 'perfect storm', whereby the body can no longer perform some activities in a safe and reliable manner, predisposing it to injury.

Concept 3: What therapy should we use and when should we use it?

In my presentation I briefly discussed a few different types of massage and when they should be used in a horse's daily routine. This small part of my talk generated a lot of discussion and follow-up

emails. In the equestrian world, we are inundated with different therapy tools – and each one will have a group of trainers and grooms that have great confidence in its' effectiveness. So naturally, it can be overwhelming when deciding what therapy tool to use (and when). As you make this decision, there are a few important things to be aware of:

i) Every means (i.e. therapy) of speeding up recovery should be considered as a piece of the larger program. What I mean by that is you want to use recovery tools to match what you are doing in training. Use the more effective recovery tools that you have after your horse has done a hard workout and its' body will need help recovering. Conversely, on easier training days you may not need to use much in terms of therapy, as the horse can likely recover naturally on its own. It is important to know your horse well and to 'listen' to what it needs.

ii) Remember that recovery tools are a stimulus, and just like training exercises, an athlete will adapt to the frequent use of the same arrangement of therapeutic tools. For example, if you ice then wrap a horse post-workout multiple times a week for an extended period, there is a good chance that the efficacy of these recovery means will begin to diminish. That is why it is important to vary what recovery tools you use – this ensures they stay effective at aiding recovery since horses won't adapt to them. Importantly, remember to 'save' your most effective recovery tools for when your horse most needs help recovering (i.e. in competition).

iii) Lastly, each horse is different so adapt recovery means to match each horse. Remember – the goal is to speed up recovery and remove stress from the body. So if your horse hates a certain therapy, it is important to ask yourself if it is worth it? Even if the therapy is helping one part of the body, it could be causing a significant amount of stress for the horse and creating more issues than it is solving. And never underestimate the importance of a relaxing trail ride or grooming session, things that can put a horse at ease and relax it are critical to speeding up recovery. A horse with a stressed nervous system will always struggle to recover after a workout, no matter what therapies you throw at it!

Concept 4: The future

It is a very exciting time in equestrian sport as we now have the technology and analytic tools available to answer a number of important questions related to performance enhancement and health. For example, activity monitors are easy-to-use tools that allow riders to track what their horses are doing in training each day. Assessing heart rate provides a unique window into how a horse responds to work and, by assessing this information over time, it can eventually be used to help guide decision-making surrounding what training sessions should be done to produce the largest gains in performance.

Perhaps the most important thing that a rider/groom/trainer can do is to keep a daily activity log (diary) for their horse. Many elite human athletes keep diaries of what they do in training as well as nutrition and wellness, and they use this information to understand what works for them and what doesn't. For example, human athletes know that sleep is critical to successful performance. Thus, every morning athletes will record how they slept the night before in their diary. If their sleep quality is poor, they can look back through the pages to identify a trigger that may have caused the restless sleep. Similarly, a poor sports performance can often be traced back to an issue that may have arisen in training, a poor sleep session, poor nutrition, etc. A few years ago, I tracked training information

for 20+ FEI jumping horses over a few months, and for each horse there were always a few really interesting pieces of information that could be used to improve performance.

What is clear is that, like any other sport, there is still much to learn about creating a champion athlete. For most human-centric sports, there have been thousands of research studies and billions of dollars invested in figuring out the best ways to manage athletes. Conversely, in the sport of eventing, there are only a handful of small studies that have been published to date. This means that trainers have much less information available when making decisions as compared to coaches of human sports. Genetics, anatomy, workout selection, teaching strategies, the horse-rider relationship, training environment, competition selection, therapy choices, and so on, all play an important role in horse development. It is critical that the sport begins to search for answers to common questions so that we can move the quality of evidence forward and ultimately be able to make better-informed decisions when managing elite competition horses.