Spring 5-1-2024

Postural Control in Young Adults with and without Recurrent Back Pain: Influence of Symptom Characteristics

Rachel Berns
Chapman University, rberns@chapman.edu

Postural Control in Young Adults With and Without Recurrent Back Pain: Influence of Symptom Characteristics

Rachel Berns, Jo Armour Smith Ph.D, PT, OCS (emeritus)

Chapman University Crean College of Health and Behavioral Sciences - Department of Physical Therapy

INTRODUCTION

Low back pain (LBP) affects ~10% of the world's population,[1] making it a global health concern that requires further assessment. The highest incidence of new episodes of low back pain occur in young adulthood.[2] Therefore, understanding what underlies back pain, especially in these young adults, gives us an opportunity to improve preventative measures and best practices for managing its progression. It is unclear how factors such as postural control, muscle fatigue, and anticipatory postural adjustments (APAs) contribute to back pain in young adults. While these factors differ between individuals with and without LBP, our goal is to understand the heterogeneity in these differences within back pain populations. This study aimed to examine anticipatory postural muscle activation in adults with and without recurrent low back pain to determine the influence of muscle fatigue and typical symptom characteristics on trunk muscle activation.

METHODS

	Back-healthy controls (n = 30)	Individuals with back pain (n = 55)	
Age	24.0 (4.3)	22.9 (3.1)	**0.014**
Sex			0.758
Male	11	20	
Female	19	34	
Non-binary		1	
BMI	22.0 (2.2)	24.0 (4.0)	**0.005**
Racial Categories	0	1	>0.05
American Indian/Alaska Native			
Asian	14	17	
Black	0	6	
Native Hawaiian/Pacific Islander	1	1	
White	14	38	
Depression	2.9 (2.7)	3.8 (3.3)	0.162
Anxiety	6.9 (2.8)	8.5 (4.4)	**0.038**
Physical Activity (MET-hours)	47.0 (13.4)	49.8 (13.6)	0.380
Positive Affect	24.2 (7.4)	20.3 (7.1)	0.052
Negative Affect	5.1 (6.0)	8.7 (7.0)	**0.047**
Pain Duration (years)	N/A	4.9 (2.2)	
Pain Intensity (VAS)	N/A	49.7 (20.9)	
Pain Impact	N/A	9.5 (3.9)	
FABQ (physical domain)	N/A	10.2 (4.9)	
Disability (%)	N/A	15.9 (12.7)	

Figure 1: Demographics of study participants.

Figure 2: Rapid arm raise and Sorensen task demonstration.

This study was approved by the Chapman IRB (#1617H094/22-295), and funded by the Eunice Kennedy Shriver National Institute of Child Health & Human Development (#K01HD092612).

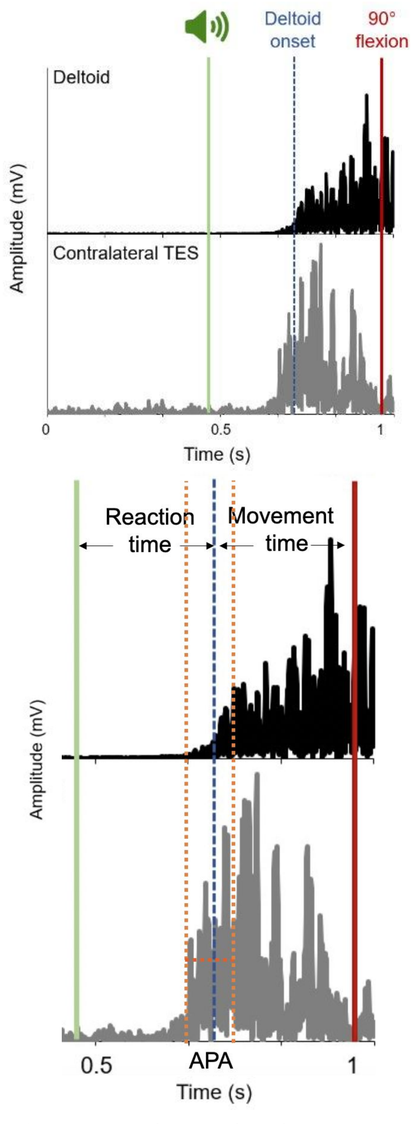
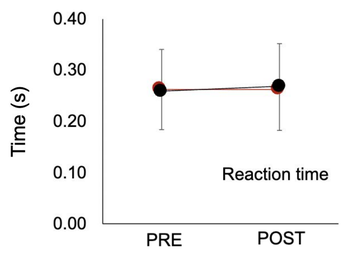


Figure 3: Sample EMG data during APA window.

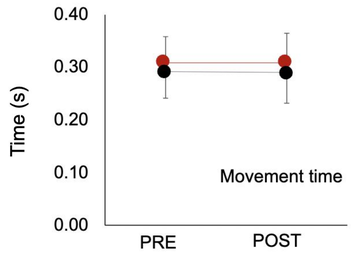
RESULTS



TASK PERFORMANCE

- Task performance did not differ:
  - between groups
  - post-fatigue

Control LBP



EFFECT OF FATIGUE AND GROUP

Changes in activation in response to fatigue

- Anticipatory activation occurred 6-10 ms earlier post-fatigue:
  - Contralateral thoracic erector spinae (TES) and external oblique (EO)
  - Ipsilateral lumbar erector spinae (LES)
- Average amplitude decreased 5-8% post-fatigue:
  - Contralateral external oblique (EO) and internal oblique (IO)

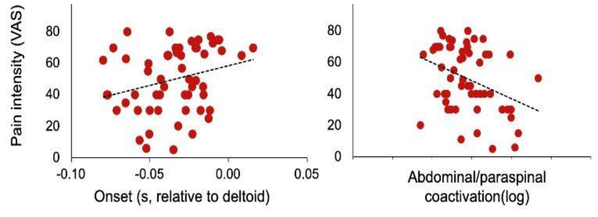
Differences in activation between groups

- Timing and amplitude of activation did not differ between groups before or after fatigue

ASSOCIATIONS WITH SYMPTOMS

	Latency cTES	Latency iTES	Latency cEO	Latency iIO	Coactivation cIO/iIO	Coactivation cEO/iEO	Coactivation Abdo/ES
Pain intensity							
r	0.157	**0.267**	**0.318**	0.248	**-0.278**	-0.264	**-0.359**
p	0.258	**0.048**	**0.023**	0.083	**0.040**	0.051	**0.007**
Pain impact							
r	0.002	0.117	0.256	**0.280**	**-0.314**	**-0.290**	**-0.342**
p	0.960	0.395	0.069	**0.041**	**0.020**	**0.032**	**0.011**

- Greater pain intensity and pain impact were associated with later onset of activation and reduced coactivation



CONCLUSIONS

- Adaptations in the timing and amplitude of anticipatory postural muscle activation occur in fatigued and non-fatigued muscles
- Young adults with greater severity and impact of typical back pain symptoms demonstrate delayed APA onset and reduced muscle coactivation, even during periods of symptom remission
- Ongoing work is determining the relationship between APA characteristics and symptom trajectory over time

REFERENCES

1. Ferreira, M. L., et al. March, L. (2023). Global, regional, and national burden of low back pain, 1990–2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. *The Lancet. Rheumatology*, 5(6), e316–e329. https://doi.org/10.1016/s2665-9913(23)00098-x
2. Hestbæk, L., et al. (2006). The course of low back pain from adolescence to adulthood. Spine *(Philadelphia, Pa. 1976) / Spine*, 31(4), 468–472. https://doi.org/10.1097/01.brs.0000199958.04073.d9