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Kinetic analysis of lunging step among badminton players

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Introduction: Footwork is the most fundamental and critical skills in badminton competitions. A proficient command of footwork enable badminton players quickly move into a best preparing position for shot with excellent balance maintenance and motor control. With the increasing popularity and participation of badminton playing around the world, acquired-techniques differed between individuals. The injury risks arose with the badminton performance difference. Knowing the kinetics of lunging step is not only beneficial for badminton performance but also for injury prevention.

Purpose of the study: The purpose of this study was to investigate the kinetic characteristics between different-leveled badminton players while performing right forward lunging step.

Methods: Six badminton male athletes and six age-matched male amateurs joined in the test. A Novel pedar insole plantar pressure measuring system and a Kistler force platform was synchronized taken to record the insole pressure and outsole force exerted to right foot and lower limb. The ground reaction force in horizontal (Fx), transverse (Fy) and vertical (Fz) axis were recorded to illustrate the kinetic difference. Participants were required to play badminton twenty minutes for warm-up and familiarization of the testing condition. Each participant performed six trials of lunging step with badminton shoes of same brand and series. The SPSS16.0 was taken for the statistical analysis, and significance level was set at 0.05.

Results: In this study, plantar pressure and ground reaction force measurement were taken simultaneously. However, badminton amateurs perform significant lateral shift in the heel-supporting and forefoot-pushing phase during the lunging step. As to the ground reaction force in three axis, badminton amateurs show obviously higher vertical loading rate (Fz') in the striking phase, comparing with badminton athletes (Fz). And badminton amateurs perform smaller vertical ground reaction force (Fz') in the pushing-off phase while finishing shot. In terms of ground reaction force in horizontal and transverse axis, badminton amateurs were lower than badminton athletes.

Discussion & Conclusion: As one of the most frequently used footwork, lunging step is not only related with badminton competition or match performance, but also linked with the ankle sprain and Achilles tendon or lower extremities injuries. In the heel-landing phase, amateurs show a higher vertical loading rate, which has been proven to be a high incidence of stress injuries to the feet or lower limb, especially to metatarsal and tibia stress fracture, patellofemoral pain, Achilles tendinopathy. The lateral shift of foot loading in the heel-supporting and forefoot-pushing phase among amateurs might imply a higher risk of ankle sprain compared with badminton athletes. Combining with the lower ground reaction force in vertical axis, it is related with lunging step performance, which is crucial for balance maintenance and body control for next movement. Considering this findings, it will be beneficial for badminton performance improvement and injury prevention among badminton participants. Further investigation shall take kinematic analysis to deeply and thoroughly illustrate the difference between performance-related badminton participants, so as to provide practical suggestion for badminton training.

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