

Biomechanics of Isotonic Exercises

Emily Brett

Mercer University School of Engineering

EXTENDED ABSTRACT

Cardiovascular training, plyometrics, and weight bearing exercise are all important for building muscle, enhancing athletic performance, and aiding in the process of healthy living. Isotonic exercise, the technical expression for weight lifting, refers to exercise that involves movement throughout a range of motion during which muscle contract and extend, but tension remains constant. The purpose of this project was to analyze muscle activity and to quantify biomechanical forces while performing three basic isotonic exercises: tricep extensions, bicep curls, and leg press.

Three athletically trained females, all varying in height, performed each of the exercises. LoggerPro Video Physics was used for data collection and motion analysis. The joints included in the range of motion were tagged during the experiment, and low intensity, controlled movement was used throughout the exercises to ensure the information captured on camera was consistent. Anatomical geometry was applied in the numeric calculations for determining the forces associated with the exercise motions.

The muscles found to be primarily active during the three observed exercises include the biceps brachii, the triceps brachii, and the quadriceps. By identifying the involved muscle groups and evaluating the biomechanics of these specific exercises, workout training can be further personalized to emphasize muscle strength and to promote joint health in the body of any individual pursuing the benefits of an active lifestyle.