SPLIT-STEP VS SIDE-STEP EVASIVE RUNNING MANOEUVRES: WHICH IS MORE PROTECTIVE OF THE ACL?

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INTRODUCTION: Side-step movements are typically performed by athletes involved in sports that require the player to evade their opponents. However, the combination of internal rotation, valgus and flexion at the knee during side-stepping places high demands on the ACL such that these movements have been associated with a high incidence of ACL injury (Ebstrup & Bojsen-Moller, 2000). An alternative technique to the side-step is the split-step. Traditionally used in court sports, the split-step is characterised by a more symmetrical approach to the cut movement relative to the side-step and, due to the more even distribution of the ground reaction forces across two lower limbs, may provide greater protection to the ACL. However, as there has been no systematic comparison of the side-step versus the split-step technique, this study aimed to characterise differences in lower limb biomechanics during unplanned side-step and split-step movements, with implications for ACL injury prevention.

METHOD: Twenty-one healthy male and female athletes (age = 23.7 ± 3.7 years; mass = 78.1 ± 11.7 kg; height = 1.75 ± 0.08 m) volunteered for the study. Whilst carrying a ball, each subject was required to react to an unanticipated directional cue and perform a previously assigned side-step or split-step movement, to evade a static simulated defender. Visual directional cues were provided just prior to contact with the force platforms and approach velocity was controlled. During each trial, three-dimensional lower limb kinematic, ground reaction force data and muscle activation data were sampled by the Opto***TRAK*** 3020 motion analysis system (100 Hz), two Kistler force platforms (1000 Hz) and two Noraxon Telemyo systems (1000 Hz). A lower limb model consisting of seven rigid segments (pelvis, feet, shanks, and thighs) was generated and the lower limb knee joint moments were calculated using Visual 3D. The raw muscle burst signals were processed to obtain linear envelopes and a threshold detector determined the temporal aspects of each muscle burst with respect to initial contact and peak knee joint loading.

RESULTS AND DISCUSSION: Although preliminary analysis revealed no significant between-technique differences in the peak knee joint moments, there were strong trends towards subjects displaying lower external rotation and adduction knee joint moments for the split-step compared to the side-step combined with high inter-subject variation. We speculate that these trends may reach statistical significance upon completion of the data analysis. It is postulated that, as subjects distribute the loads generated at landing across both lower limbs during the split-step compared to one limb sustaining the entire load during the side-step, ACL loading will also be reduced.

CONCLUSION: The results of this study will potentially identify which evasive running manoeuvre should be taught to developing athletes to assist in preventing ACL injuries. However, although injury risk may be reduced, future research should investigate the performance implications of employing the split-step technique.

REFERENCES:

Ebstrup, J.F. & Bojsen-Moller, F. (2000). Anterior cruciate ligament injury in indoor ball games. *Scandinavian Journal of Medicine and Science in Sports*, 10, 114-116.