CHANGE IN GROUND CONTACT KINETICS AS A RESULT OF ACCELERATION TRAINING IN FIELD SPORT ATHLETES
Lockie Robert¹, Murphy Aron², McLachlan Ken², Rees Sven²
(University of Newcastle¹, University of Technology, Sydney², Australia)

A variety of interventions are used to improve acceleration (e.g. plyometrics, weight training, resisted sprinting). The mechanism by which these protocols improve sprint performance is largely unknown. This study evaluated 4 popular protocols: free sprint (FST), weights (WT), plyometrics (PT), and resisted sprint (RST) training. The aim was to identify changes in acceleration ground kinetics, and establish any between-group differences.

33 men (age: 18-39 yrs) were divided into 4 groups (FST = 9, WT = 6, PT = 9, RST = 9) based on 10m velocity. Kinematic analysis included 0-5, 5-10, and 0-10m velocity, stride length and frequency, and contact and flight time. Kinetic analysis included peak braking (BF), propulsion (PF) and ground reaction force (GRF) force, time to peak forces (TBF, TPF and TGRF), and vertical (VI) and propulsion impulse (PI) of the 1st, 2nd and last contact of a 10m sprint. Training involved 2 1-hr sessions a week for 6 weeks. The sprint programs had a total distance of 195m in Week 1, increasing by 20-30m per week. The WT program progressed from 75% 1RM to 90% 1RM by Week 6. The PT program began with 100 total ground contacts, increasing weekly by 12-20 contacts. Repeated measures ANOVA found significant (p < .05) within-group changes. Univariate analysis assessed between-group differences. Effect sizes (Partial Eta²) were checked for comparisons that approached significance.

Following training, each group significantly increased 0-5 and 0-10m velocity by 9-10%. The WT and PT groups increased 5-10m velocity by 10%. There were no significant between-group differences. The FST group had greater relative stride length increases and an increase in mean contact time over each interval. The other groups also increased stride length, but contact times did not differ. The FST group had a significantly longer first stride contact when compared to the PT group after training.

The WT group significantly reduced 1st contact TPF. For the 2nd contact, TBF was significantly reduced for the FST and PT groups; TPF was significantly reduced for the FST and RST groups; and PI was significantly reduced for the FST and PT groups. As a measure of later acceleration, for the last contact of a 10m sprint the WT group significantly reduced TPF. The PT group significantly decreased TBF and PI. The WT group’s last contact PI was lower (p = .095, eta² = 0.22) when compared to the RST group.

This study has revealed essential information about the outcomes of specific training modalities on acceleration. Protocols that overload an athlete (weights, plyometrics, resisted sprinting) may allow for greater acceleration support time maintenance. Resistance exercises incorporating higher movement speeds (resisted sprinting) appear to augment later acceleration propulsion when compared to weights training. With correct administration, all protocols from the current study can improve acceleration, primarily through increased stride length and ground contact efficiency.

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