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Effect of Elastic Resistance on Scapular Kinematics During Overhead Squats: Implications for Shoulder Stability and Rehabilitation

This study investigated the effects of elastic resistance on scapular kinematics during overhead squat movements in 18 asymptomatic adults. Scapular rotations (internal-external rotation, upward-downward, and anterior-posterior tilt), were analyzed using 3D motion analysis under three conditions: no resistance and two levels of elastic resistance. Internal-external rotation showed great differences in resistance-moment at 30°, with R02 vs. R00 differing by 4.2°. Significant resistance-phase-moment interactions were observed. During the load phase at 30°, R01 vs. R00 differed by 8.4°, while R02 vs. R00 differed by 6.7°. For upward-downward rotation, resistance-phase-moment interactions showed differences during the load phase at 60°, revealing a difference of 1.1° between R00 and R01 during the load phase. The anterior-/posterior tilt showed a significant mean effect for phase, with a 0.5° difference during the load phase, and for resistance-moment at 60°, R00 vs. R01 differed by 1.3°. Furthermore, resistance-phase-moment interaction indicated differences during the load phase at 30°, indicating that R01 vs. R00 differed by 1.8, while R01 vs. R02 differed by 2.4°. The results demonstrate that elastic resistance can significantly influence scapular mechanics, providing valuable insights for rehabilitation programs to improve scapular stability. Incorporating elastic resistance into the kinetic chain may help address dysfunctional scapular mechanics, offering innovative strategies for injury prevention and shoulder function optimization in both clinical and athletic contexts.

Keywords

shoulder, kinematics, overhead squat, elastic resistance, kinetic chain

Biography

He holds a degree in Physical Therapy, a master's degree in Administration, and is currently completing his Ph.D. in Rehabilitation at Faculty of Human Kinetics. As a physical therapist, he specializes in the treatment of musculoskeletal and sports-related conditions. His doctoral research focuses on the influence of the kinetic chain on shoulder function using elastic resistance and progressive loading. He also has extensive experience in higher education, having taught Physical Therapy courses in Brazil for over 10 years.