COMPARISON OF RUNNING KINEMATICS BETWEEN ELITE AND NATIONAL LEVEL 1500 m RUNNERS

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Previous studies concerning running kinematics have focused on relationships between running kinematics and running economy (Kyröläinen et al. 2001, Williams et al. 1987). However, according to our knowledge there are no studies to compare running kinematics between different level runners in real competition conditions. Thus, the purpose of the present study was to find out whether better runners differ in running kinematics from their poorer counterparts in 1500 m race.

The measurements were performed during the 10th IAAF World Championships (WC) and in a Grand Prix (GP) competition both at the Helsinki Olympic Stadium. In GP, six national level male Finnish runners (seasonal best: 3 min 49.2 ± 3.2 s) were investigated during the second lap of 1500 m race. Their running kinematics was then compared to five elite runners (seasonal best: 3 min 35.6 ± 2.6 s) analysed from the second lap of men's 1500 m final in WC. The data was collected by using two 200 Hz high speed cameras with 3-D pan & tilt system. The motion of the left side of the body was analysed during one stride cycle from each runner by utilizing four point model, which consisted of head (tragus), hip (trochanter major), knee (femoral condyle) and ankle (lateral malleolus).

The running speed was the same for both groups and contact times did not differ between the groups. During the stance phase the lowest knee angle was greater (138 ± 2 vs. 131 ± 4 deg, p<0.01), and averaged extension velocity of the knee angle slower (318 ± 30 vs. 474 ± 90 deg/s, p<0.01) in elite runners as compared to the national level ones. The elite runners flexed their hip faster (157 ± 49 vs. 90 ± 31 deg/s, p<0.05) in the beginning of the swing phase as compared to their national counterparts. Consequently, their hip angle was smaller (132 ± 2 vs. 140 ± 4 deg, p<0.01) during the midstance of contralateral leg.

In the present study the greater knee angle in the middle of the stance phase among elite runners suggests that they have higher muscle stiffness surrounding knee and hip joints in a breaking phase of the contact. This is needed for creating optimal circumstances for utilization of elasticity (Komi & Gollhofer 1997). Further support for superior running technique among elite runners may result from the more efficient function of the hip joint and less work in the concentric push-off phase of the contact. In conclusion, elite runners may utilize elastic energy more efficiently combined with minimized concentric work, leading to improvements in their running economy.

REFERENCES
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