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# Impact of Warrior Poses on Quadricep Muscle Activation



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## Abstract

The purpose of this study was to compare the impact of Warrior poses I, II, and IV on quadricep muscle activity. The null hypothesis stated that no significant differences would be found in quadriceps muscle activation between the three Warrior poses. Six college-aged females ( $20.67 \pm 0.62$  yrs) with at least two years of experience participated in the study. Surface electromyography (sEMG) was recorded during maximum voluntary isometric contractions (MVICs) of the right and left vastus medialis (VM), and vastus lateralis (VL). Participants performed the Warrior poses and held each pose for 10 seconds. A 1-min break was given between each pose. All trials were recorded. Sensors detected muscle activity was processed and sent to EMGworks® for analysis. Calculation of root mean squares (RMS) were used to select MVIC for normalization. Mean muscle activation values indicated that the quadriceps muscle were activated in all poses. An ANOVA two-factor test without replication did not reveal significant differences for the entire muscle between Warrior I, II, and IV. The null hypothesis was accepted.

## Introduction

Yoga is an alternative form of exercise that improves health and fitness through the integration of the mind, body, and spirit.<sup>1</sup> Yoga improves strength and flexibility<sup>2,3,4</sup> reduces the risk of cardiovascular disease and improves quality of life.<sup>5</sup> Although yoga has many benefits, researchers aim to identify yoga postures that strengthen muscles surrounding the knee while minimizing potentially damaging knee loads.<sup>1</sup> Quadriceps strengthening is recommended for managing knee pathologies such as osteoarthritis (OA).<sup>6,7</sup> Loss of quadriceps strength is also implicated in the initiation and progression of symptomatic knee OA.<sup>6,7</sup> Surface electromyography (sEMG) has been used in yoga studies to assess lower extremity muscles.<sup>8</sup> Previous studies have compared various balance exercise programs to determine the most effective exercise to improve balance ability in the knee joint.<sup>9</sup> Balance exercise programs have been reported to increase quadriceps and hamstring muscle strength.<sup>9</sup> However, repeated single limb exercises should be performed carefully so that muscles are not overworked.<sup>9</sup>

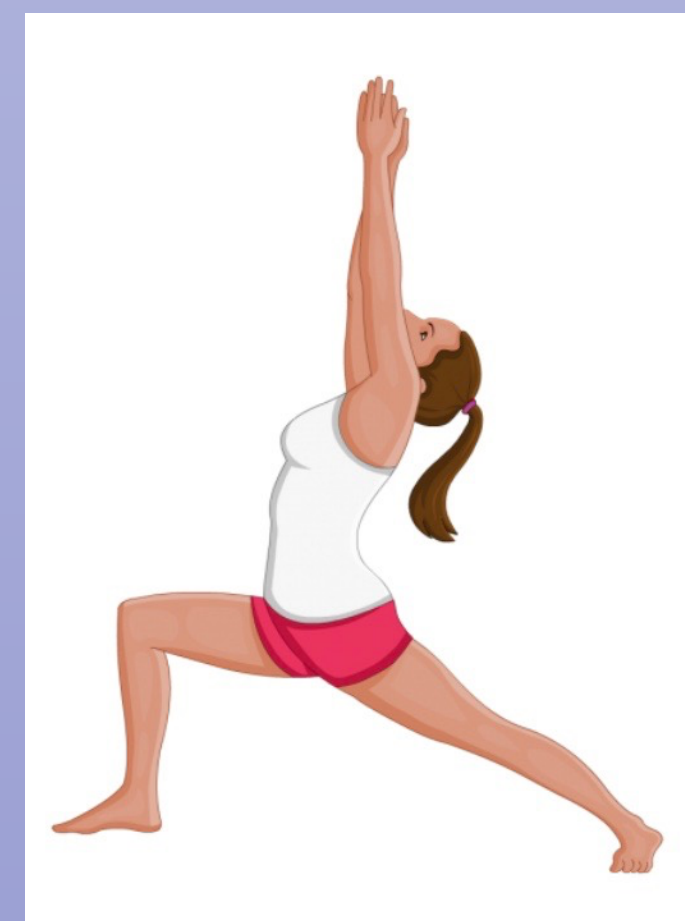


Figure 1.  
Warrior I



Figure 2.  
Warrior II



Figure 3.  
Warrior IV

## Methods

### Setting

- Human Performance Laboratory at small private Midwestern University
- Spring 2020

### Participants

- 6 female college yoga practitioners ( $20.67 \pm 0.62$  yrs.,  $66 \pm 4.8$  kg,  $168.3 \pm 4.5$  cm)

### Procedures

- Demographics were measured with stadiometer.
- 5-min. warm-up on cycle ergometer.
- Skin surface was cleaned and electrode sensors placed on the muscle belly of the R & L vastus lateralis & vastus medialis.
- MVIC was collected for each muscle using weight bench.
- 3 Warrior poses were performed while video-recorded.
- Sensors detected muscle activity and sent signals to EMGworks® to be processed.
- Randomized Block Design two-factor ANOVA without replication was used to analyze the data.

## Results

Table 1

Mean percent MVIC activation: LVM

n	WI	WII	WIV
6	41.27	42.91	38.12

Table 2

Mean percent MVIC activation: RVM

n	WI	WII	WIV
6	49.28	44.74	52.29

Table 3

Mean percent MVIC activation: RVL

n	WI	WII	WIV
6	70.12	46.33	60.49

Table 4

Mean percent MVIC activation: LVL

n	WI	WII	WIV
6	70.76	60.24	61.79

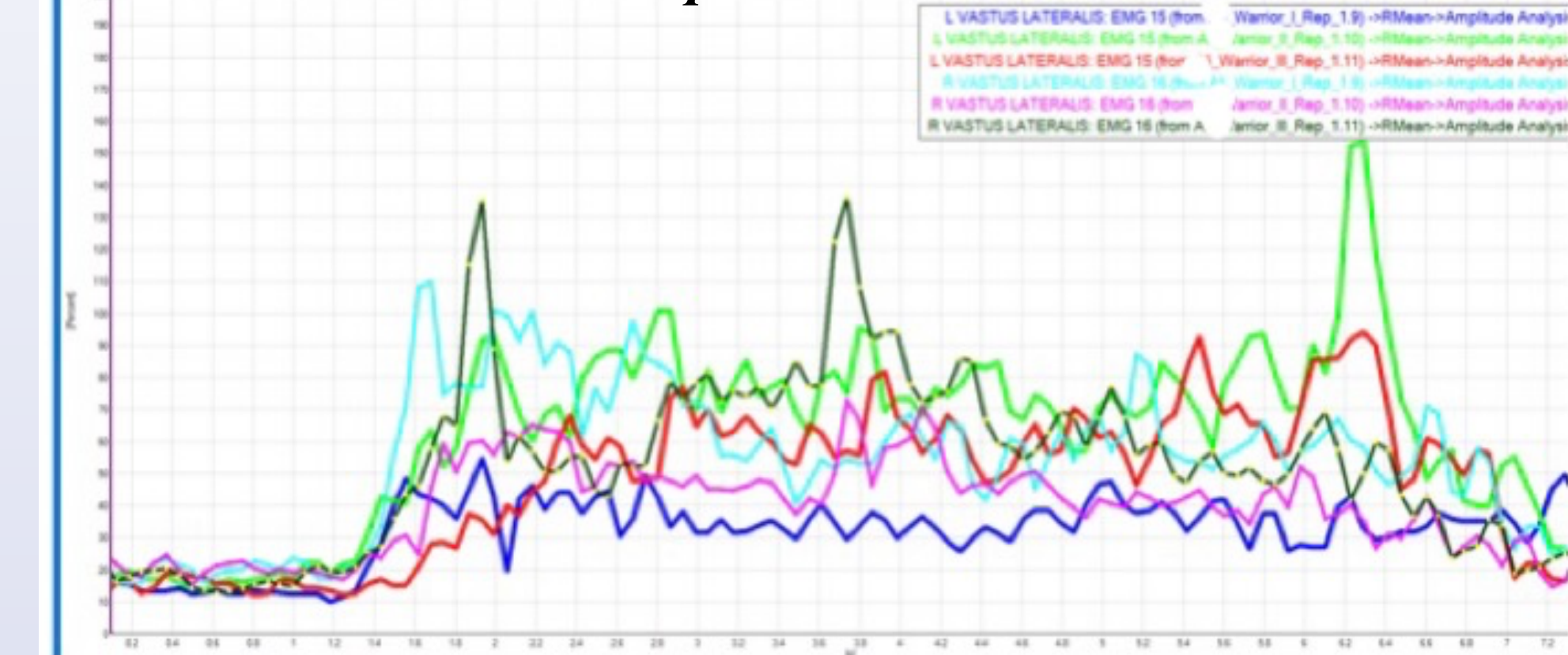
### Acknowledgements

I would like to recognize and thank Dr. Kelly Helm for both supervising and assisting me throughout my entire study. It was a privilege working under her guidance. I would also like to thank my six participants for helping me accomplish this study. I could not have done it without their willingness to participate. Thanks to Terry Wade for helping with data analysis and Theresa Augle for formatting help. I'd like to thank Darby Kloweit for both assisting and participating in my study. Lastly, I am extremely grateful for my classmate Cody Dolloway for helping throughout my entire data collection.

## Results cont.

Figure 4

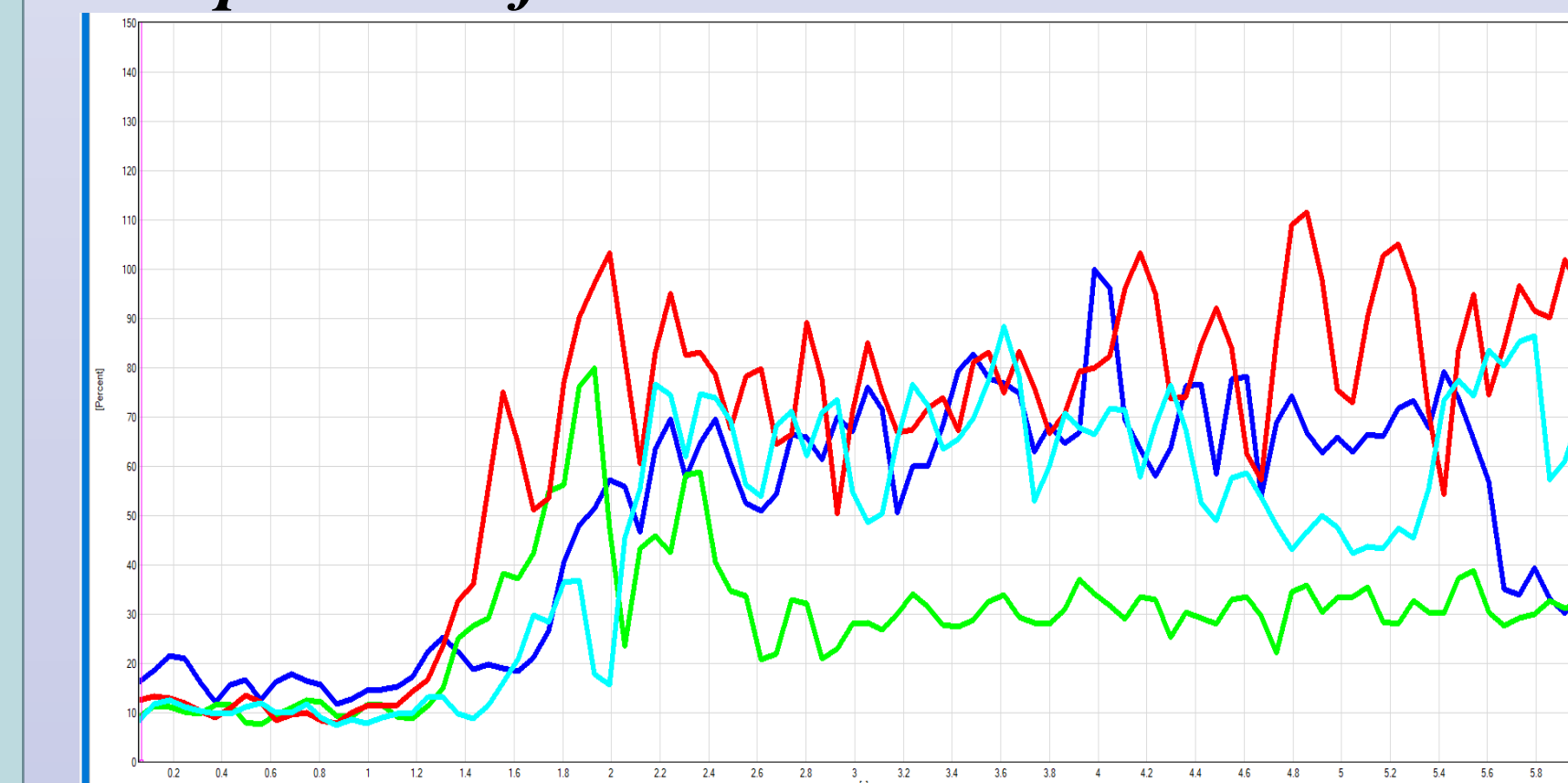
R & L Vastus Medialis: 3 poses



No significant differences for the entire muscle between Warrior poses I, II, and IV.

Figure 5

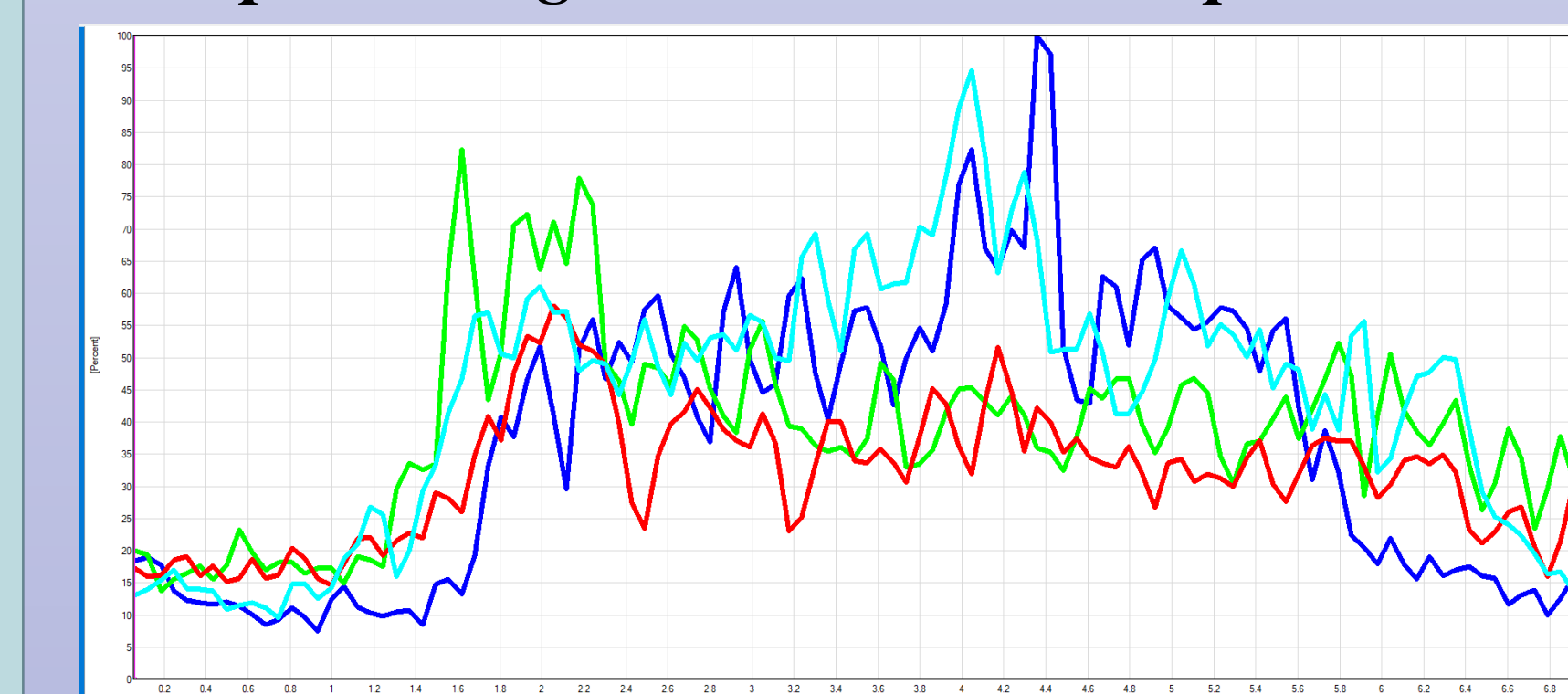
Comparison left vastus medialis: 3 Poses



Left Vastus Medialis (front leg)  
Blue: MVIC  
Green: Warrior I Pose  
Red: Warrior II Pose  
L. Blue: Warrior IV Pose

Figure 6

Comparison right vastus medialis: 3 poses



Right Vastus Medialis (rear leg)  
Blue: MVIC  
Green: Warrior I Pose  
Red: Warrior II Pose  
L. Blue: Warrior IV Pose

## Conclusions

Although the quadricep muscles were activated in all poses no significant differences were found between Warrior poses I, II, and IV. The muscle activation present in the quadriceps muscles during each Warrior pose may suggest that because each pose is similar (although have different purpose) may account for the results found in the study. Researcher concluded that there was no significant difference in mean muscle activity for the vastus lateralis and vastus medialis between the three Warrior poses, however quadricep muscle activation was present which may indicate the potential benefit of each pose. Further research is needed with a larger sample size and modification in duration for holding the pose could be changed.

### References

1. Apollo, K., Kelley, K., & Slattery, K. (2018). An electromyographic analysis of selected asana in experienced yogic practitioners. *Journal of Bodywork & Movement Therapies*, 22(1), 152-158.
2. Bukowski, E. L., Conway, A., Glentz, L. A., Kurland, K., & Galantino, M. L. (2006). The Effect of Iyengar Yoga and Strengthening Exercises for People Living with Osteoarthritis of the Knee: A Case Series. *International Quarterly of Community Health Education*, 26(3), 287-305.
3. Cheung, C., Resnick, B., & Wyman, J. (2012). Is yoga effective for knee osteoarthritis in older women? *Osteoarthritis and Cartilage*, 20(1), 280.
4. Ebnezar, J., Nagarathna, R., Nagendra, R., & Yogitha, B. (2012). Effects of an integrated approach of hatha yoga therapy on functional disability, pain, and flexibility in osteoarthritis of the knee joint: a randomized controlled study. *The Journal of Alternative and Complementary Medicine*, 18(5), 463-472.
5. Ross, A., & Thomas, S. (2010). The health benefits of yoga and exercise: a review of comparison studies. *The Journal of Alternative and Complementary Medicine*, 16(1), 3-12.
6. Findlay, C., Nevitt, M. C., Segal, N. A., Torner, J. C., & Wang, K. (2012). The longitudinal relationship between thigh muscle mass and the development of knee osteoarthritis. *Osteoarthritis and Cartilage*, 20(12), 1534-1540.
7. Brandt, K. D., Braunstein, E. M., Byrd, D., Hellman, D. K., Katz, B. P., Mazzuca, S. A., & Slemenda, C. (1998). Reduced quadriceps strength relative to body weight: a risk factor for knee osteoarthritis in women? *Arthritis & Rheumatism*, 41(11), 1951-1959.
8. Giannico, K., Kelley, K., Lesnet, G., & Romano, A. (2019). A comparison of EMG output of four lower extremity muscles during selected yoga postures. *Journal of Bodywork & Movement Therapies*, 23(2), 329-333.
9. Choi, B.-R., Park, S.-J., & Shim, S.-J. (2017). Comparison of quadriceps, hamstring, and gastrocnemius muscle co-activation in balance exercises. *Isokinetics & Exercise Science*, 25(4), 309-316.
10. <https://www.ritualflow.com/guides/warrior-one-pose/> (Image for Figure 1)