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Changes in Contact and Flight Times with Increased Speed during Overground and Treadmill Race Walking

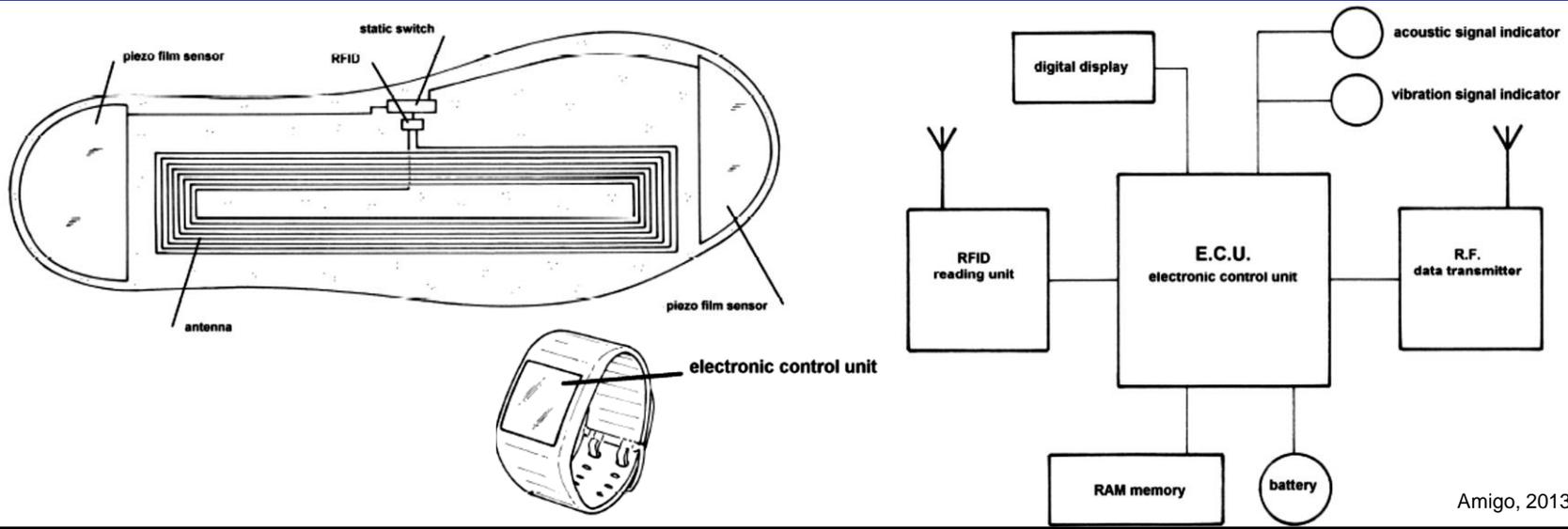


Brian Hanley & Catherine B. Tucker



Introduction

- Race walking is an Olympic event dictated by a rule that states that no visible loss of contact with the ground should occur (IAAF Rule 230.2).
- The importance of measuring flight times has been increased with the proposed introduction of the Race Walking Electronic Control System (RWECS).



Introduction

- Previous research has found that a loss of contact of 0.04 s is reflective of visual loss of contact in race walkers (Knicker & Loch, 1990).
- Women have been found to experience more flight time at any given speed (De Angelis & Menchinelli, 1992) but, in general, their slower race walking speeds mean their flight times in competition are often less than those of men (Hanley et al., 2014).
- The OptoJump Next system has been found to be reliable for measuring flight times in race walking in both overground and treadmill conditions, provided particular settings are adopted (Hanley & Tucker, 2019).
- The aim of the study was to compare the effects of changes in speed on temporal variables in elite race walking during treadmill and overground race walking.



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Methods

- Twenty race walkers from 12 different nations took part in the study. Fifteen of these athletes had competed at the 2016 Olympic Games or 2017 World Championships.

	Men (N = 11)	Women (N = 9)
Age (years)	26 ± 4	25 ± 4
Height (m)	1.77 ± 0.06	1.68 ± 0.09
Mass (kg)	64.4 ± 4.7	57.5 ± 10.6
Personal best (h:min:s)	1:23:02 ± 2:28	1:32:23 ± 6:02

Methods

	Overground	Treadmill
Number of OptoJump Next bars	5 x 1 m	1 x 1 m
Testing speeds (men) (km/h)	11, 12, 13, 14, 15	11, 12, 13, 14, 15
Testing speeds (women) (km/h)	10, 11, 12, 13, 14	10, 11, 12, 13, 14
Sampling rate and time	1000 Hz, N/A	1000 Hz / 30 s
GaitIn_GaitOut LED settings	2_2	0_0
Minimum flight time threshold (s)	0.001	0.001



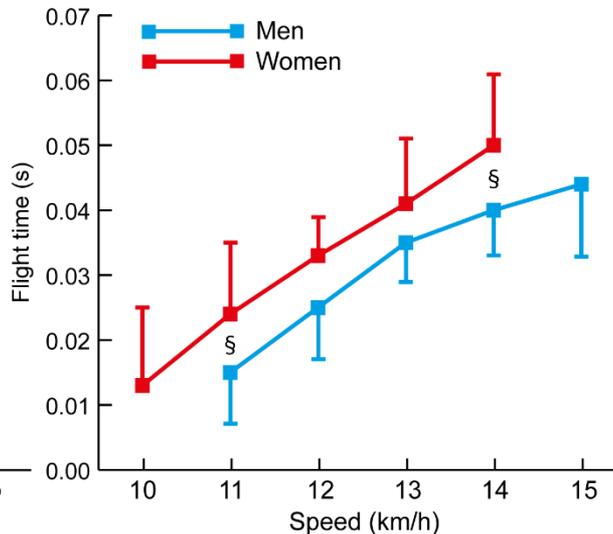
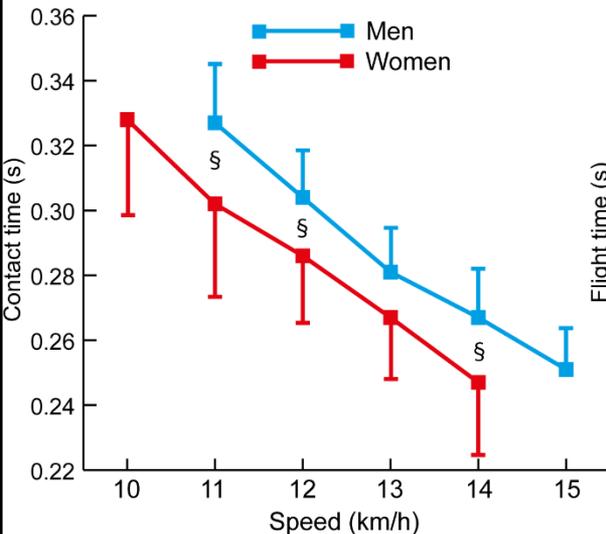
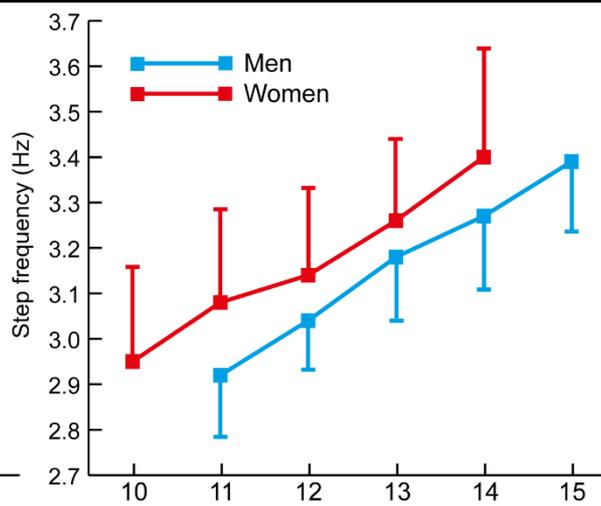
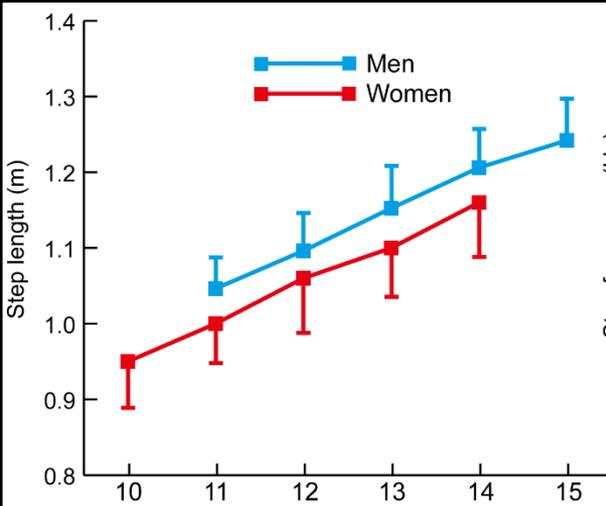
RELIABILITY OF THE OPTOJUMP NEXT SYSTEM FOR MEASURING TEMPORAL VALUES IN ELITE RACEWALKING

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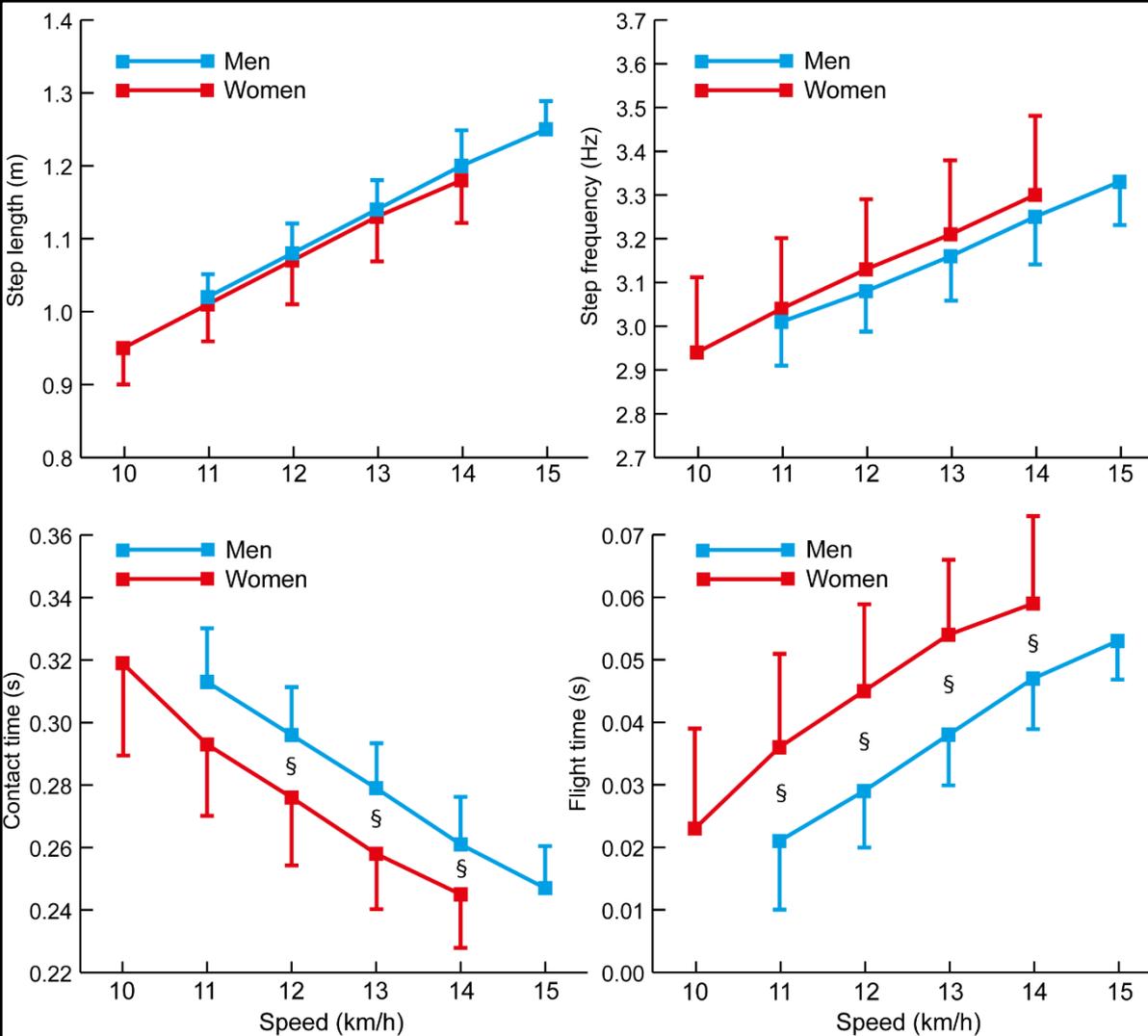
Results: Overground

- There were successive changes in all variables with increased speed, except for flight time in men (not from 14 – 15 km/h) and step frequency in women (not from 11 – 12 km/h).
- Differences between men and women are annotated with §.



Results: Treadmill

- There were successive changes in all variables with increased speed, except for flight time in women (not from 13 – 14 km/h) and step frequency in women (only from 13 – 14 km/h).
- Differences between men and women are annotated with §.



Discussion

- Women had longer flight times than men at 11 and 14 km/h in the overground condition, and longer flight times at all speeds in the treadmill condition, even though there were no differences in step length or step frequency. Women might therefore be at a greater risk of visible loss of contact at racing speeds than men.
- Adopting the 0.04 s “safety” threshold for visible loss of contact (Knicker & Loch, 1990) showed that men were likely to be within the rules at 14 km/h, and women at 13 km/h.
- At these speeds, the men had step lengths and step frequencies of approximately 1.20 m and 3.25 Hz, respectively; similarly, for women, their step lengths and step frequencies at the “safe” speed were approximately 1.10 m and 3.25 Hz.

Practical implications

- The present results give an indication of what flight times occur at different race walking speeds, and which can inform any new race walking rules that incorporate technology.
- The results are not meant to indicate that it is impossible to achieve competitive speeds with no loss of contact (the athletes did not attempt to do this), and a different approach to technique could allow for less or no loss of contact.
- The finding that men did not have longer flight times at 15 km/h than at 14 km/h suggests that better technique can be achieved at faster speeds. Coaches should note, however, that flight times might be higher if using a treadmill.

Thank you for your attention!



Do you have any questions?



References

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