Kinetics and Lower Extremity Muscle Activation during the Maximum Isometric Mid-thigh Pull and Belt Squat

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INTRODUCTION

- Isometric mid-thigh pull is a highly studied performance test
- Isometric belt squat is increasingly popular due to reduction of spinal loading[1,2]
- There is little research isometric mid-thigh pull to the isometric belt squat
- Our **purpose** was to compare the kinetics and lower extremity muscle activations during maximum isometric mid-thigh pull and belt squat testing.

METHODS

17 healthy, active participants (13F, 4M).

Testing protocol:

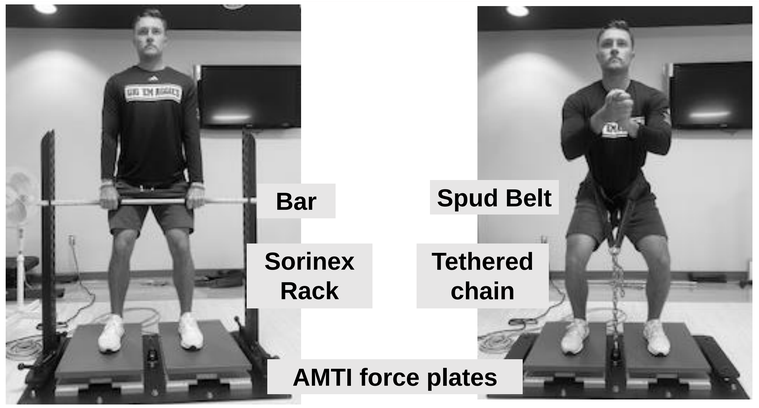
- Familiarization session and 2 counterbalanced experimental sessions
  - Isometric mid-thigh pull
  - Belt squat
- Dynamic warm-up, 2 submaximal practice trials, and 4 maximal 5 second trials
- High density EMG measured on right leg
- Vertical ground reaction forces for each limb.

Lower limb muscles

Rectus Femoris

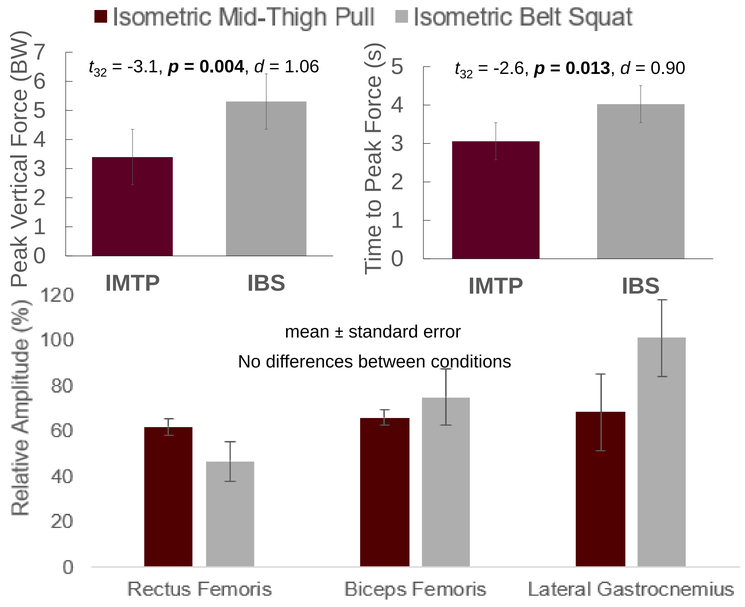
Biceps Femoris

Gastrocnemius



Isometric Mid Thigh Pull Isometric Belt Squat

RESULTS



Peak muscle activation amplitude (% mid-thigh pull peak amplitude)

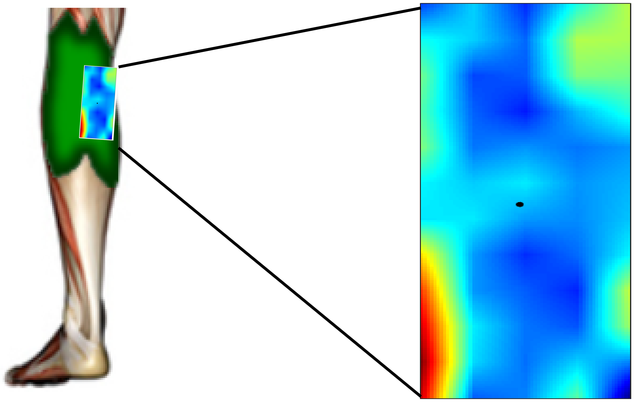
DISCUSSION

- **Greater peak vertical forces that occurred later** during the **isometric belt squat** compared to the isometric mid-thigh pull
- Equivalent lower limb muscle activation amplitudes in each condition

PRACTICAL APPLICATIONS

- Isometric belt squat provides an alternative to the isometric mid-thigh pull that may be more effective for assessing lower limb strength
- High-density electromyography may identify localized electrical muscle activation and loading during isometric strength testing

High-density EMG spatial map



REFERENCES

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2 Joseph L, Reilly J, Sweezey K, Waugh R, Carlson LA, Lawrence MA. Activity of trunk and lower extremity musculature: Comparison between parallel back squats and belt squats. J Hum Kinet. 2020. 31;72(1):223–8.