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RELATIONSHIPS AMONG SPRINT VELOCITIES, HORIZONTAL GROUND REACTION FORCE, AND ISOKINETIC TRUNK STRENGTH

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SUMMARY
The purpose of this study was to investigate the relationships among sprint velocities, horizontal ground reaction force, and isokinetic trunk strength. Voluntary 19 athletes (11 men and 8 women) were participated to the study[age(year)=20.9±2.3,training age (month)=91.3±48.2, body height (cm)=173.1±6.5, body weight (kg)=64.7±8.4] from different sports including explosive strength. Isokinetic trunk strength at 30, 90, 120^{o}.s^{-1} angular velocities were tested. Sprint tests (10, 20, 30, 40m) were tested on a non-motorized treadmill. Subjects were have less affected by horizontal force while performing 40m sprint. The 40m sprint has a statistically highly significant correlation (r=0.851 p≤0.01) with isokinetic trunk strength. In conclusion, trunk flexion and extension strength values are crucial for improving sprint acceleration and horizontal component of ground reaction force.

INTRODUCTION
Derived from Newton's second law, if force applied to an object in a particular direction, the object would move. Whole body's or a limb's relocate time depend on zero to peak velocity for achieve goals.

Sprint running have a crucial role in the most of sports. Ballistic cyclic moves are performed during sprint. Intense contraction, relaxation and stretching states are occurs on muscles while performing cyclic moves and these moves lead on body parts acceleration and deceleration. There is a linear relationship between force and sprint performance. Stronger athletes can perform better during sprint.

Ground reaction force (GRF) and propulsive strength take active role for determining sprint. While performing sprint, external reaction forces may affect athletes' mechanic of sprint running. External forces are; wind resistance, gravity force and GRF, GRF is the most important one. It consist, of two components (horizontal-vertical) and these two components divide into another two sub components (propulsive-braking), athletes should minimize braking GRF and maximize propulsive GRF at acceleration phase to reach maximum velocity throughout sprinting. Short contact time with the ground has an advantage for propulsion. Therefore, the purpose of this study was to investigate relationships among sprint velocities, horizontal ground reaction force, and isokinetic trunk strength.

METHODS
Voluntary 19 athletes (11 men and 8 women) were participated to the study [age (year)=20.9±2.3, training age (month)=91.3±48.2, body height (cm)=173.1±6.5, body weight (kg)=64.7±8.4] from different sports including explosive strength. Sprints (10, 20, 30, and 40m) were tested for horizontal forces on a non-motorized treadmill (Woodway Force 3.0, Woodway Inc., Waukesha, USA). Isokinetic trunk flexion and extension at 30, 90, 120^{o}.s^{-1} angular velocities were tested. Pearson Correlation Coefficient was used for statistical analysis. Probability level was p≤0.05.

RESULTS AND DISCUSSION
Each of the sprint test results (10m, 20m, 30m, 40m) was correlated with horizontal ground reaction force and isokinetic trunk strength (30, 90, 120^{o}.s^{-1}) (p≤0.05). There were significant relationships of horizontal ground reaction force with trunk extension and flexion at 30, 90, 120^{o}.s^{-1} (p≤0.01). Statistically highly significant correlations have been found between 20m and isokinetic trunk extensions (30 and 90^{o}.s^{-1}) (r=0.691; r=0.670; p≤0.01). Statistically significant relationship has been found between 20m and isokinetic trunk extension (120^{o}.s^{-1}) (r=0.480; p≤0.01). Statistically highly significant correlations have been found between 40m-sprint and isokinetic trunk extension

(30, 90, 120^{o}.s^{-1}) (r=0.846; r=0.848; r=0.740; p≤0.01, respectively).

Nesser (2008) found statistically significant relationships of trunk flexion with 20m (r=0.485; p≤0.01) and 40m (r=0.479; p≤0.01). These findings are collateral with the present study. Even though his study couldn't find out relationship between sprints (20m-40m) and trunk extension, the results of this study were contradicted with Nesser (2008)'s study.

CONCLUSION

In conclusion, effect of interaction of the different components (horizontal GRF, trunk strength) on sprint has declared. For future studies, different methods either force plates or high-speed cameras could be usable for evaluation of GRF and propulsive strength. These methods are adaptable to various grounds.

References

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