

Man with Machine Versus Man Without Machine: Debunking the Myths

By Andy Wolter, Equinosis CEO

The Debate:

A debate continues to fester around the topic of comparing subjective to objective evaluation of lameness. The problem is, in its current form, the debate is not a genuine examination of the appropriate question – what is the most transparent and, therefore, best information that can be provided to horse owners?

Instead the debate has been oddly twisted to pit man VERSUS machine – as if every new machine replaces the man, instead of complimenting his or her abilities, like the microscope, or telescope, or the wheel! Unfortunately, this debate further devolves into mischaracterizations and falsehoods, some that have been recently published in equine veterinary journals and magazines. When the result is maligning objectivity and those who practice it, we feel compelled to take a stand. The fear of objectivity negatively affects the care of the horses we are all committed to serve.

Readers of some of these articles might conclude that having objective lameness measurement data replaces a skill provided by the veterinarian. But this could not be further from the truth. Measuring lameness does not interfere with skillful subjective detection of lameness. It enhances it. There is no EITHER/OR when conducting the lameness evaluation.

A Comparison to Ultrasound:

Would anyone today seriously indulge a similar debate comparing the use of palpation OR ultrasound - Man vs. Machine? Has ultrasound replaced the palpation skills of experienced veterinarians, as was feared 30 years ago? No,

they would not, and no it hasn't. Using inertial sensors to evaluate horses for lameness without an understanding of what you are measuring is as useless as ultrasound examination of the limbs by someone without knowledge of limb anatomy and imaging interpretation. Careful palpation of the limbs is helpful to all veterinarians, but no one feels compelled to forego palpation because they will be examining the limb with ultrasound. The same is true with using inertial sensors to evaluate lameness in horses. When will the detractors get the point?

The Evidence is Available:

It seems like new things are appearing for use in veterinary medicine every week. Veterinarians are constantly bombarded with new drugs, techniques, tests, and equipment, and told that they need this or that to improve their care, offer this service, or make more money. Many are adopted hastily but fizzle out. But, few needs in equine veterinary medicine have been so well documented than the deficiency and disadvantages of relying solely on subjective lameness detection, and few techniques, tests, or pieces of equipment have been so well defined and tested before clinical adoption than body-mounted inertial sensors. Body mounted inertial sensors have been used to measure lameness in horses since the late 1990's and have been in consistent use since 2008, growing in use every year since. Currently, Equinosis alone has systems in over 350 private practices and equine university hospitals in 31 countries. The science and method of using body-mounted inertial sensors to accurately and precisely detect lameness in horses is not difficult to understand and it is not a mystery.

The Basics:

We think that one of the issues at hand is a general deficiency in the use of quantitative sciences and specifically, simple statics and dynamics (a branch of physics) to explain some issues in physical medicine. If one remembers from high school physics, it is very easy to understand why vertical acceleration of the torso is THE simple solution to measuring pain in the limbs during weight bearing. Without an understanding and appreciation of these basic concepts, it may be very difficult to comprehend why simple but precise measurements of the vertical movement of the head and pelvis can be better at detecting lameness than looking at, and even measuring, many other things.

The Fear:

Some fear that the “art” of lameness evaluation is in peril. But, shouldn’t the detection of a clinical sign really be more science than art? Believing lameness detection to be more art than science is part of the problem and, to some degree, explains why, in study after study, subjective evaluation is shown to have such poor agreement amongst even experienced veterinarians believed to be skilled in lameness evaluation. Veterinarians tend to look at multiple and different things, some which are highly associated with lameness but difficult to see, some which are weakly associated with lameness but maybe easier to see, and some that may be thought to be seen but impossible to measure (so can they really be seen?). The importance the veterinarian places on these different things can vary from person to person. Looking at or measuring many things may at first seem like a good backup plan for something that may be difficult to pin down. But this is usually not a wise thing to do. If you were interested in measuring one thing, in this case lameness, and if there was one test that could be shown to be accurate and repeatable, is running many additional different tests helpful? It isn’t. Running multiple tests (which could be likened to veterinarians looking at many

different things that may be indicative of lameness), does not improve the correct identification of lameness. It hampers it. Probability shows that it leads to greater chances of false positives and false negatives.

One of the clinicians interviewed for a recent article in The Horse Magazine (November 2018) claimed that using inertial sensors causes veterinarians “to stop looking at the horse” or “might keep using nerve blocks everywhere for asymmetry that is just natural and not related to pain and lameness”. This is not our experience and is contrary to Equinosis training and instruction in use of the technology.

The fear that lameness measurement will compromise the art and replace the need for a “good eye” is wrong.

Some have even said that they have resisted use of this technology only because they believed that it would prevent the development of the subjective skill of visually detecting lameness, or similarly, that it might erode one’s already-developed art of lameness detection. Although this belief at least reveals an acceptance of the validity of results, experience shows us that it is entirely unfounded. In fact, the opposite happens, and users further develop their subjective skills because they are reinforced immediately and consistently. Movements that are strongly associated with lameness are positively reinforced. Movements that are weakly associated with lameness are downgraded and eventually disregarded as not important to assess.

However, keep in mind that, no matter how good one perceives he or she is at detecting lameness, there will always be some cases that are just too difficult to see and follow. They will be too difficult because they are so subtle, or because they are so complicated, because they are multi-limb, or because they are so intermittent. The human eye only sees things well that are close to the observer and that happen slower than 20 – 30 frames per

second. The inertial sensors measure movement to sub-mm accuracy whether the horse is 10 or 100 meters away at a sampling frequency an order of magnitude greater (200 samples per second).

Lameness is Clinical Sign not a Disease:

Of course, there IS more to lameness evaluation than detecting and measuring it. No one is suggesting users shut their eyes, cover their ears, stick their hands in their pockets and turn off their brain. The real worth of a veterinarian is not in a mysterious ability to identify lameness, but in finding the cause, assessing its importance, treating, and prognosticating. THIS is lameness evaluation.

As trained users of this technology understand, lameness is simply a clinical sign – which can be measured. Lameness is not a disease and it is not a diagnosis.

A veterinarian skilled in the use of lameness measurement during evaluation must still arrive at the correct diagnosis and must also discern what care, if any, can or should be provided. This is the “art” of lameness evaluation.

False Criticisms:

There are a few inaccuracies reported in The Horse (November 2018) article regarding use of inertial sensors. Two require rebuttal.

In the article it was stated that “a slight change in placement... [of sensors] can cause dramatic differences [in results]”. This has been studied and the results have been published, which found that only misplacement of the pelvic sensor had a negative effect on accuracy of pelvic measurement. The pelvic sensor must be misplaced by more than ½ the width of the sensor – or about ¾ inch - to appreciably affect results. This amount of misplacement is obvious to even a casual observer. The head and pastern sensor have attachment accessories that make misplacement highly

unlikely. The right fore pastern sensor has no effect on the calculation of amplitude of lameness. The right forelimb sensor must rotate more than 45 degrees from dorsal midline to affect determination of side of lameness. This would be a dramatic, not a slight, change in placement.

Another statement was made that body mounted inertial sensors cannot detect bilateral lameness. This is false. It is true that current algorithms that use head and pelvis vertical movement asymmetry are not developed to precisely measure the amplitude of lameness in both limbs when the horse is traveling in a straight line. But this is also true with subjective evaluation, the use of a force plate, or any other method that assesses body or limb movement. But it can be done. You just have to know what the movement would be in that particular horse without pain on weight bearing, or you would have to compare to an ideal population standard. When someone is saying that the horse just appears stiff in both front limbs, this is what they are doing. They are comparing what they are seeing to what they think they should see in that particular horse, compared to what they have seen before in other normal horses of the same size, breed, age, and use. But this disadvantage is really quite a weak criticism. Even with visual subjective evaluation, the hint of bilateral involvement in lameness is first recognized when the horse or veterinarian does something to lateralize the lameness, like turn in a circle, or flex a joint, or block a nerve. To measure bilateral lameness with inertial sensors you just have to lateralize the lameness.

The Importance of Education

Training in proper use of inertial sensor-based lameness measurement is imperative. Simply purchasing an ultrasound does not make one skilled in its use. Simply instrumenting a horse with inertial sensors and trotting it around to get data does not always provide meaningful or consistent results. Proper data collection protocols should be

followed. Stride-by-stride and trial-by-trial variability must be evaluated and understood. Getting enough strides and taking care to collect consistent and repeatable data is vital. If used correctly, the Equinosis Q system will measure what the horse is really doing, with an accuracy and precision that meets and exceeds current clinical requirements.

With any new piece of equipment or technique, achievement of expert status in the use and comprehension can lag early adoption. From the beginning, Equinosis has endeavored to provide high quality training resources and educational events. Training videos and additional resources are available online, with comprehension checks to provide objective feedback on knowledge attainment. Not all users of the technology have taken it upon themselves to complete our basic training, but Equinosis is working hard to change this. To that end, in 2019, all new Q systems purchased in the USA will include on-site training. Other training accommodations are being made for international customers.

The Future:

Not only is basic training in the use of inertial sensors imperative, staying abreast in the advancements of the technology is equally important. We are learning more and more every day. Recognition of compensatory lameness patterns, types of lameness in horses lunging in a circle, the effects of rider movement and position on lameness evaluation, the variability in lameness from day to day, and even hour to hour, have all been more clearly understood because of the expanding use of body mounted inertial sensors by veterinarians in the field. The discipline of lameness measurement, and what we are learning clinically as a result, is evolving rapidly. Finding patterns in large data bases of objective lameness measurements will undoubtedly uncover more interesting associations of clinical importance.

The question facing each clinician, if you knew there was a superior method of care for your patients, do you learn about it and embrace it, or do you resist it?

Field-based lameness measurement is new technology – but it is here to stay. Who will be in front of the technology ensuring its ethical implementation?