



# Comparison of temporal-spatial and pressure gait analysis between resting and exercised Labrador retrievers

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## Introduction

Exercise-induced muscle damage and subsequent inflammation and soreness are frequently studied topics in both human and animal trials<sup>1,2</sup>. Gait analysis using a commercial mat system is a newer technology that identifies the temporal and spatial qualities of a subject's gait. Gait analysis in healthy canines, especially in an exercise model, has been infrequently studied. Our objectives were to compare gait analysis metrics between exercised and non-exercised dogs, to identify which parameters were most impacted by running exercise, and to identify the ideal time to perform gait analysis post-exercise.

## Materials and Methods

### Animals and Housing

- All dogs selected from colony of Labrador retrievers at Four Rivers Kennel.
- 24 Labrador retrievers (12m/12f).
- All dogs housed in temperature controlled individual kennels overnight and aired outside in social groups for appx 6hrs daily.
- Water was provided *ad libitum* via automatic waterers
- All dogs fed a standard kennel diet of poultry and corn and fed once daily in the morning.

### Experimental Design

- Twenty-four Labrador retrievers were used in this trial, with 12 untrained dogs performing one 5km run, and 12 untrained dogs providing a resting comparison.
- All dogs were walked across a Gait4Dogs (CIR Systems, Inc; Sparta, NJ) pressure walkway system at baseline (pre-run), within 30-min post-run, 3h post-run, and 24h post-run enough times to obtain at least 3 valid walks at each timepoint.
- All dogs were walked by the same handler for the duration of the trial and all attempts were made to ensure consistency in handling.
- Walks were processed after data collection. Video of each walk was recorded and any walks which appeared inconsistent (dog distracted, stopping, stepping off the mat, etc) were discarded.

## Results and Discussion

### Pressure Measurements

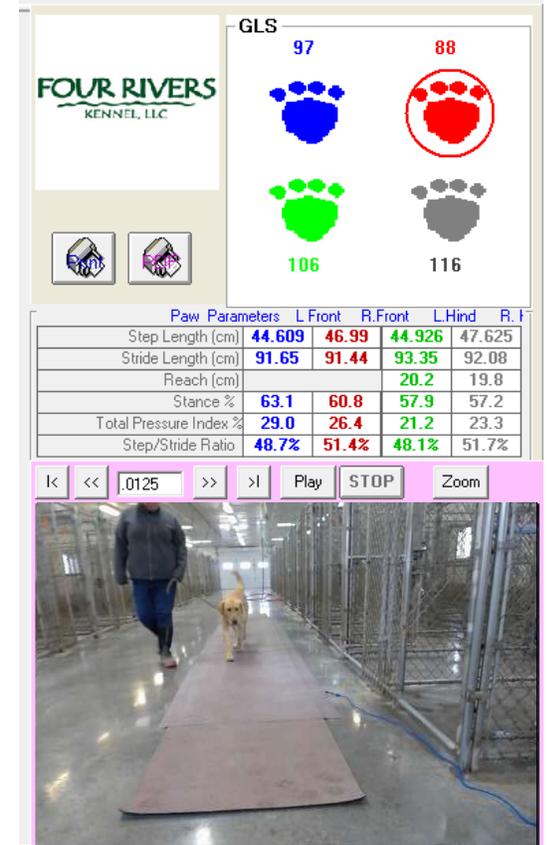
- No significant differences were found between timepoints in resting dogs.
- In exercised dogs, the number of activated sensors for the symmetry ratio of the left/right forelimbs improved from baseline to 30min post-run ( $p < 0.01$ )
- In exercised dogs, pressure time was significantly slower 30min post-run compared to 3h post-run ( $p < 0.01$ ), indicating discomfort during the walk immediately after exercising.

Pressure Measurements in Exercised Dogs						
Parameter	Limb	Pre-Run	30min Post-Run	3h Post-Run	24h Post-Run	P-value
Number of Activated Sensors	Left/Right Forelimb Symmetry	1.03 ± 0.01 <sup>a</sup>	1.00 ± 0.01 <sup>b</sup>	1.01 ± 0.01 <sup>ab</sup>	1.01 ± 0.01 <sup>ab</sup>	0.049
Pressure Time	All	1521 ± 0.27 <sup>ab</sup>	1601 ± 27 <sup>a</sup>	1471 ± 25 <sup>b</sup>	1544 ± 26 <sup>ab</sup>	0.007

### Temporal-Spatial Measurements

- No significant differences were found between timepoints in resting dogs.
- In exercised dogs, step time was significantly lower at 3h post-run compared to 30min and 24h post-run ( $p = 0.006$ ), indicating discomfort at 3h post-run
- In exercised dogs, cycle time was significantly longer at 30min post-run compared to 3h post-run. This indicates a slower speed at 30min post-run.
- In exercised dogs, swing percent was significantly lower at 30min post-run compared to baseline ( $p < 0.01$ , indicating reduced flexion.
- In exercised dogs, stance percent was significantly higher at 30min post-run compared to all other timepoints ( $p < 0.01$ ), indicating an affected gait and discomfort during the walk
- In exercised dogs, stance time was significantly lower at 3h post-run compared to 30min and 24h post-run ( $p < 0.01$ ), indicating and affected gait and discomfort during the walk

Temporal-Spatial Measurements in Exercised Dogs						
Parameter	Limb	Pre-Run	30min Post-Run	3h Post-Run	24h Post-Run	P-value
Step Time	All	0.37 ± 0.01 <sup>ab</sup>	0.38 ± 0.01 <sup>a</sup>	0.35 ± 0.01 <sup>b</sup>	0.37 ± 0.01 <sup>a</sup>	0.006
Cycle Time	All	0.73 ± 0.01 <sup>ab</sup>	0.75 ± 0.01 <sup>a</sup>	0.71 ± 0.01 <sup>b</sup>	0.74 ± 0.01 <sup>ab</sup>	0.008
Swing Percent	All	38.05 ± 0.23 <sup>a</sup>	37.10 ± 0.23 <sup>b</sup>	38.44 ± 0.21 <sup>a</sup>	38.07 ± 0.21 <sup>a</sup>	<0.001
Stance Percent	All	61.94 ± 0.23 <sup>b</sup>	62.91 ± 0.23 <sup>a</sup>	61.57 ± 0.21 <sup>b</sup>	61.93 ± 0.22 <sup>b</sup>	<0.001
Stance Time	All	0.45 ± 0.01 <sup>ab</sup>	0.47 ± 0.01 <sup>a</sup>	0.44 ± 0.01 <sup>b</sup>	0.46 ± 0.01 <sup>a</sup>	0.001



## Conclusion

In summary, untrained Labrador retrievers had a significantly affected gait primarily thirty minutes and three hours after exercise compared to resting dogs. More research is necessary to identify the primary gait parameters affected after endurance exercise.

## References

- Faie M.A., Cortez, J.C., Ledesma M., and Su Y. (2018) Pressure Mat Analysis of Walk and Trot Gait Characteristics in 66 Normal Small, Medium, Large, and Giant Breed Dogs. *Front Vet Sci*, 5:256.
- Light V.A., Steiss J.E., Montgomery R.D., Rumph P.F., Wright J.C. (2010) Temporal-spatial gait analysis by use of a portable walkway system in healthy Labrador Retrievers at a walk. *Am J Vet Res*, (71) 9, 997-1002.