Biomechanical Differences in Unilateral and Bilateral Battle Rope Sets

BUILD CSULB

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ABSTRACT

Battle ropes are a useful exercise tool and can be versatile in incorporating different types of movement. The incorporation of battles ropes to a training regime can improve cardiorespiratory fitness and build overall muscular strength. Few studies have looked at the differences in biomechanical factors and muscle activity while performing battle rope sets both unilaterally and bilaterally. The purpose of this study is to look at the differences (both kinetic and kinematic) of the lower extremities while performing battle rope sets. To measure these differences, a force plate along with motion capture software will be used to collect the kinematic and force data of the battle rope sets. All the participants will be asked to do different battle rope exercises to compare the unilateral exercises and the bilateral exercises. The significance of the expected findings will give users knowledge of efficiency of movement, safety of movement, and the ability to apply emphasis on certain muscle groups while using battle ropes.

INTRODUCTION

- Battle ropes are a physically demanding activity that can improve overall cardiovascular performance and muscular strength of both the arms and legs
- Sizes may vary from 30 to 50 lbs and 30 to 60 feet
- Little research has looked the lower extremity mechanics and muscle activation patterns.
- Electromyography and motion analysis systems will look at the mechanics of the hip, knee, and ankle joint, and muscle activity patterns

Figure 1. Battle rope

PURPOSE

- The purpose of this study is to look at the biomechanical differences between bilateral and unilateral battle rope sets to determine effective exercise programming involving battle rope exercises and to prevent injury

METHODS

Sample

- 40 female and male subjects age 18 – 35 who have participated in battle rope exercises for the past 6 months will be recruited from California State University, Long Beach

Procedures

- Subjects will undergo a 5 minute cycling warm-up
- EMG placement upon vastus medialis, vastus lateralis, semitendinosus, biceps femoris, and latissimus dorsi

Figure 2. Placement of EMG onto Vastus Medialis and Vastus Lateralis

Figure 3. Placement of EMG onto Biceps Femoris and Semitendinosus

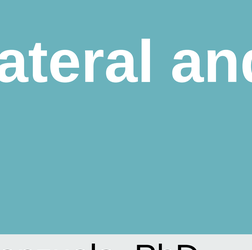

Figure 4. Placement of EMG onto Latissimus Dorsi

- Tracking markers are placed on subjects on landmark bones to track mechanics of the individual.
- In randomized order 8 different sets of 2 different orientations will be conducted

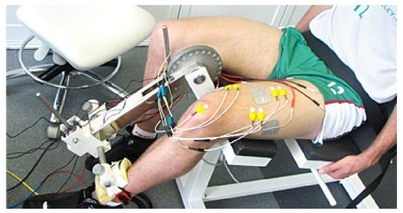

Figure 6. MVIC being conducted with EMG electrodes

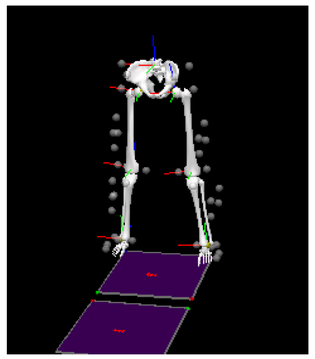

Figure 7. QTM and 3D Visuals showing any deviation from baseline

JUSTIFICATION

- Battle rope exercises may be an effective way to target specific medial vs lateral muscles in the legs and back
- The results of this study will allow for better training programming to prevent injury and to guide rehab of an injury that has already occurred.

EXPECTED RESULTS

- It is projected that when performing unilateral sets there will be an increase in the joint moment of the frontal plane in the ankle, knee and hip joints
- A center of pressure shift is also expected when conducting the unilateral sets

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