There are No Sex Differences in the Landing Biomechanics of Youth Soccer Athletes


Context: Postpubertal females have been shown to have different landing biomechanics than males, which may put them at increased risk for ACL injury. Limited knowledge is available regarding sex differences and landing biomechanics in younger populations. Objective: To determine if there are sex differences in youth soccer athletes’ landing biomechanics. Design: Cross-sectional. Setting: Research laboratory. Participants: Sixty healthy soccer athletes (females: n=25, age=10±1 years, height=140.34±6.48cm, mass=33.06±5.03kg; males: n=35, age=10±1 years, height=143.03±6.23cm, mass=34.42±5.34kg) volunteered to participate. Interventions: One set of three trials of a jump-landing task was performed during a single test session. The task required participants to jump forward from a 30cm high box placed a distance of half their height away from a force plate, land with their dominant foot on the force plate, and immediately jump for maximal vertical height. An optical three-dimensional motion analysis system and a force plate measured lower extremity kinematics and kinetics. Main Outcome Measures: Dependent variables included sagittal and frontal plane knee angles at initial contact and peak values over the stance phase. Peak vertical (VGRF), posterior (PGRF), and anterior (AGRF) ground reaction forces (PGRF), internal knee extension moment, and external knee valgus moment over the stance phase were also measured. Forces were normalized to body weight and moments were normalized to body weight and height. Separate one-way analyses of variance were performed on the dependent variables to assess group differences between males and females (α≤.05) and descriptive statistics were used to identify mean values. Results: No significant differences were observed (P>0.05) in our main outcome measures. A descriptive analysis of kinematic variables revealed that at initial contact participants landed with 17.96±6.3° of knee flexion and 0.537±3.77° of knee valgus and peaked at 76.23±9.11° of knee flexion and 5.51±8.21° of knee valgus during the jump landing task. Descriptive analysis of normalized peak kinetic variables revealed VGRF=3.59±0.786%BW, AGRF=0.383±0.253%BW, and PGRF=-1.32±0.318%BW. Conclusion: Male and female prepubertal soccer players are not significantly different in their biomechanical landing strategies and tend to land in an extended knee position. This suggests that injury prevention programs should be implemented in this age group to encourage proper landing technique before sex differences emerge. Word Count: 353