

ETB Pegasus equipment was used in the following paper

Validation of a Novel Accelerometer-GPS system for measuring stride characteristics in galloping horses

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Validation of a Novel Accelerometer-GPS system for measuring stride characteristics in galloping horses



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Introduction

Methods for equine stride measurement

- Optical gait analysis systems
- Instrumented shoes
- Accelerometer devices

Aims

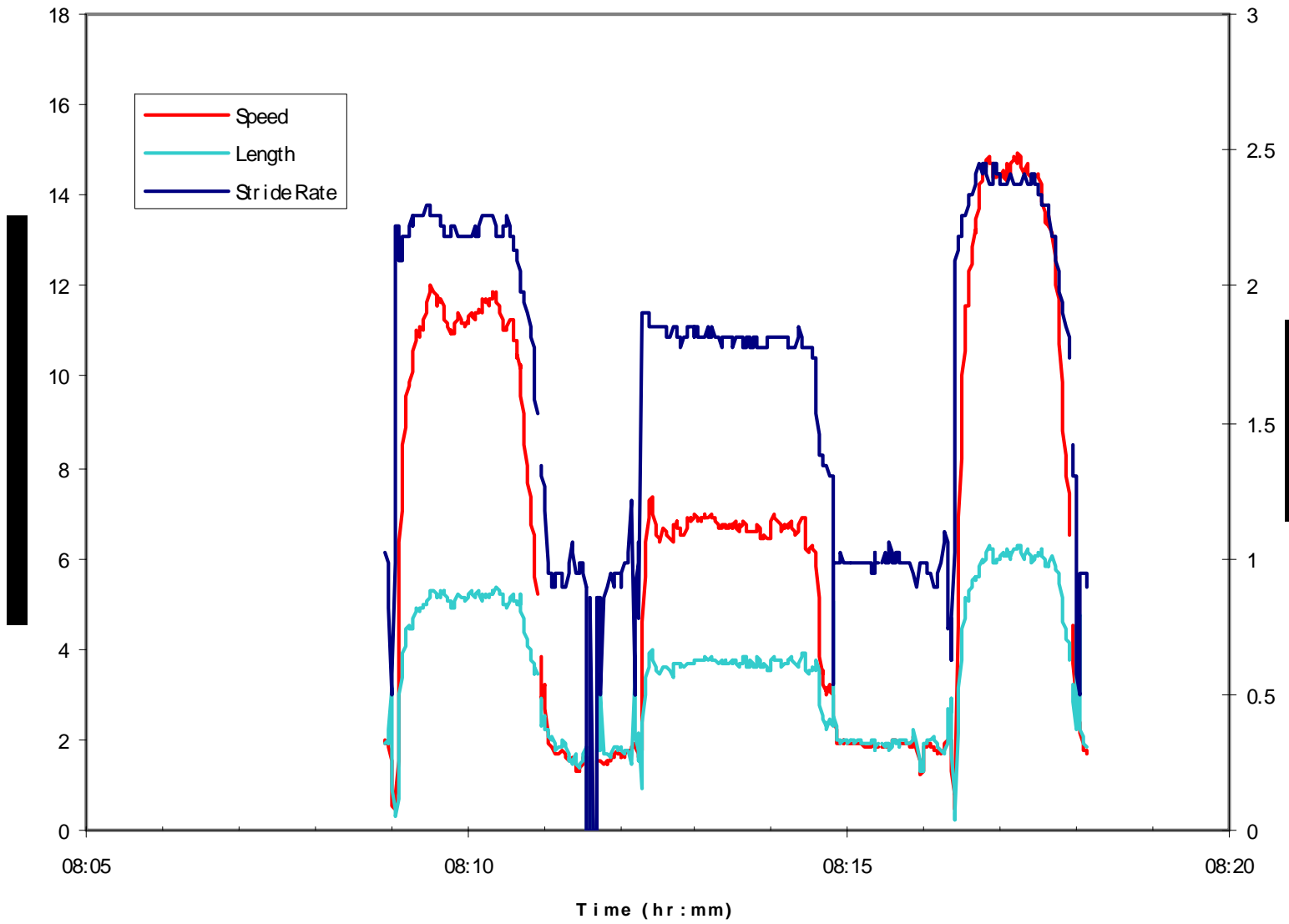
- To validate the new “Pegasus” system against a standard method
- To examine the reliability and practicality of the Pegasus system in making stride measurements on Thoroughbred racehorses in training

Materials and Methods

Pegasus System

- data were collected using a Pegasus triaxial accelerometer/data logger (European Technology for Business Ltd)
 - measuring 78 x 25 x 10mm
 - weighing 52g
- A proprietary GPS receiver/data logger (GL-50-S, San Jose Navigation Inc)
 - measuring 62 x 40 x 25mm
 - weighing 79g
- Units were synchronised before data collection with custom software, Poseidon (ETB Ltd)
- After collection, data were downloaded to personal computer for processing by Poseidon software which returned elapsed time, gait, SF, SL, speed and temperature at 1 Hz





Horses

- 6 fit Thoroughbred racehorses were used
 - 4 mares and 2 geldings aged 2-7 years

Experimental Protocol

- Horses exercised in pairs, twice on a 1200m (6 furlong) wood chip all-weather gallop
- Riders rode constant speeds using speed/heart rate monitors at 11 ms^{-1} (25 mph) and 16 ms^{-1} (36 mph) on first and second runs, respectively



- Stride data from Accelerometer-GPS system were compared with manual measurements
- Manual SL was measured between successive imprints of the lead fore foot between the third and fourth furlong marker



- Manual timing was measured using a stopwatch

Statistics

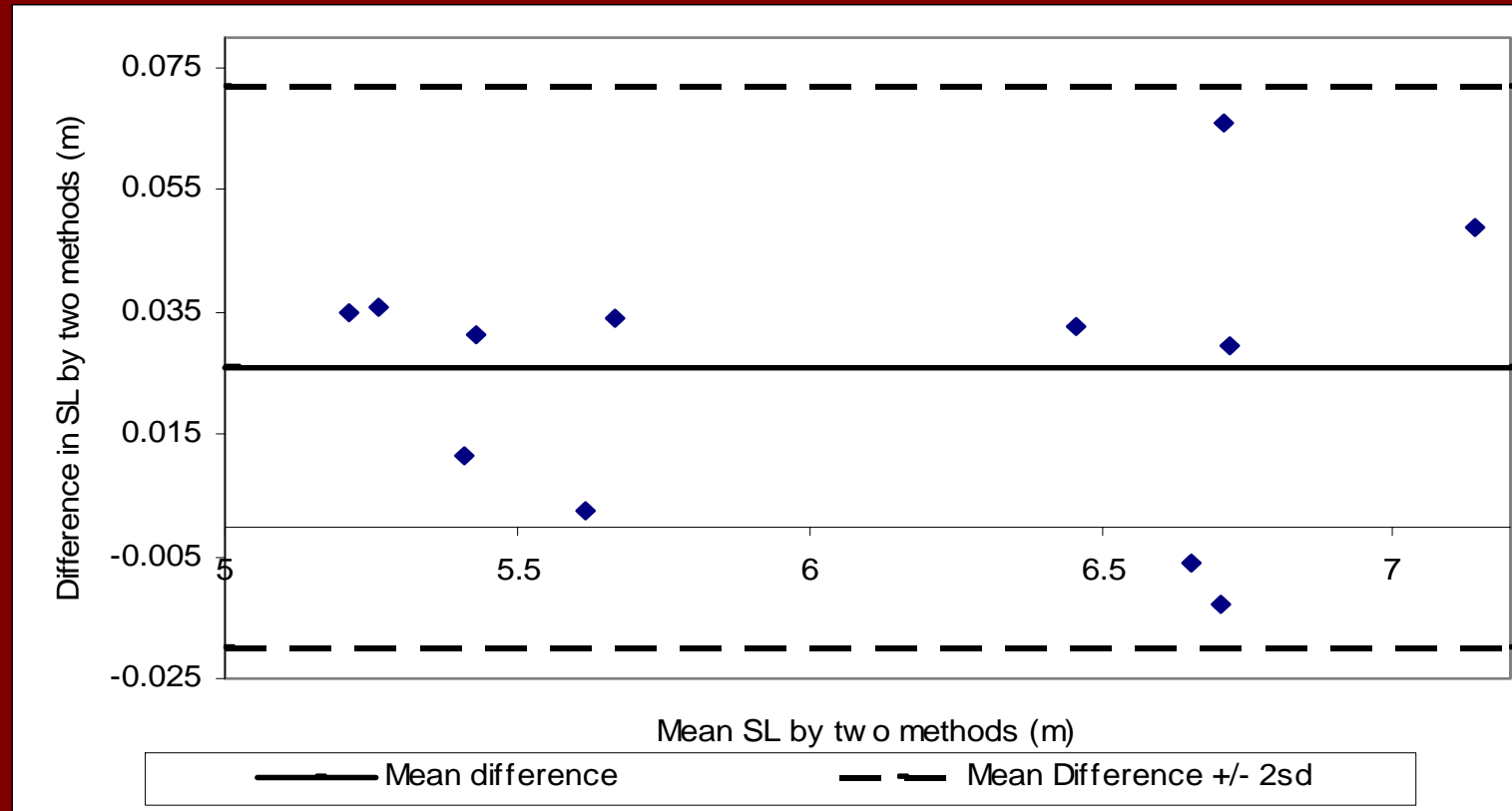
- Extent of agreement of SL and SF between methods was compared using analysis of Bland and Altman 1986
- Paired t tests where applicable (significance $P < 0.05$)
- Stride regularity was compared examining coefficient of variation for SL and SF for each run (Dubost et al, 2008)

Results

- Mean speed for 6 horses

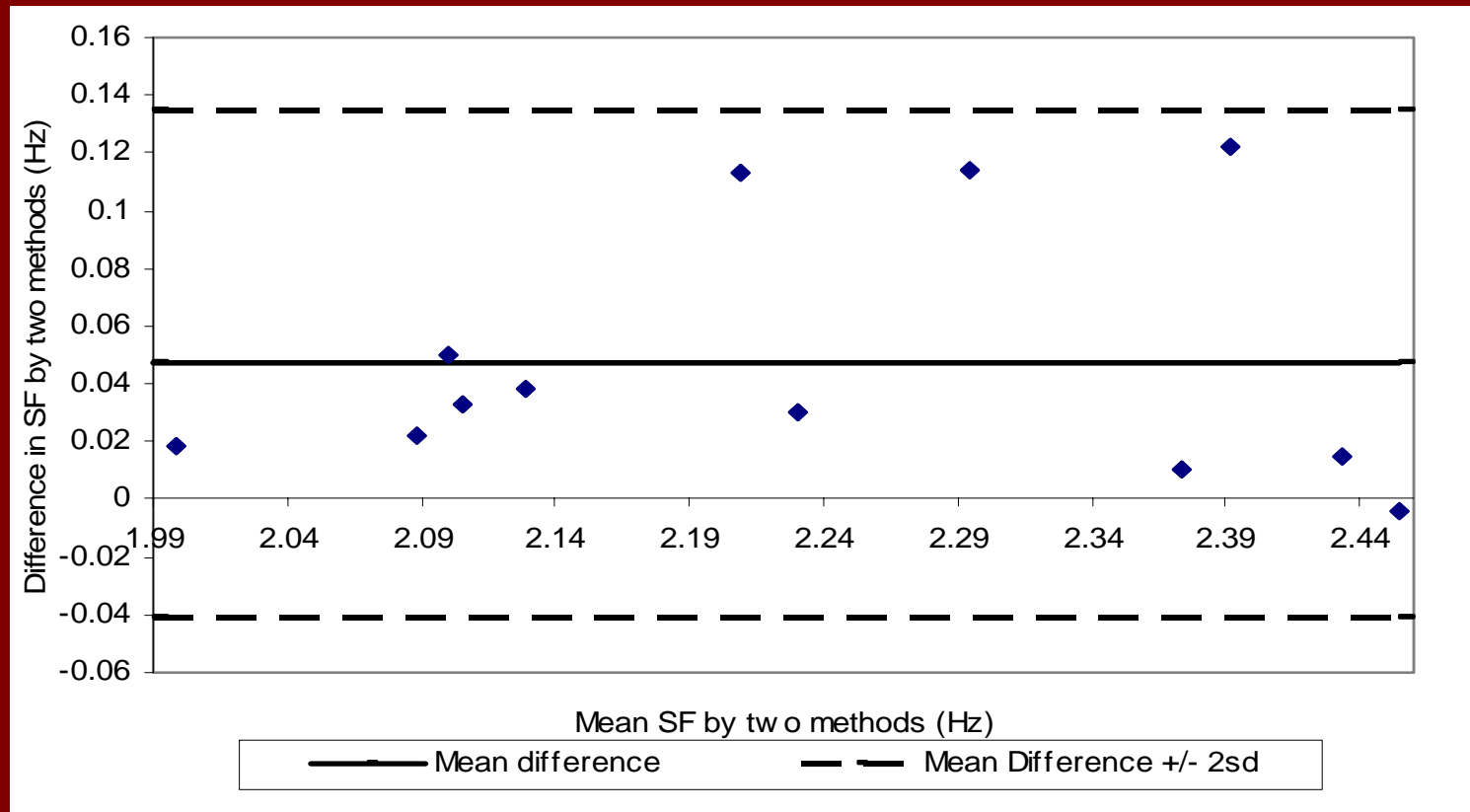
Horse	11m/s		16m/s	
	Manual	Pegasus	Manual	Pegasus
1	11.0	11.15	16.34	16.33
2	11.03	11.12	16.34	16.36
3	11.66	12.19	15.09	15.80
4	11.66	11.94	15.09	15.70
5	11.31	11.36	15.87	15.97
6	11.31	11.34	15.87	15.97
Mean	11.33	11.52	15.77	16.02
p	0.06		0.11	

SL agreement between methods



- Mean difference between methods for SL was 0.026m
 - Represents 0.43% difference (mean SL by two methods is 6.08m)

SF agreement between methods



- Mean difference between methods for SF was 0.047 Hz
 - Represents 2.10 % difference (mean SF by two methods is 2.234Hz)

Within-run SL coefficient of variation

- No significant differences in either run

Horse	11m/s		16m/s	
	Manual	Pegasus	Manual	Pegasus
1	1.68	1.47	2.20	2.16
2	1.38	1.40	3.14	3.62
3	2.08	1.15	1.96	2.57
4	2.22	1.85	2.00	1.70
5	1.88	2.30	2.32	0.74
6	2.47	2.14	2.80	1.60
Mean	1.95	1.72	2.40	2.07
p	0.26		0.40	

Conclusion

- Data were consistent with previous reports
- Very close agreement between methods
- Important source of error was most likely manual timing
- Within-run stride variability was the same for both methods
- Pegasus system was accurate, reliable, robust and repeatable in field conditions
- Will allow for future application for further research questions

References

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- Dubost, V., Annweiler, C., Aminian, K., Najafi, B., Herrmann, F.R. and Beauchet, O. (2008) Stride-to-stride variability while enumerating animal names among healthy young adults: Result of stride velocity or effect of attention-demanding task. *Gait & Posture* **27**, 138-143.