

MAXIMAL SPEED SPRINT RUNNING

INTRODUCTION

The complexity of the tree-structured, non-rigid, multi-segmented running human reflects in the literature on the topic, containing differences and insufficiencies on the understanding of technical execution. Only three studies have looked into the dynamics of *maximal* sprint running [1,2,3]. These 2D studies are limited by sub-optimal equipment and methods, as measured by today's standards. Two of them show consistent results, while the third contradicts.

Our 3D study examines relations between the anterior-posterior (AP) ground reaction force (GRF) component and the net joint kinetics of the support leg for two elite sprinters at maximum constant velocity.

MATERIALS AND METHODS

Support leg activity was captured using two Amti force platforms (960Hz) synchronized with a ProReflex camera system (24 reflective body markers, 7 cameras, 240 Hz). Anthropometric data were collected (11 rigid links) according to Yeadon's method [4], Woltring's GCVSPL algorithm [5] smoothed the data, and a standard 3D inverse dynamics procedure revealed the final net joint kinetics.

RESULTS AND CONCLUSION

The subjects achieved maximums of 9.68 m/s and 9.46 m/s. Almost 80 % of the total work by the support leg joints was done in the sagittal plane. The remaining work was evenly distributed between the frontal and transversal planes. Contradicting the studies above, a substantial hip extensor moment was found throughout most of the support phase. Energy generation at the hip was found to compensate for energy absorption at the ankle. At the knee, a large flexor moment peak was found just after initial contact (IC). This peak coincided with a peak extensor moment at the hip. In conclusion, the hip extensors and the knee flexors contributed strongly to reduce the negative AP component of the GRF in the braking phase. The observed peak moment combination supports the hypothesis that hamstring sprains may occur immediately after IC. The positive AP impulse from the GRF produced in the driving phase seemed to originate from power generation at the hip, succeeded by the knee (negligible) and finally the ankle, causing a proximo-to-distal action sequence.

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