GLUTEAL AND TFL MUSCLE ACTIVATION STRATEGIES DURING BAND ASSISTED HIP REHABILITATION EXERCISE PROGRESSIONS

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INTRODUCTION
Clinically, there has been an interest in the relationship between hip and spine function since the first reporting of hip-spine syndrome [1]. This work discussed the effects of a pathological hip joint on spine function. Others [2,3] have suggested an association between low back pain (LBP) and gluteal muscle inhibition as part of the functional presentation in some patients with LBP. A variety of exercises are offered to enhance gluteal muscle activation during functional rehabilitation. Recent studies [4,5] have begun to compare muscle activation levels across multiple exercises that are commonly used to challenge the gluteal muscles. However, there is a paucity of information regarding the within exercise progression, specifically relating to exercise modifications. A critical question for constructing a progressive exercise rehabilitation program is the knowledge of muscle activation levels across exercises and within exercise modifications. This knowledge will allow the clinician to design a rehabilitation program tailored to the patient's capabilities and spine tolerance. This research seeks to understand the influence of resistance band position on muscle activation profiles during two commonly used rehabilitation exercises. The effects of altering resistance 'mini-band' placement (i.e., around the knees, ankles, and feet) during two rehabilitation exercises (commonly referred to as 'monster walks' and 'sumo walks'), which use upright, semi-squat postures during gait to target increased muscle activation of the gluteal muscles and TFL, were analyzed.

METHODS
Nine healthy male volunteers formed a convenience sample and performed two styles of modified gait exercises with three band placements, while the activation of hip muscles and three-dimensional (3D) body segment kinematics were recorded. Three electromyography (EMG) channels measured neural drive of selected muscles of the right hip muscles: gluteus maximus (GMax), gluteus medius (GMed), and tensor fascia latae (TFL). Eight optoelectronic cameras captured kinematic data. Participants were briefly coached on the main features of the exercises and given an opportunity to practice until they felt comfortable and had achieved competence based on the clinical goals of the exercise. Three resistance band placements (i.e., around the knees, ankles, and feet) during the two exercises were utilized to provide a progressive challenge to the gluteal muscles while repeated measures analysis of variance (ANOVA) with a Bonferroni adjustment was used to assess differences in mean EMG.

RESULTS
Examining muscle activation profiles in the three hip muscles of interest revealed the progressive nature of the neural drive when altering band placement. TFL demonstrated a progressive activation when moving the band placement from the knee to the foot, but not between the ankle and foot placements. GMed demonstrated a progressive activation when moving distally between band placements. GMax was preferentially activated only during the foot placement. In addition, spine motion was minimized during these exercises and held in a near neutral position while the expression of motion occurred at the hip joint.

DISCUSSION & CONCLUSIONS
The band placements offered a progressive increase in challenge for hip rehabilitation, specifically the gluteal muscles, while maintaining a fixed neutral spine. The added benefit of placing the band around the fore-foot was selective enhancement of the gluteal muscles versus TFL – presumably by adding an external rotation effort to the hips. Moreover, unlike other exercises often prescribed for gluteal rehabilitation, these exercises can be used in neutral spine posture with limited spine movement. This information may assist those who address gluteal activation patterns for patients suffering hip and back conditions where gluteal activation has been affected.

REFERENCES

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