The Analysis of Ground Kinematics in Tie-Down Ropers

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Context: Tie-down roping, an event in rodeo, occurs when the athlete ropes a calf while on horseback, quickly dismounts from the horse and ties three legs of the calf together. Injuries to the knee and lower body have occurred with athletes in the tie-down roping event. Previous research with college rodeo athletes has shown the knee to be the most frequently injured area of the body. The athlete's lower body movements during the dismount from the horse may increase the risk of injury to the knee. However, these movements have not been previously studied in the tie-down roping event. The purpose of this pilot study is to examine the lower body movements of college rodeo athletes during a practice tie-down roping run. **Methods:** Two male tie-down athletes were recruited from local college teams for this pilot study. All participants were screened for musculoskeletal injuries and provided informed consent. Movella Awinda inertial measurement units (IMU) were used to analyze joint kinematics over three trials of the tie-down roping event. Sensors were secured to the posterior pelvis, lateral thigh, and medial shank under the subject's jeans and on top of the foot inside the boot. Movella Analyze Pro software and a custom Matlab script were utilized to deduce the hip and knee joint angles at the time of contact and for the following 100ms. The results of three trials for each subject were averaged and the average of all subjects is reported. **Results:** Left foot ground contact always occurred before right foot ground contact. Hip flexion was 39° ± 15 in the right and 22° ± 3 in the left at ground contact. Both hip angles reduced by 7° toward extension over the next 100ms. Knee flexion was 38° ± 5 in the right and 31° ± 20 in the left at ground contact. Knee angle reduced by 10° over the next 100ms in the right but remained stable (within 1°) over the next 100ms for the left. The knee was slightly adducted at ground contact for the right -.2° ± 7 and -.2° ± 3 left knee. **Conclusion:** These results suggest that hip and knee flexion of tie down roping athletes is insufficient to absorb ground forces during contact with the ground. However, tie down roping athletes are able to maintain a neutral lateral knee angle during ground contact. Understanding the lower body movements during the ground mechanics portion of a tie-down roping run can contribute to the development of strength and injury prevention programs for the athletes.