

Frontal Plane Range of Motion Differences in Unilateral and Bilateral Battle Rope Sets: A Pilot Study

JANICE KO, SEAN YONEMORI, & KEVIN A. VALENZUELA

Movement Science Lab; Kinesiology Department; California State University, Long Beach; Long Beach, CA

Category: Undergraduate

Advisor / Mentor: Valenzuela, Kevin (Kevin.Valenzuela@csulb.edu)

ABSTRACT

Battle rope exercises are commonly used among cross-fitters to build overall muscular strength and cardiorespiratory endurance. Although this training method is physically demanding, no studies have examined the frontal plane movements in the lower extremities when performing battle ropes exercises in their different variations. **PURPOSE:** The objective of this research was to compare the frontal plane range of motion (ROM) along with the peak joint angles of the ankle, knee, and hip when performing bilateral and unilateral battle ropes exercises. **METHODS:** Participants with at least six months of resistance training experience performed four sets of bilateral and unilateral battle ropes in a randomized order. The hip, knee, and ankle joint angles were measured using motion-capturing cameras and retroreflective markers placed on the participant's body. Additionally, the sequence of the angles was measured from the top to bottom motion of the right hand during both unilateral and bilateral activities. **RESULTS:** The frontal ankle ROM during unilateral measured 2.1 degrees (peak ankle eversion of -5.2 degrees), while during the bilateral battle rope, there was a 1.0 degrees ROM (peak ankle eversion of -3.6 degrees). Additionally, the frontal knee ROM during bilateral battle rope exercises was 4.0 degrees (peak knee adduction of 3.5 degrees), slightly greater than the unilateral battle rope ROM of 3.6 degrees (peak knee adduction of 2.7 degrees). However, in contrast to the ankle and knee, the hip exhibited a significantly greater ROM of 5.9 degrees (peak hip abduction of -17.8 degrees) during unilateral battle rope exercise, as opposed to the 1.8 degrees of ROM (peak hip abduction of -13.7 degrees) during bilateral battle rope exercise. **CONCLUSION:** This study identified that the hip range of motion was significantly increased when performing unilateral battle rope exercise as opposed to bilateral exercise. The performance of a unilateral battle rope demands a greater side-to-side shift in the frontal plane, requiring the hip joints to accommodate the movements. An increased level of muscular activation in the hip adductors is needed to control the increased range of motion and joint position within the hip joint when performing unilateral battle ropes activities, which involves an increased side to side shifting motion.