

# Identifying Sex-Differences In Neuromuscular Patterns Of Response During Unilateral and Bilateral Fatiguing Body Weight Squats

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## INTRODUCTION

Prior studies demonstrated that during submaximal exercise, women exhibit greater resistance to fatigue than men<sup>1</sup>. However, the mechanisms mediating these differences remain unclear.

## PURPOSE

The purpose of this study was to examine sex differences in the neuromuscular patterns of response during unilateral (UL) and bilateral (BL) bodyweight (BW) squats to failure.

## METHODS

**Table 1.** Participant Characteristics

	Male	Female
Weight (kg)	78.1±12.5	68.0±9.6
Height (cm)	176.8±5.8	164.3±6.4
Age (years)	24.0±4.4	25.8±3.3
PA Level (min)	241.0±110.8	255.0±117.6

*Physical Activity (PA) level measures resistance exercise per week.*

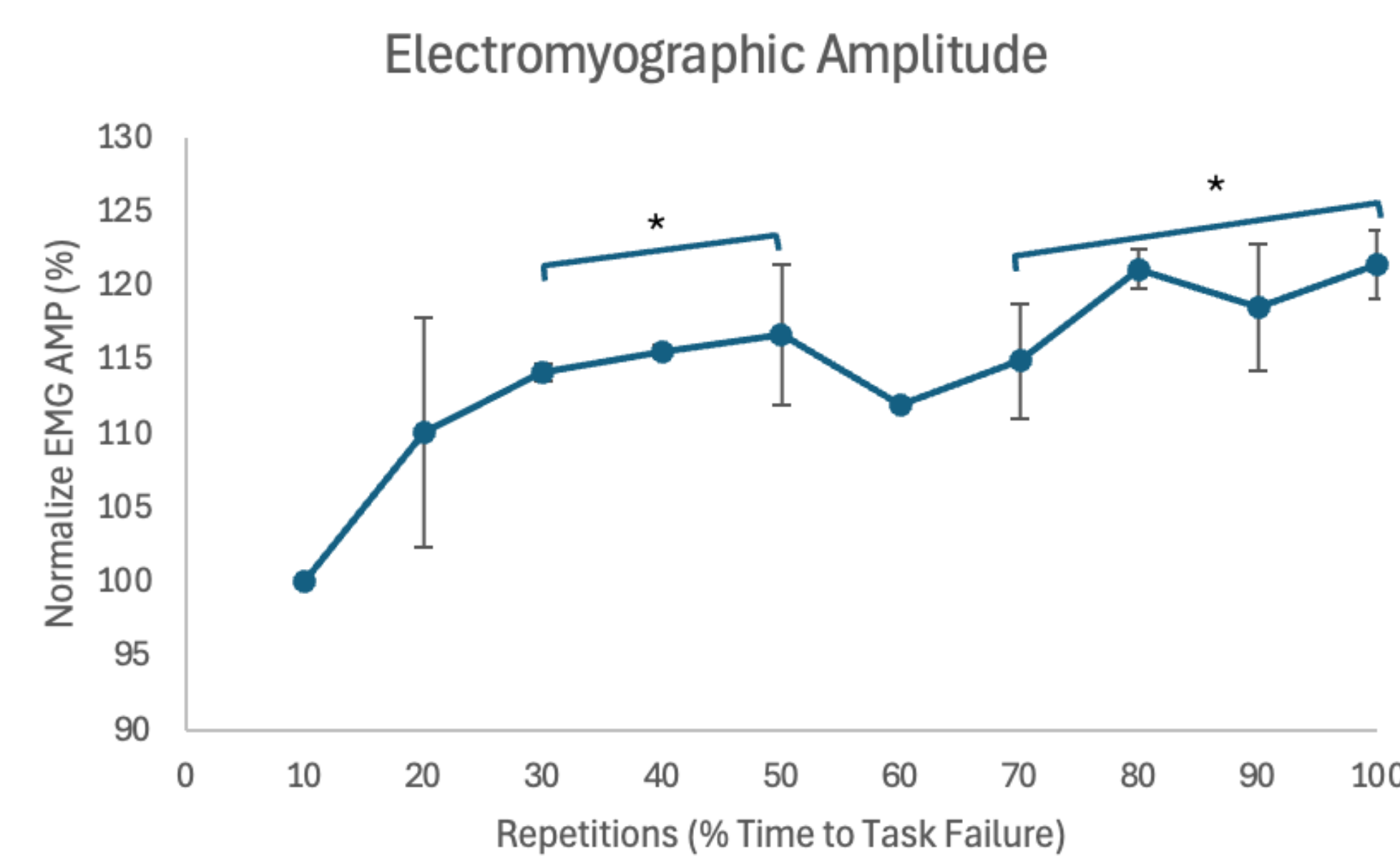
## PROCEDURES

- Participants performed UL and BL BW squats at full range of motion until failure, in random order on separate days. BW squats were done in a standing position, lowering to 90-degree knee flexion and returning to a standing position.
- For UL, participants placed their non-working leg on a bench behind them.
- Data was collected using electromyography (EMG) sensors attached to the vastus lateralis (VL) and bicep femoris (BF) muscles.

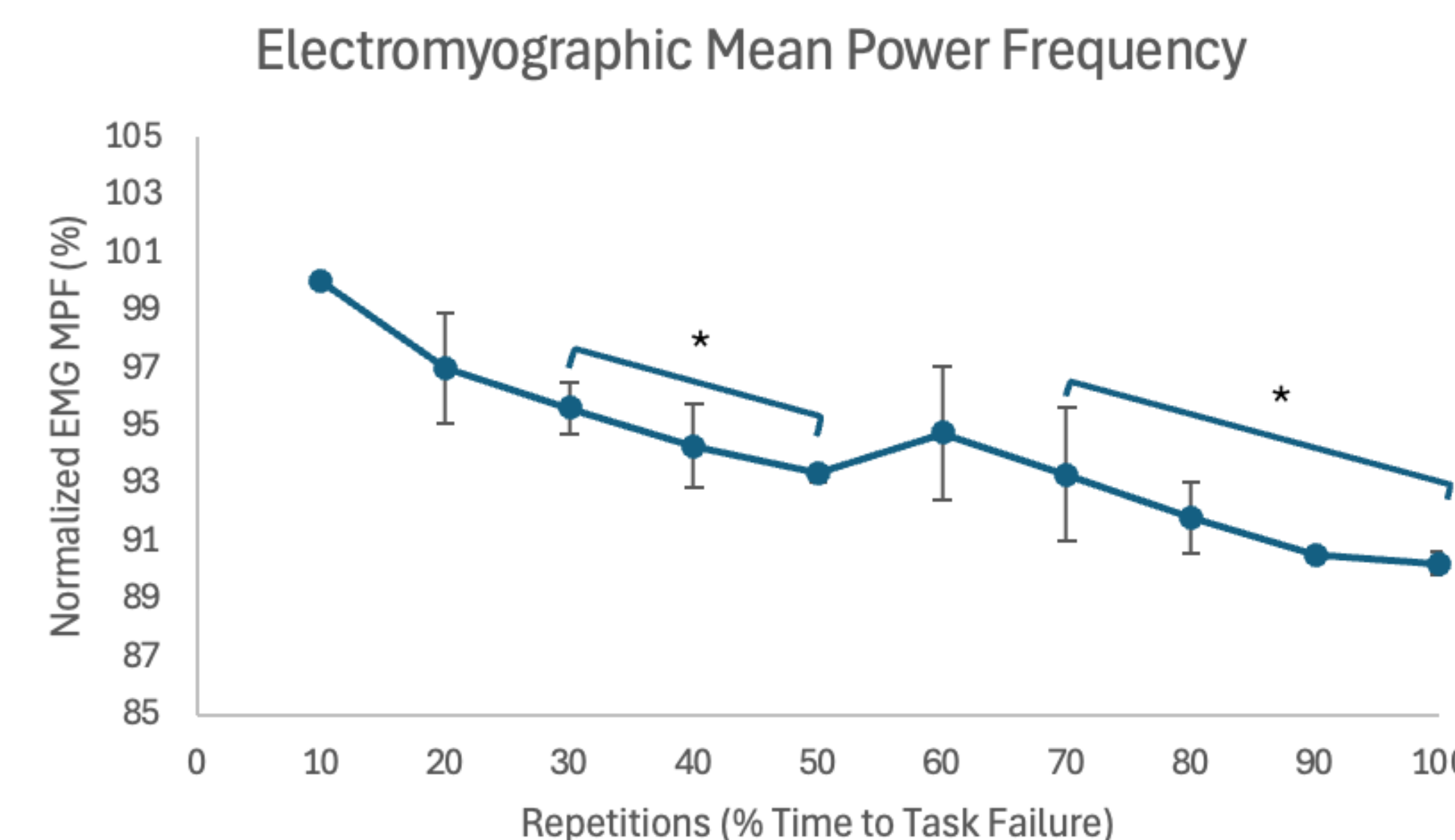


**Figure 1.** Example of participant performing unilateral fatiguing task with EMG sensors.

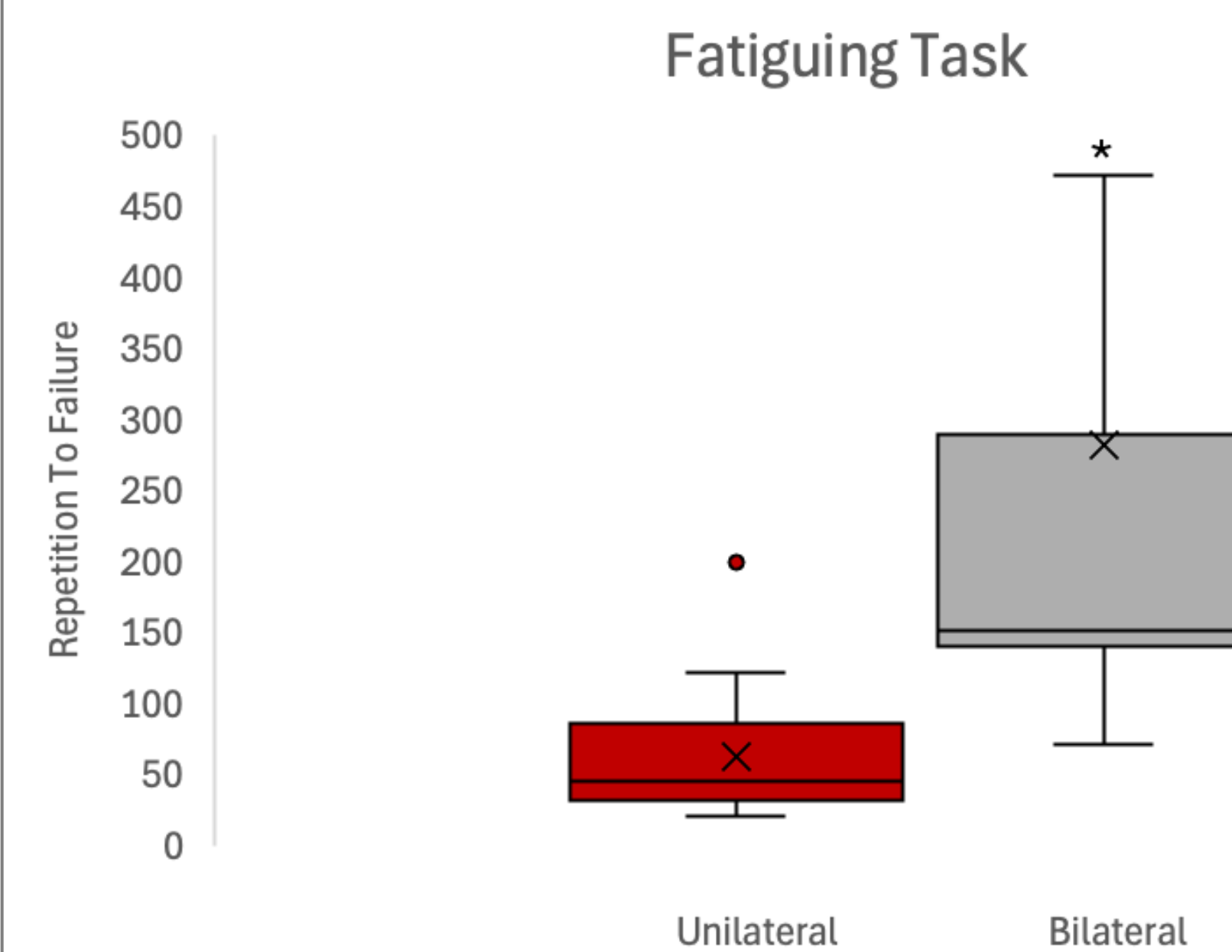
## RESULTS



**Figure 2.** Mean ± Standard Deviation of Electromyographic (EMG) amplitude (AMP) during the submaximal fatiguing task, collapsed across modality. \* Indicates a significant ( $p<0.05$ ) difference from the value at 10% time to task failure.



**Figure 3.** Mean ± Standard Deviation of Electromyographic (EMG) Mean Power Frequency (MPF) during the submaximal fatiguing task, collapsed across modality. \* Indicates a significant ( $p<0.05$ ) difference from the value at 10% time to task failure.



**Figure 4.** Mean ± Standard Deviation of the repetitions performed during the Unilateral and Bilateral fatiguing tasks. \* Indicates a significant ( $p<0.05$ ) difference in the number of repetitions performed. Note:  $n=2$  was removed from the figure due to performing 892 and 1136 repetitions for the UL and BL modalities, respectively.

- The EMG AMP results indicated no significant 3-way or 2-way interactions ( $p>0.05$ ), but a significant main effect for Repetition ( $p<0.001$ ).
  - Post-hoc pairwise comparisons demonstrated that compared to the value at 10%, the values at 30-50% ( $p=0.009-0.016$ ) and 70- 100% ( $p<0.001-0.012$ ) time-to-task failure (TTF) were significantly greater.
- For EMG MPF, the results indicated no significant 3-way or 2-way interactions ( $p>0.05$ ), but a significant main effect for Repetition ( $p<0.001$ ).
  - Post-hoc pairwise comparisons demonstrated that compared to the value at 10%, 30- 50% ( $p<0.001$ ) and 70%-100% ( $p<0.001-0.002$ ) TTF were significantly lower.

- Analysis for Repetitions completed demonstrated no Sex by Condition interaction ( $p=0.601$ ) but a significant main effect for Condition ( $p=0.006$ ).
  - Post-hoc pairwise comparisons demonstrated that the participants performed significantly more repetition during the BL ( $282.2\pm281.2$ reps) than the UL condition ( $62.8\pm43.9$ reps).

## CONCLUSION

- Under submaximal conditions, men and women exhibited a similar increase in neuromuscular excitation (EMG AMP) and development of peripheral fatigue (EMG MPF) in response to submaximal fatiguing exercise.
- Our finding suggested that under submaximal conditions, there were no sex-specific differences in the neuromuscular patterns of response.

## Practical Application

Under submaximal conditions, exercise-induced fatigability may be more attributable to perception of fatigue than excitation-contraction coupling failure. Practitioners may use athletes' ratings of perceived exertion to determine fatigability from submaximal exercise, regardless of sex.

## Citation

- Hunter SK. The Relevance of Sex Differences in Performance Fatigability. *Med Sci Sports Exerc.* 2016 Nov;48(11):2247-2256.