# Effects of Head and Pelvic Rotation on Evaluating Lameness Using Uni-axial Body Mounted Accelerometers

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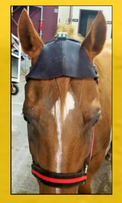
## Background:

Lameness is a very common occurrence in horses. Early, accurate detection is helpful in order to return these horses to normal function. Most lameness evaluation is done subjectively by veterinarians observing how the horse moves. However, using an objective measurement system with high sensitivity for detecting movement can assist in the identification of lameness and lameness patterns by enhancing detection, reducing inconsistency, and eliminating bias. Objective methods can also track effectiveness of treatments. Lameness Locator is a commercially available lameness evaluation system developed at the University of Missouri that uses uni-axial accelerometers attached to the head and pelvis. Lameness measures are derived from vertical head and pelvic acceleration. However, when the horse is trotting the head and pelvis rotate, affecting uni-axial sensor measurement of true vertical acceleration. The purpose of this study is to determine the magnitude of the effect of head and pelvic rotation on calculation of lameness measures derived from uni-axial accelerometers. We hypothesize that head and pelvic rotation when the horse is trotting in straight line will not influence results; but when trotting in a circle, uncorrected uni-axial head and pelvic acceleration will cause significant bias in derived lameness measures.

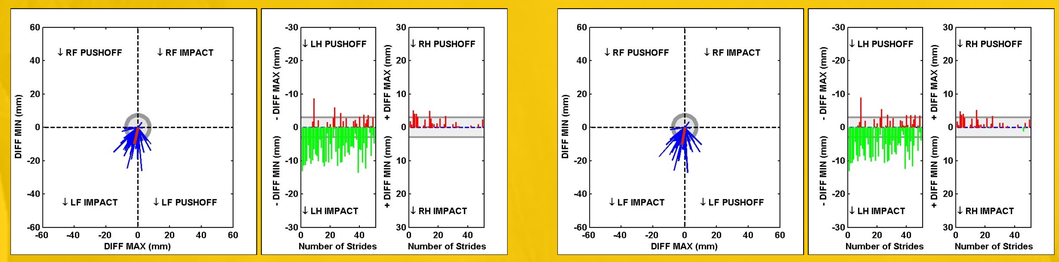
## Methods:



- Data collection on 10 horses with varying lameness
- Head sensor placed dorsally, centered between ears
- Pelvic sensor placed dorsally, centered between tuber sacrale
- Gyroscope placed dorsally on front right pastern
- 8 data trials at the trot: Straight line x2 (asphalt and packed dirt), lunge left (sand and packed dirt), lunge right (sand and packed dirt)

## Data:

**Straight Line Corrected** (packed dirt)

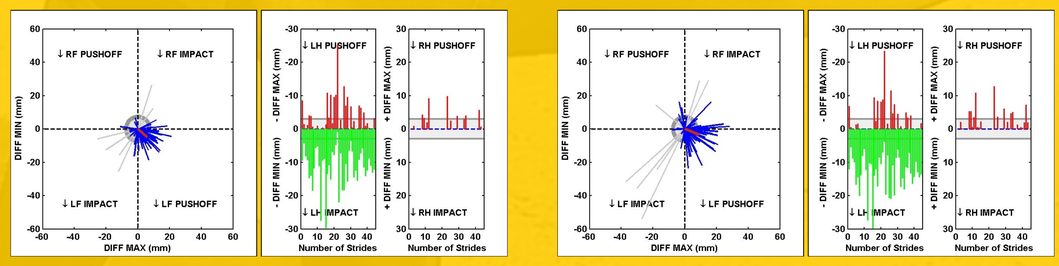



**Straight Line Uncorrected** (packed dirt)




- No statistical difference (p-value > 0.05) between min and max differences for trotting in a straight line between corrected and uncorrected data sets for head and pelvic rotation.

**Lunge Left Corrected** (sand)

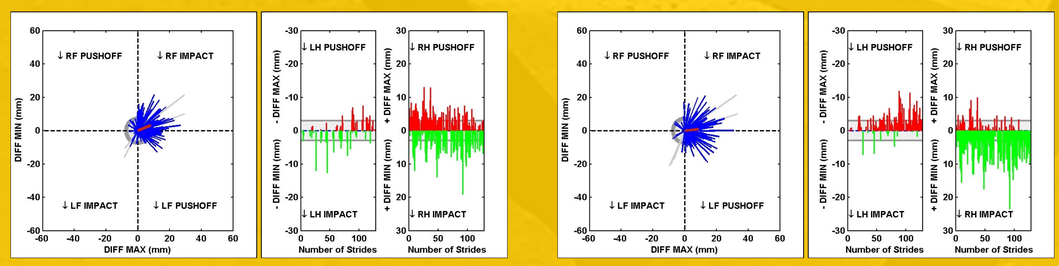



**Lunge Left Uncorrected** (sand)




- Statistically significant difference (p-value = 0.0006; n=4) while lunging to the left at a trot between pelvic max differences; corrected measures had increased sensitivity for intensity of lameness.
- No significant difference for head lameness measures; however there is evidence of increased sensitivity with correction for rotation.

**Lunge Right Corrected** (sand)



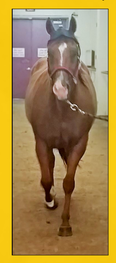
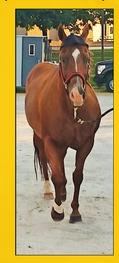

**Lunge Right Uncorrected** (sand)




- Statistically significant difference (p-value = 0.004; n=4) while lunging to the right at a trot between pelvic min differences; corrected measures had increased sensitivity for intensity of lameness.
- No significant difference for head lameness measures; however there is evidence of increased sensitivity with correction for rotation.

## Conclusions:

**STRAIGHT LINE** (asphalt and packed dirt)

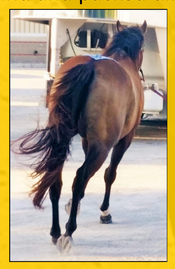



- Asphalt mean standard deviations were significantly lower. Asphalt is less variable and decreased intensity.
- Data corrected for rotation had little difference to data that was uncorrected for head and pelvic rotation.

**LUNGE LEFT** (packed dirt and sand)


- Lunging inside on sand was more consistent and intensified lameness compared to packed dirt.
- Significant differences were seen between corrected and uncorrected data for pelvic sensors – corrected being more sensitive and consistent.

**LUNGE RIGHT** (sand and packed dirt)

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