Effect of Forelimb Instrumentation on Lameness Detected with a Portable Inertial Sensor-Based System for Horses

Jeremiah Nichols, Marco Lopes, Cezar Dearo, Alyssa Davis, Kevin Keegan - College of Veterinary Medicine, University of Missouri, Columbia, MO

Background

- A portable inertial sensor-based system (PISBS) has been used to detect and quantify lameness in horses (www.equinosis.com).
- The PISBS is composed of 3 sensors: 2 accelerometers attached to the head and pelvis and a gyroscope attached to the dorsal aspect of the pastern of the right forelimb (**Figure 1**).
- Sensors wirelessly send data to a handheld computer (**Figure 1**) where the severity of lameness can be determined.
- Attaching the gyroscope to the wrong forelimb (i.e., left forelimb) or attaching the gyroscope upside down to the correct forelimb (i.e., right forelimb) causes inversion of the lameness(es): the lameness(es) will be assigned to the contralateral (i.e., sound) limb(s).
- One potential cause of concern for veterinarians and horse owners is that the sensor attached to one of the forelimbs may cause asymmetric motion that can be falsely interpreted by the PISBS as lameness.

Objective

- To investigate if the gyroscope attached to the right forelimb can actually cause false lameness in horses evaluated at the trot with the PISBS.

Material and Methods

- Using a crossover design, 12 horses were evaluated with the PISBS while trotting in a straight line.
- The gyroscope was alternately attached to the right forelimb or attached upside down on the left forelimb.
- The order of the limbs instrumented with the gyroscope was randomly assigned.
- Data analysis and interpretation of results were performed as recommended by the manufacturer of the PISBS (**Figure 2**).
- Agreement between the two approaches was investigated with the McNemar's test.

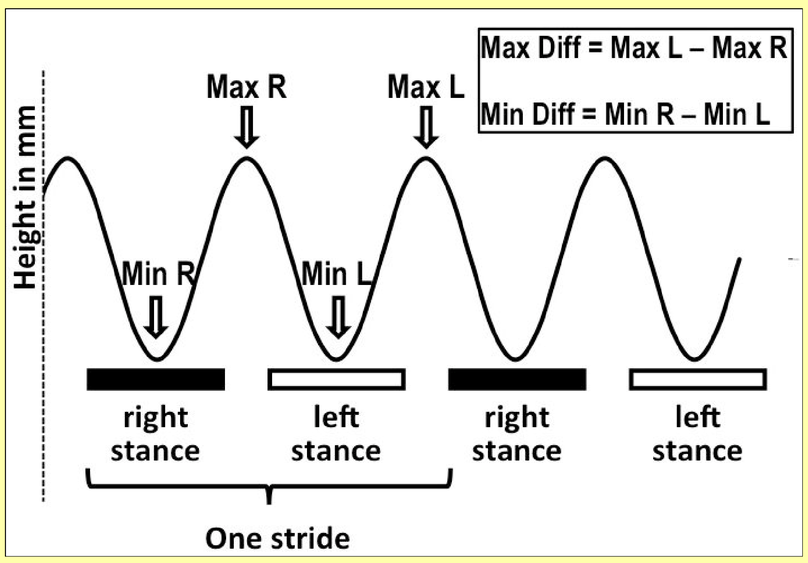

Figure 2 - Graphic representation of how the PISBS calculates Max Diff and Min Diff.

Results

- In all horses, the same lamenesses were identified regardless of the forelimb instrumented with the gyroscope (**Figure 3**).
- I.e., the evaluations with the PISBS were not affected by the forelimb instrumented with the gyroscope (p=0.9995).

Conclusions

- These findings support the use of the gyroscope attached to the right forelimb for evaluation with the PISBS and indicate that a gyroscope attached to one forelimb does not cause false lameness.
- These findings support the use of the gyroscope positioned upside down on the left forelimb in case there is any indication to do so.

Acknowledgments

- College of Veterinary Medicine Agricultural Experiment Station Funds
- E. Paige Laurie Endowed Program in Equine Lameness

Figure 1 - A- Sensors of the PISBS; B- accelerometer attached to head; C-accelerometer attached to pelvis; D- Gyroscope on the right forelimb; E- Horse being evaluated with the PISBS; F- Tablet computer during data collection with the PISBS.

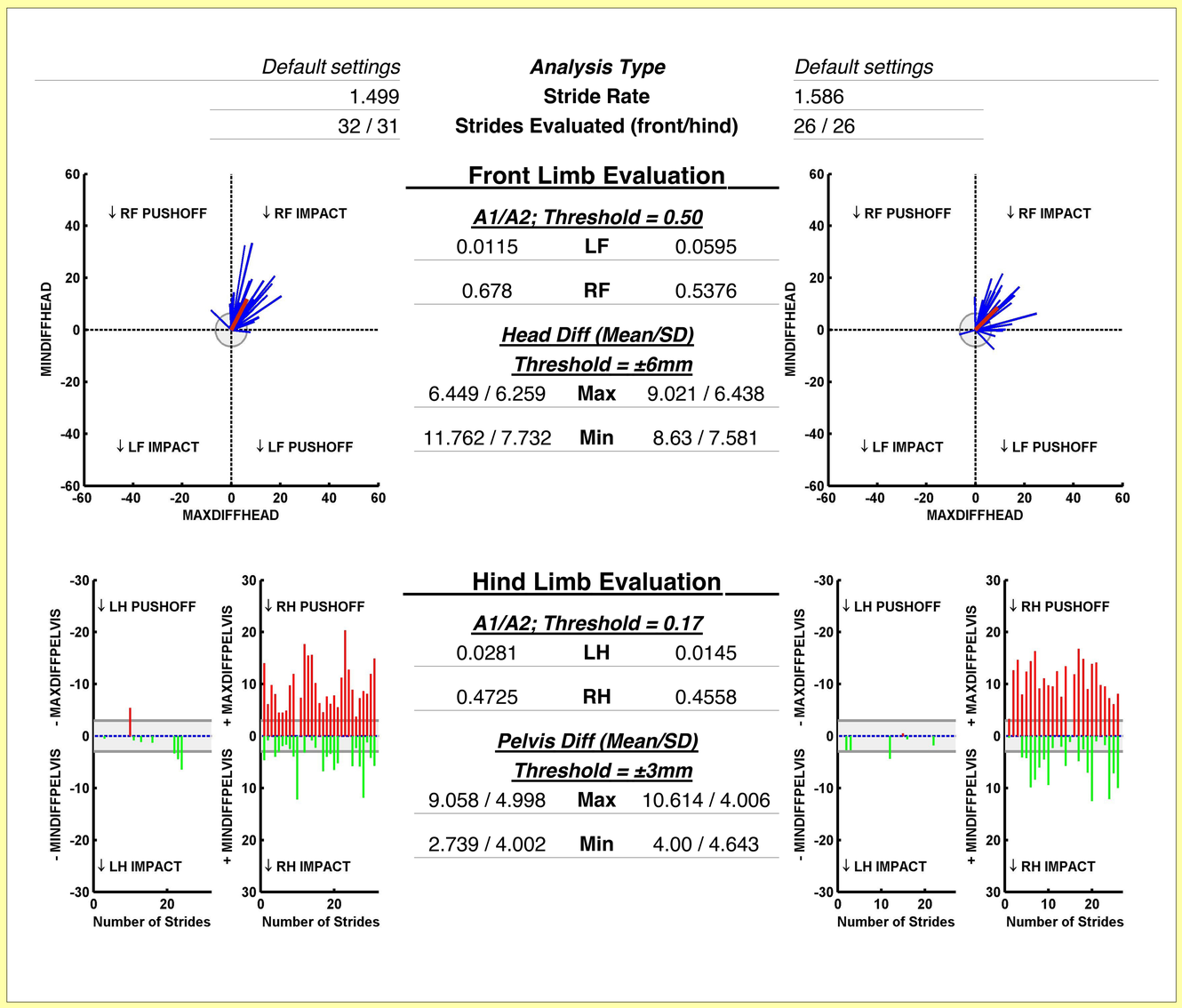

Figure 3 - Report of 2 evaluations with the PISBS: gyroscope on right forelimb (right side); gyroscope upside down on left forelimb (left side). Results were practically identical.