INTRODUCTION

The ability to maintain a coordinated running form and stride rate has previously been identified as a technique utilised by elite runners in order to be economical during distance running events (Coyle, 2007). Within this running form stride rate (SR) has been identified as a major contributing factor to running economy and overall run outcome.

SR during Distance Running

Kyröläinen et al. (2000) found an increase in SR during marathon running, perhaps in an effort to combat neuromuscular fatigue.

Mizrahi, Verbitsky, Isakov, and Daily (2000) found a decrease in SR when inducing fatigue over a 30 minute running period.

Due to an increasing number of recreational participants in distance running events this population is of growing interest.

This study therefore aimed to investigate the stride rate dynamics, utilising a novel computational method, produced by a recreational runner when undertaking his first marathon.

METHODS

Accelerometry data from 1 male, (age: 37 years, height: 1.81 m, mass 87 kg) recreational runner undertaking half marathon (12 week) and marathon (16 week) training programmes was utilised.

The participant attached a tri-axial Shimmer 2R™ accelerometer (SHIMMER Ltd, Dublin, Ireland) to their anterior-medial distal tibia bilaterally for each distance running event and training.

Accelerometer calibration resulted in a coordination system which allowed for collection of medio-lateral acceleration in the x axis, vertical acceleration in the y axis and anterior-posterior acceleration in the z axis (Figure 1).

Data were sampled at 204.8 Hz (± 6 g, sensitivity range of 200 mV/g). Right leg accelerometer data from 2 runs (containing up to 14 million data points each) were analysed.

Figure 1. Frontal view of accelerometer attachment to the right shin with superimposed positive coordinate system.

Medio-lateral accelerometry data were low-pass 2nd order reverse filtered at 2 Hz resulting in data representing the gross tibial acceleration pattern.

Stride time was identified via a positive zero crossing, using a custom built LabView™ programme (National Instruments, Newbury, U.K.).

Run time was then broken into 1% epochs and stride rate (strides per minute) was calculated for each epoch.

For data analysis run 1 (R1) was a half marathon and run 2 (R2) was a marathon (Figure 2).

RESULTS

• For investigation one R2half displayed decreased SR and increased SR variance in the 1st third of the race, compared to the same period in R1.

• Variance for the latter two thirds of R1 and R2half were comparable (Figure 3).

• Time to completion for both R1(99 mins) and R2half (102.5 mins) were comparable.

• For investigation two SR variance was increased from 30 km - end of R2 (SR range = 11), compared to start to 21.1 km (SR range = 5) and 21.1 km to end (SR range = 2).

• Less SR consistency for the latter part of the marathon race (R2) (Figure 4).

DISCUSSION & CONCLUSION

Hunter and Smith (2007) stated that in a non-fatigued state runners adopted a preferred SR optimising race performance.

Comparable completion times of R1 and R2half indicate the SR strategies selected by the participant were optimal.

The participant was unable to maintain SR after 30 km identified by a decreasing trend in SR and increased variance in SR.

Increased fluctuations in SR may result in a negative shift of the compromise between minimum amount of force exerted by the muscles and the minimum lower limb stiffness (Snyder & Farley, 2011).

Increasing knowledge on optimal strategies during distance running may be of use to recreational runners undertaking distance events.

REFERENCES


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