

EMG Analysis of Neural Activation Patterns of the Gluteal Muscle Complex

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ABSTRACT

Gluteal amnesia is described as a condition in which the neural recruitment patterns of the gluteal muscle complex are insufficient to activate muscle fibers, causing the hamstring and lower back muscles to take up the physical demand. Symptoms due to insufficient gluteal muscle activation include tight hamstrings post-exercise, anterior pelvic tilt, and knee valgus during squat or lunge performance. This could lead to compensation injuries of the lumbar, knee, and ankle joints. Many physical therapy rehabilitation programs of the lower back and lower extremity incorporate gluteal exercises which could potentially treat this condition and prevent compensation injuries. **PURPOSE:** To identify and test a person experiencing symptoms of gluteal amnesia to determine gluteal muscle activation before and after a therapy program designed to enhance muscle recruitment and function. **METHODS:** A 74-year-old male experiencing symptoms of unilateral gluteal amnesia was recruited for this case-study. Electromyographic (EMG) analysis of the gluteal muscle complex was recorded while the subject performed movements typically associated with gluteal muscle complex activation. Both the affected and unaffected side were analyzed while the subject performed movements, as well as submaximal and maximal voluntary isometric contractions (MVIC). After baseline testing, a daily, 3-week progressive resistance rehabilitation program consisting of exercises utilizing the gluteal muscle complex was completed. After completion of the rehabilitation program, EMG analysis of the affected and unaffected sides was performed as during the baseline measures. Integrated EMG signals of gluteal activation were compared between pre- and post-tests. Baseline EMG was considered to be 100% of muscle activation. The post-rehabilitation EMG during MVIC was a percentage of the maximal effort output. MVIC of the submaximal tests were obtained by comparing the quadruped hip extension and single leg glute bridge exercises to the standing gluteal squeeze, and the quadruped hip abduction and clam shell exercises to the side lying hip abduction. **RESULTS:** Increased gluteal complex activation post-rehabilitation was evident in both the affected and unaffected limbs. Specifically, the largest increases of the left and right side were seen through the quadruped hip extension (18.7%, 52.4%) and quadruped hip abduction (54.1%, 98.8%) exercises, respectively. The left limb presenting with gluteal amnesia symptoms consistently gave lower output values. **CONCLUSION:** In this case-study, increased EMG activity in the affected muscles, progressive increases in resistance during daily rehabilitation and anecdotal improvements in movement patterns were observed. Based on the results of this case-study, treatment for conditions such as gluteal amnesia and other disorders of ineffective motor unit recruitment should include targeted rehabilitation exercises designed to isolate the affected musculature.