

# ELECTROMYOGRAPHY OF THE HIP AND THIGH MUSCLES DURING TWO VARIATIONS OF THE LUNGE EXERCISE: A CROSS-SECTIONAL STUDY

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## ABSTRACT

**Background:** The lunge is a closed kinetic chain exercise that athletes frequently use as part of training and rehabilitative programs. While typically performed on a stable surface, modifications include the use of balance platforms to create an unstable surface and suspension equipment. Suspension training exercises are theorized to be higher demand exercises and may be considered a progression from exercises on stable surfaces. Comparison of muscle recruitment between the suspended lunge and the standard lunge has not been reported.

**Hypothesis and purpose:** The purpose was to compare differences in muscle recruitment between a standard lunge and a suspended lunge. We hypothesized that hip and thigh muscle recruitment with a suspended lunge would be greater than a standard lunge due to less inherent support with the suspended lunge exercise.

**Study Design:** Analytic, observational cross-sectional study design.

**Methods:** Thirty healthy participants (15 male and 15 female) voluntarily participated in this study. Electromyographic (EMG) muscle recruitment was measured in five hip and thigh muscles while performing a standard and suspended lunge. EMG was expressed as a percentage of EMG with a maximal voluntary isometric contraction (MVIC).

**Results:** Recruitment was significantly greater in the suspended lunge condition compared to the standard lunge for the hamstrings ( $p < .001$ ), gluteus medius ( $p < .001$ ), gluteus maximus ( $p < .001$ ), and adductor longus ( $p < .001$ ). There was no significant difference in rectus femoris recruitment between conditions ( $p = .154$ ).

**Conclusion:** Based on EMG findings, the suspended lunge is a more demanding exercise for hip muscles, compared to the standard lunge.

**Level of evidence:** Level 3 Mechanism-based reasoning intervention study trial.

**Clinical relevance:** The results of this study can assist clinicians in designing and progressing lower extremity exercise programs. With greater muscle recruitment, the suspended lunge is a more demanding exercise for hip muscles and can be considered a progression of the standard lunge as part of an exercise program

**What is known about the subject?** Muscle recruitment associated with the lunge exercise, variations of the lunge, and similar exercises has been reported. The use of suspension training exercise equipment has been reported for upper extremity exercises however not for the lower extremity.

**What does this study add to existing knowledge?** Results of this study provide novel EMG information related to the lunge exercise using suspension training exercise equipment. Clinicians can use this information designing lower extremity exercise programs.

**Keywords:** Electromyography, Exercise Therapy, Lunge, Suspension Training

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