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Spring 5-3-2023

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#### Recommended Citation

Soliman, Jolene Kay and Smith, Jo Armour, "Central Modulation of Postural Control in Response to Task Demands and Fatigue in Individuals with and without a History of Low Back Pain" (2023). *Student Scholar Symposium Abstracts and Posters*. 571.

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# Central Modulation of Postural Control in Response to Task Demands and Fatigue in Individuals with and without a History of Low Back Pain

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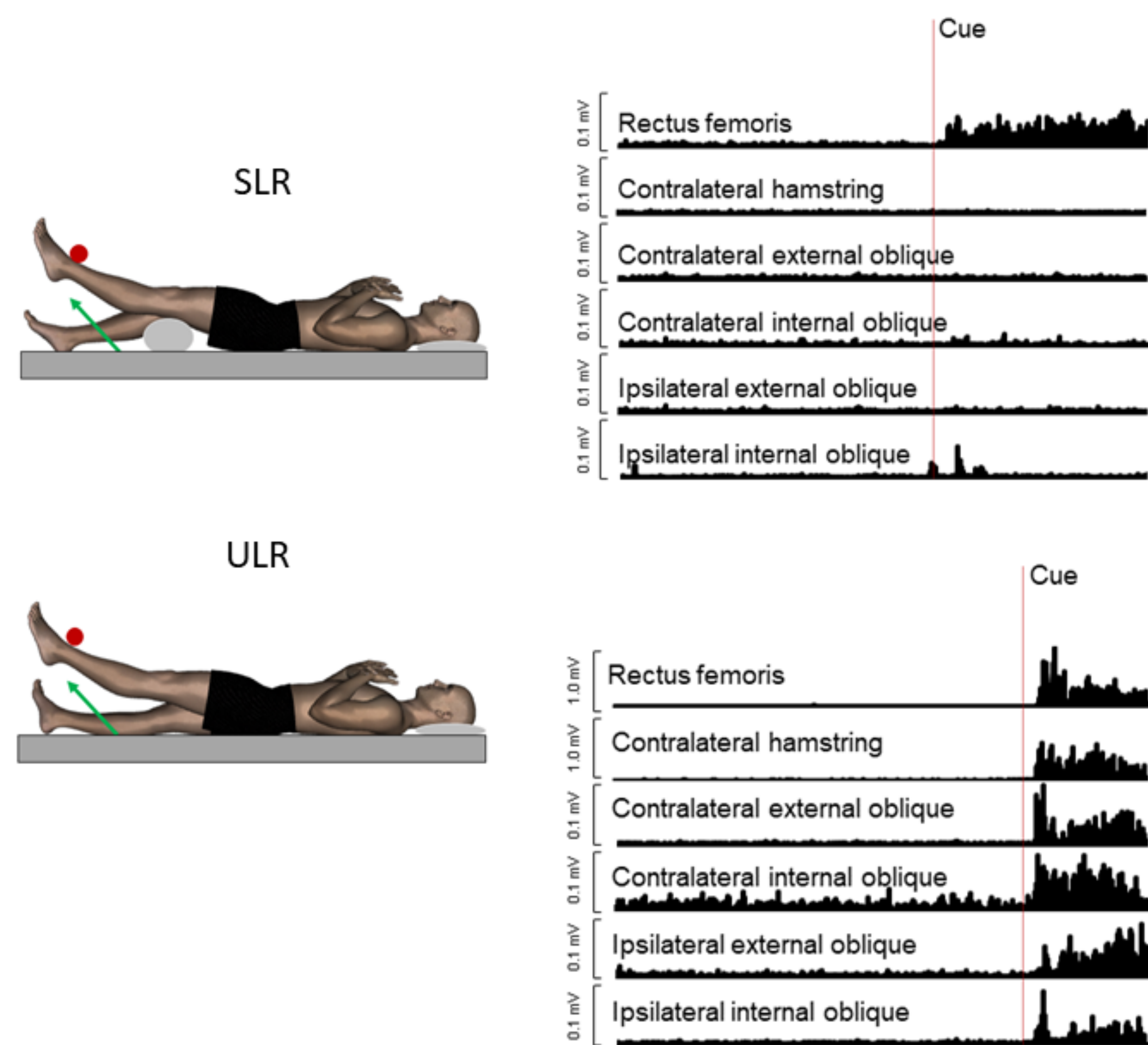


Figure 1. Supported (SLR) and unsupported (ULR) leg raise tasks, with APAs evident during the ULR

## Background

- Anticipatory postural adjustments (APAs) are feedforward postural activation of the trunk and hip musculature during voluntary limb movement
- Symptomatic individuals with persistent low back pain (LBP) experience delayed trunk muscle APAs<sup>1</sup>
- It is not clear how spatial APA organization is affected by LBP and how it may be centrally modulated by muscle fatigue<sup>2</sup>
- We hypothesized that individuals with a history of LBP demonstrate increased amplitude of APA activation in non-fatigued muscles following fatiguing exercise

## Conclusion

- Central modulation of APAs in non-fatigued muscles occurs in response to fatiguing exercise in order to maintain postural stability
- The ability to modulate abdominal muscle APAs in response to fatigue and task demands is impaired in young adults with a history of LBP even during symptom remission

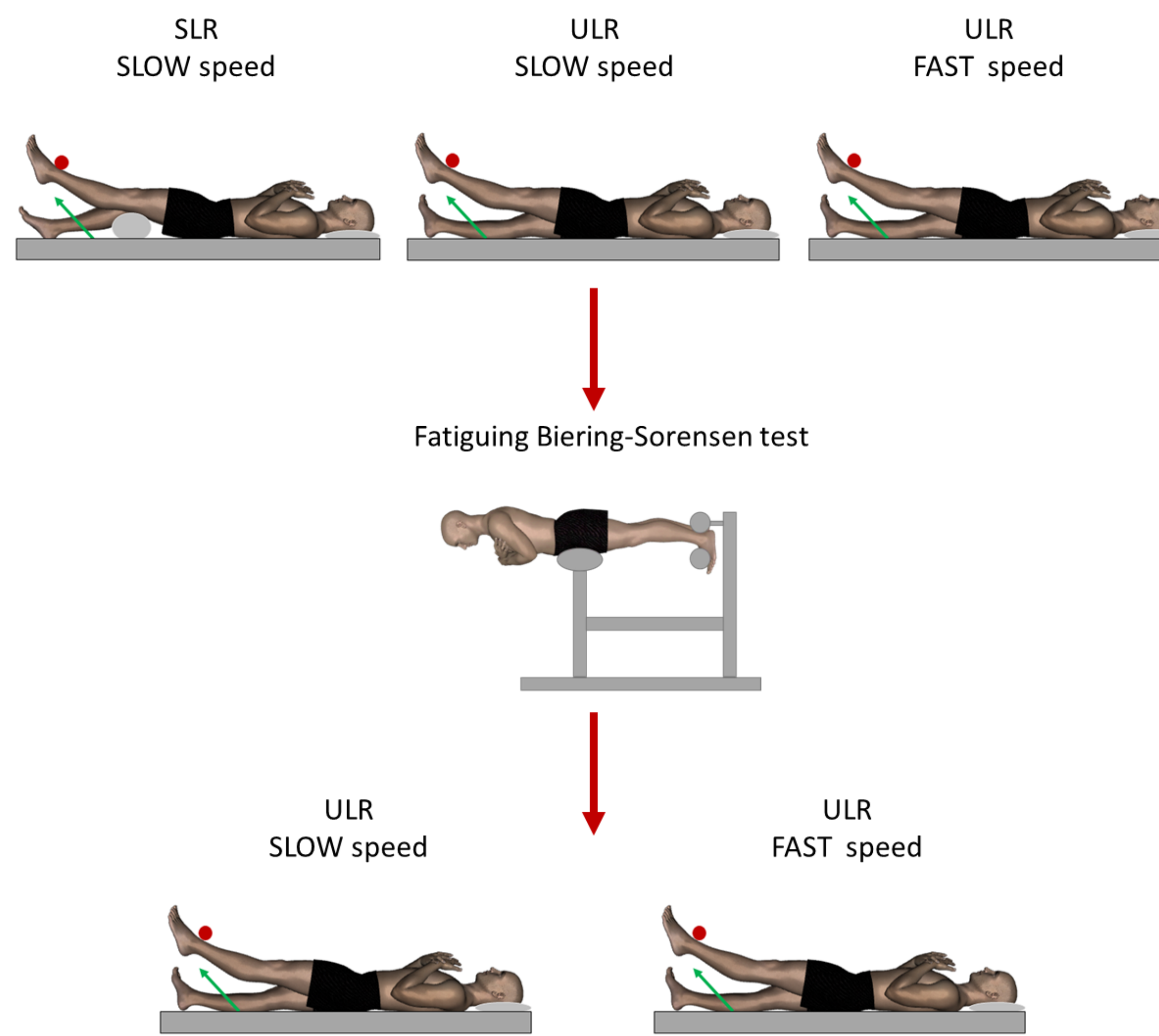


Figure 2. Supported (SLR) and unsupported (ULR) leg raises performed at two speeds, pre- and post-fatigue

## Methods

- 40 right-limb dominant participants between the ages of 18 to 35 years:
  - Low back pain group (n=25)
  - Healthy group (n=15)
- Surface electromyography electrodes placed bilaterally on the internal obliques (IO), external obliques (EO), biceps femoris (HS), and left rectus femoris (RF)
- Participants performed two versions of a leg raise task<sup>3</sup> (Figure 1): The supported leg raise (SLR) does not elicit APAs. The unsupported leg raise (ULR) elicits APAs in the abdominals and contralateral hamstrings
- 10 repetitions of SLR and ULR were performed before and after fatiguing paraspinal exercise (Figure 2)
- Root mean square amplitude of APAs and speed of task performance (raise time) was calculated
- Mixed model ANOVA tested for main effects of task (5 levels: SLR, ULR SLOW and FAST pre-fatigue, ULR SLOW and FAST post-fatigue) and group, and task by group interactions

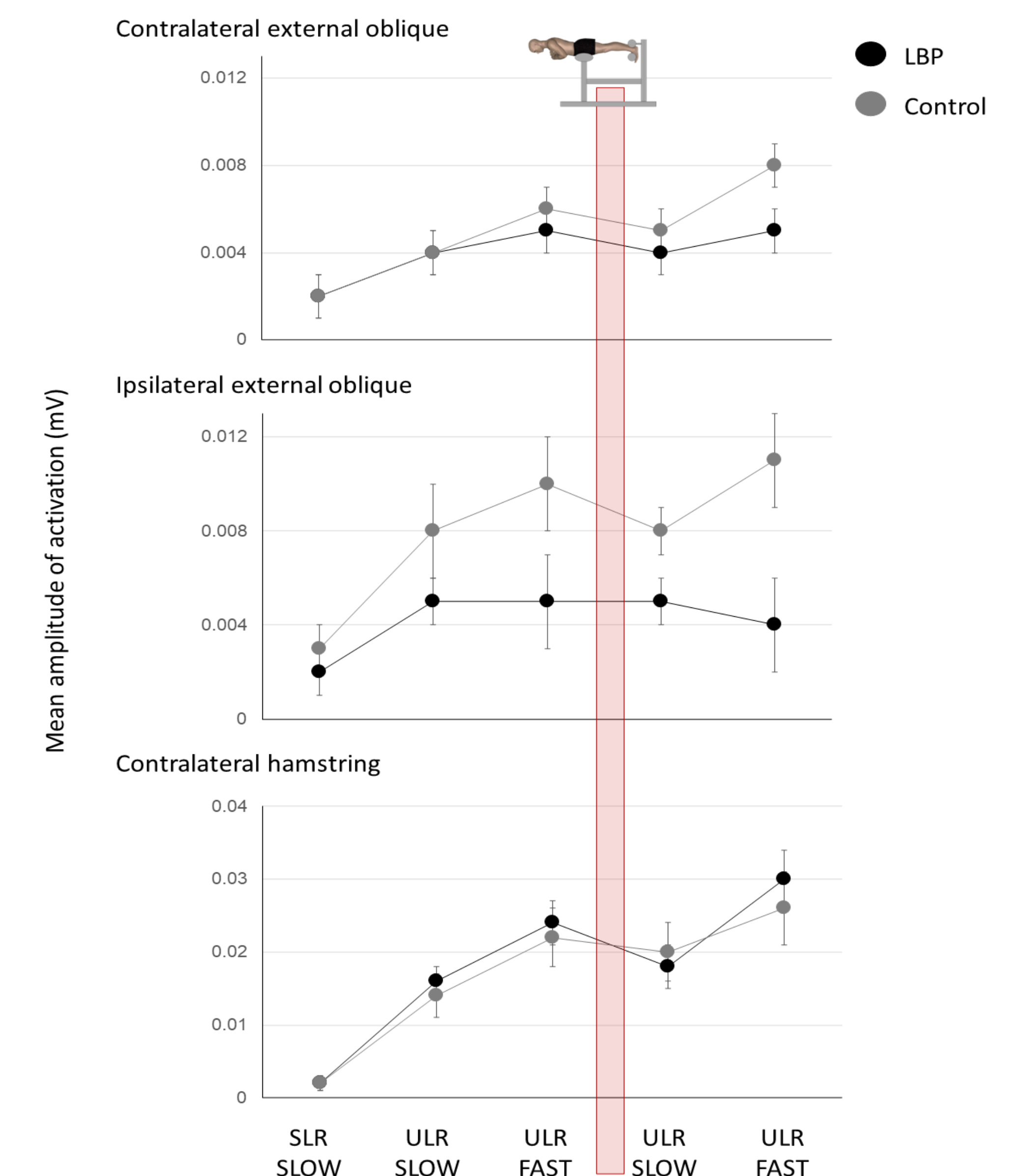


Figure 3. Task and group comparisons for bilateral external obliques and contralateral hamstrings

## Results

- Raise time was faster for the ULR FAST than the ULR SLOW pre- and post-fatigue ( $p < 0.001$ )
- Raise time did not differ between groups and remained the same post-fatigue ( $p > 0.05$ )
- For all muscles, APA amplitude increased with task difficulty and with task speed (Figure 3)
- For right and left EO there was a significant task by group interaction ( $p = 0.036/0.030$ )
- Amplitude of activity increased for ULR FAST pre-fatigue in both groups, but the speed-dependent increase in amplitude did not occur in the LBP group post-fatigue (Figure 3)

## References

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## Acknowledgements

This study was funded by a grant from NICHD (K01 HD092612)