

CHANGES IN SPRINT PERFORMANCE AND KINETICS DURING THE ACCELERATION PHASE OF RUNNING OF A WORLD RECORD HOLDER

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INTRODUCTION: Previously, it was reported that faster athletes tend to produce vertical ground reaction force (GRF) impulse during the acceleration phase of sprint (Hunter et al. 2005). The purpose of this study was to investigate changes in sprint performance and kinetics during the acceleration phase of running for a world record holder.

METHOD: A world record holder (A.P), 100-m best time 9.74sec, and a Japanese Olympic athlete (N.A), 100-m best time 10.02sec, performed several start dashes along a 100m linear indoor track. Cinematographic recordings of sprint were made with 12 infrared cameras (VICON system; VICON Motion Systems, 120Hz), and GRF was obtained from 6 force platforms (90cm×60cm, Kistler-9287A; Kistler, 600Hz). The markers were placed on the lateral surfaces of the joints. The center of mass was identified from the kinematic data. Running velocity was calculated by multiplying stride length (SL) and stride frequency (SF).

RESULTS: During the acceleration phase, the running velocity increased that was accompanied by an increase in the SL while the SF remained unchanged in both sprinters. The SL of A.P was larger than that of N.A at every step. The vertical GRF increased with increasing running velocity, and the peak value of A.P was also larger than that of N.A at every steps (Fig. 1). Even if the vertical GRF was divided by the body weight, the tendency was the same.

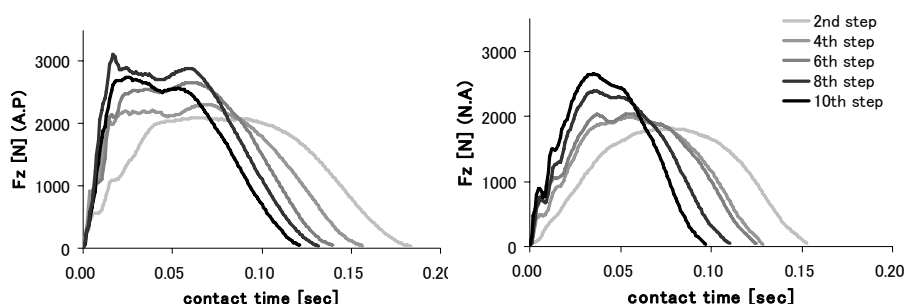


Figure 1 The vertical GRF curves 2, 4, 6, 8, and 10th step, respectively (left; A.P, right; N.A).

DISCUSSION: It was suggested that the increase in the running velocity during the acceleration phase was influenced by the SL rather than the SF in both sprinters. The results indicate that the larger SL of A.P during the acceleration phase is connected with greater vertical GRF.

A world record holder's running performance during the acceleration phase of running is related with larger SL, possibly due to the greater vertical GRF.

REFERENCES:

Hunter et al. (2005). Relationships between ground reaction force impulse and kinematics of sprint-running acceleration. *Journal of Applied Biomechanics*, 21, 31-43.