TECHNICAL SKILLS AND MOVEMENT COORDINATION IN ELITE, NATIONAL AND REGIONAL LEVEL RACE WALKERS

E Preatoni[1], D Cazzola[1], G Pavei[2], AE Minetti[2]
[1] Sport, Health & Exercise Science, Department for Health, University of Bath, UK
[2] Department of Pathophysiology and Transplantation, Università degli Studi di Milano, Italy

WCB2014 | Boston, 6-11th Jul 2014

Introduction

Race walking (RW) requires athletes to walk as fast as possible following two main rules:

- keep the knee of the supporting leg locked "*from the moment of first contact with the ground until the vertical upright position*";
- generate a progression of steps with no visible flight phase.

The use of conventional analytical tools (kinematic, kinetic and physiological measures) has not been very successful in:

- discriminating between different skill levels;
- identifying the factors for excellent performance.(1)

Improved experimental protocols and finer analytical tools are needed to unveil the subtle differences existing between athletes of different competitive standard.(1)

Aim

To compare coordination and coordination variability in RW, and highlight differences between elite-, national- and regional-standard athletes.

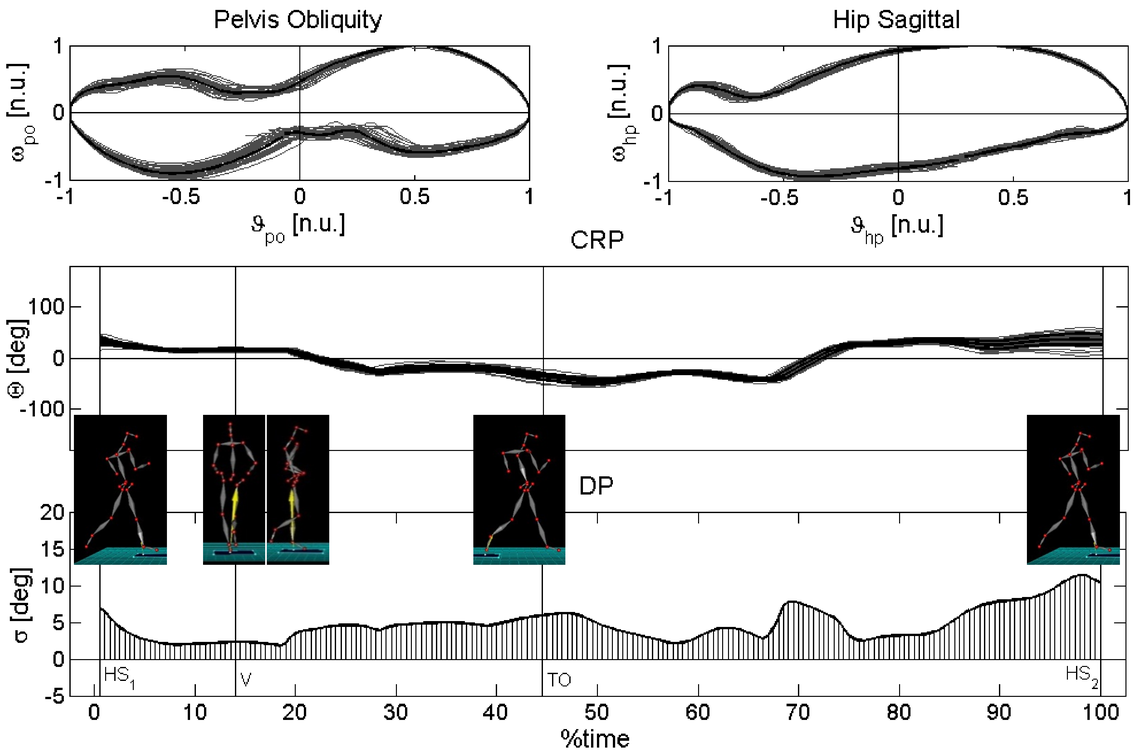

Figure 1. An example of individual continuous relative phase (CRP) analysis including pelvis obliquity and hip sagittal angles. Normalised phase planes (top), continuous relative phase (middle) and its variability (i.e., deviation phase, DP, bottom) are reported. HS= heel strike, V= vertical upright position stance leg, TO= toe-off.

Methods

- 15 competitive male race walkers.
- Cross-sectional design: changes in coordination variability as a factor of skill level (Elite, National or Regional).
- Race-walk on treadmill at 15 km/h, 40 gait cycles/participant.
- 3D pelvis and lower limb kinematics to study coordination variability through a dynamical system approach(2) (Figure 1).
- Multiple joint couplings (e.g. hip-knee, knee-ankle) and movement phases (early/late stance and swing) considered.

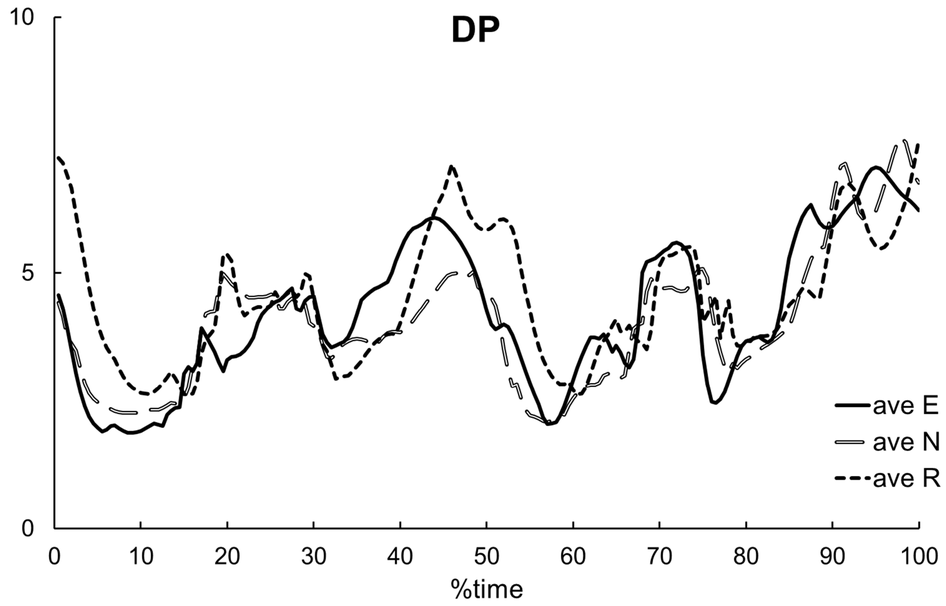

Figure 2. Average deviation phase for the pelvic obliquity – hip sagittal coupling in the three groups (E= elite, N= national, R= regional level race walkers).

Results & Discussion

- Coordination variability appeared to increase during *transition phases* (e.g. heel-strike and toe-off) (Figure 2).
- Less skilled athletes tended to produce larger coordination variability: higher deviation phase during early-stance phase of hip-knee (P=0.20), and pelvis-hip (P=0.09) couplings.
- Coordinative patterns showed potential for characterizing individual peculiarities and to improve the understanding of technical skills, although more work is needed to relate coordinative measures with features of the neuro-muscular-skeletal system organization.

References

(1) Pavei, G., Cazzola, D., La Torre, A., & Minetti, A. E. (2014). The biomechanics of race walking: Literature overview and new insights. *European Journal of Sport Science*, (ahead-of-print), 1-10.
(2) Preatoni, E., Hamill, J., Harrison, A.J., Hayes, K., Van Emmerik, R.E.A., Wilson, C., Rodano, R. (2013). Movement variability and skills monitoring in sports. *Sports Biomechanics*, 12, 69-92.

CONTACT
Dr Ezio Preatoni | e.preatoni@bath.ac.uk
@iszio