

TIBIAL ACCELERATION AND EMG DIFFERENCES BETWEEN ISOCALORIC HIGH-INCLINE WALKING AND LEVEL-GRADE JOGGING

Taj Krieger, Motoki Sato, Ricardo Sanchez, & D.E Lankford

Introduction

Human locomotion is driven by the muscles in our lower body and their ability to interact with the ground in a coordinated and well-executed manner. Running and walking are the two most common forms of locomotion that we use on a daily basis.

Many people turn to treadmills as a way to get in exercise. The IHRSA Health Club Consumer Report indicated treadmills to be the most popular piece of exercise equipment 43% of members use them regularly. Of that group, 51% prefer walking, while 28% prefer running or jogging. Recent internet popularity around incline walking has sparked interest after claims that it Burns fat, increases calorie burning, decreased joint forces, increased muscle activation.

There is a lack of research investigating the effects that incline has on impact forces and muscle activation above a 11% grade.

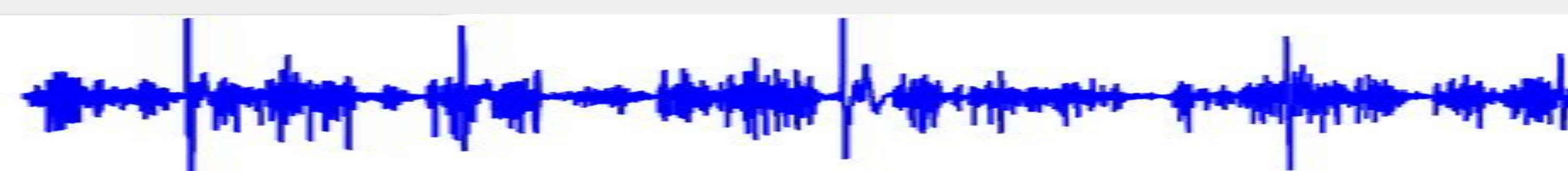


Purpose Statement

Analyze Tibial Acceleration and EMG differences between isocallorically matched 20% incline walking and level grade jogging. Also to determine if incline walking can be used as a substitute for individuals who do not enjoy jogging.

Methods

- Using Isocallorically matched speeds
- Put EMGs on 8 muscles
 - 6 lower body muscles
 - (Gluteus Maximus, Vastus Lateralis, Bicep Femoris, Lateral Gastrocnemius, Soleus, Tibialis Anterior)
 - 2 upper body muscles
 - (Anterior Deltoid, Erector Spinae)
- Preparation
 - Site locations will be shaved, cleaned, and lightly exfoliated
 - Signal to noise ratio will be inspected
- IMUs
 - Placed on lateral shank (collect tibial accelerations)
 - Placed on top of foot (detect foot strike and toe off)
- Testing
 - Subjects will be asked to walk for 10 mins at a 20% incline (speed determined using metabolic cart data from Motoki et al.)
 - 10 minutes of rest between trails
 - They will then complete 10 mins jogging on level grade



Analysis

- A Paired t-test will be used to compare mean muscle activation across stance phase expressed as a % of MVC between run and walk for each muscle.
- A repeated measures T-test will be used to compare Peak Tibial Acceleration during stance between incline walk and jogging

Key

- IMU
 - Inertial Measurement Unit (Acceleration, gyroscope)
- EMG
 - Electromyography (the study of muscle electrical signals)
- Foot Strike
 - When the foot first makes contact with the ground during a locomotion cycle
- Toe Off
 - When the foot loses contact with the ground and begins to return back to start the cycle
- Stance Phase
 - The period where the foot is in contact with the ground.

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