The Effect of a Lace-Up Ankle Brace on Squatting Mechanics

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Background

"With a prevalence of 20%, ankle sprains are the **most frequent** injuries in athletes"

"Taping and ankle braces are the most advocated interventions to **prevent** ankle injuries"

Alfuth et. Al 2014

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Background

- Ankle bracing has the **potential** to cause deleterious biomechanical deviations at the knee during plyometric tasks.
- Research has found that anatomically **restricted dorsiflexion** has been shown to cause **movement compensation** during the overhead squat.

Klem et. al 2016; Dill et. al 2014

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Purpose

Hypothesis - Wearing a lace-up ankle brace during an overhead squat will lead to compensatory strategies at the knees, hips, and shoulders in the form of changes in joint angles.

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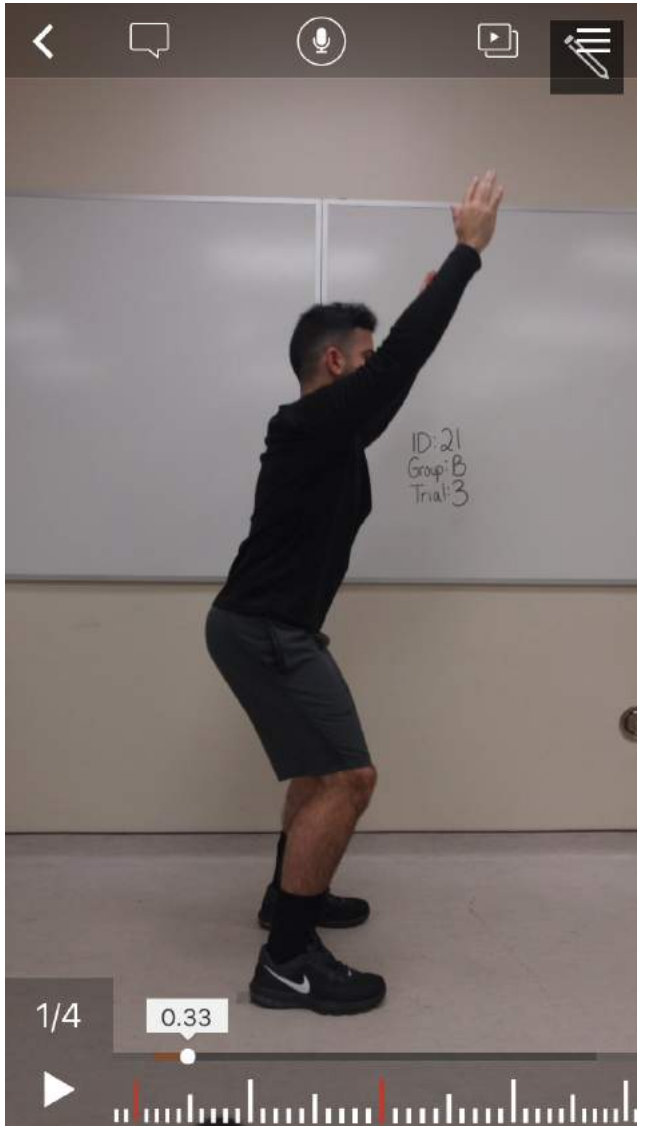
Methods

- 30 Healthy Participants
  - 22-34yo
  - 17 F & 13 M
- Warm-up
- Single OH Squat (3 Conditions)
  - No ankle brace
  - Right ankle brace
  - Bilateral ankle braces
- Squat order randomized
- Standardized verbal script



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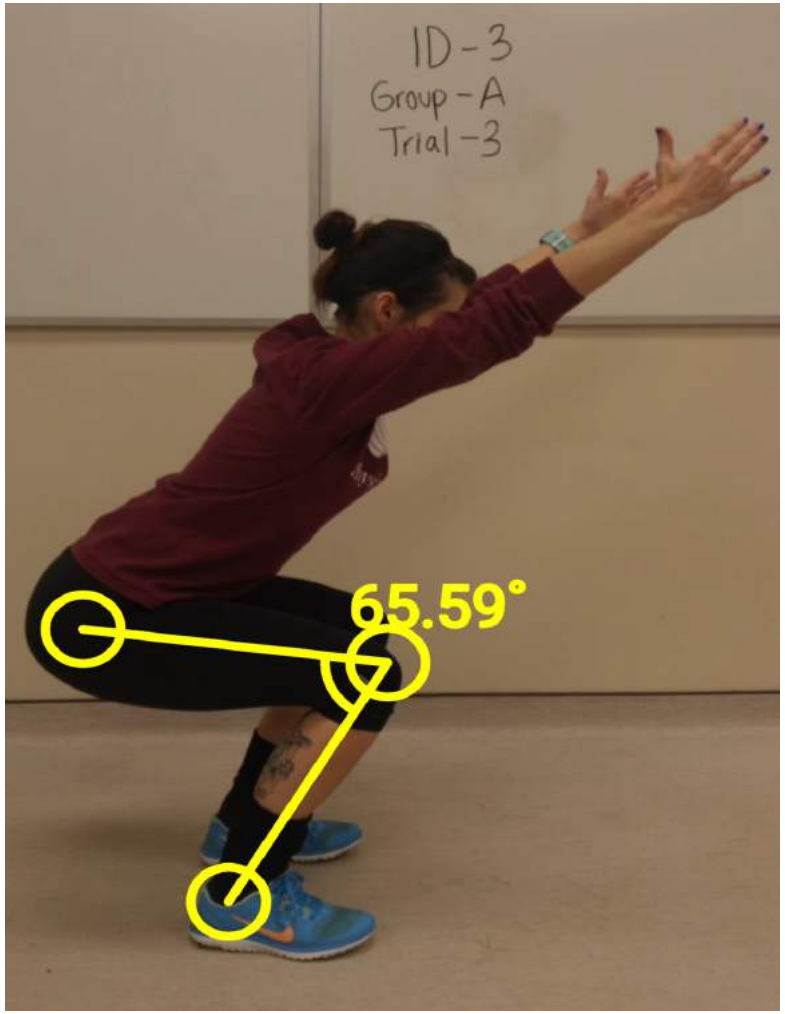
Methods

- Squat recorded by mobile device on stabilized tripod
- Analyzed via Hudl Technique
  - Right ankle, knee, hip, and shoulder flexion
  - Blinded to condition order via mid-calf length black sock



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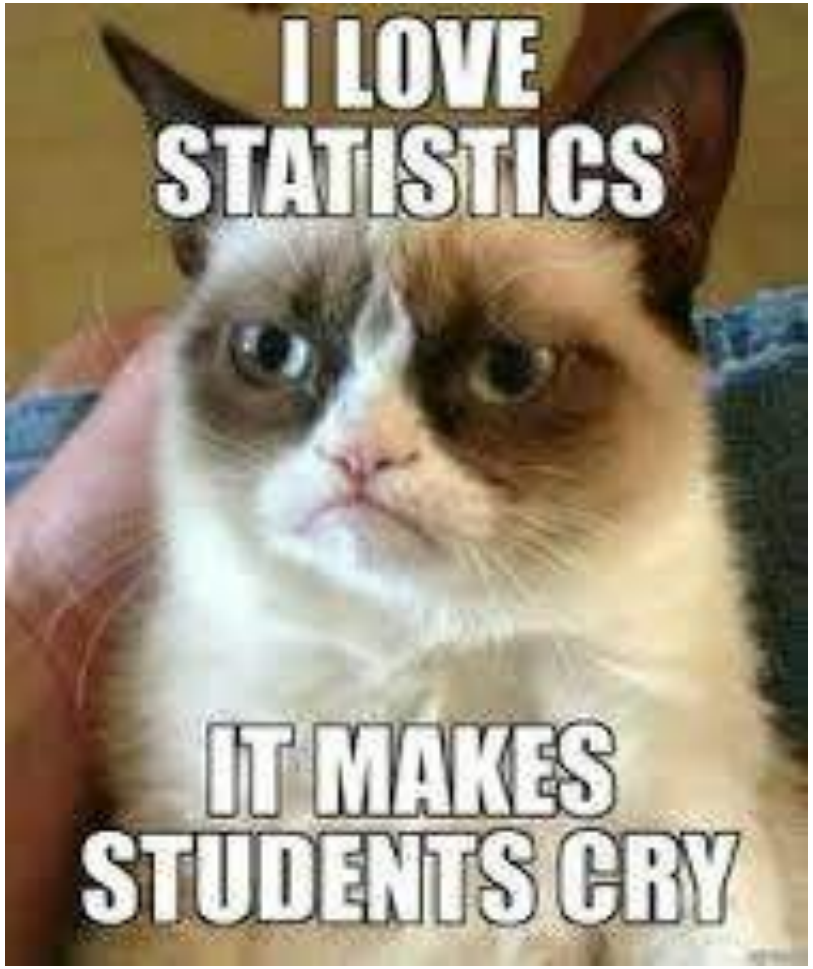
Statistical Analysis

- IBM SPSS software
- Repeated measures ANOVA
  - Bonferroni post-hoc
  - Alpha level of $p \leq 0.05$



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Results

Significant changes at the knee between bracing conditions ($p < .001$)

No significant differences at the ankle, hip, or shoulder.

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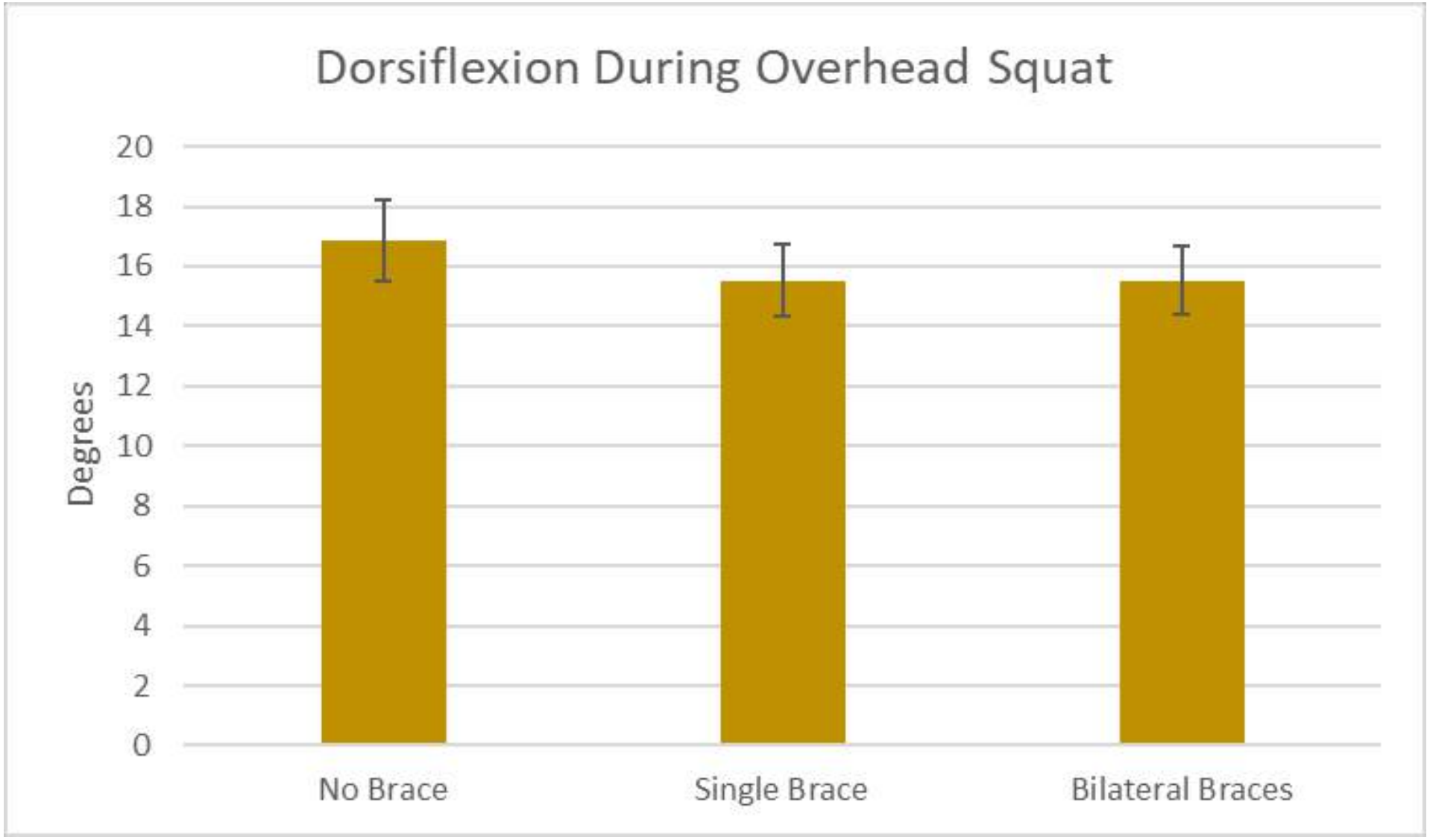
Results



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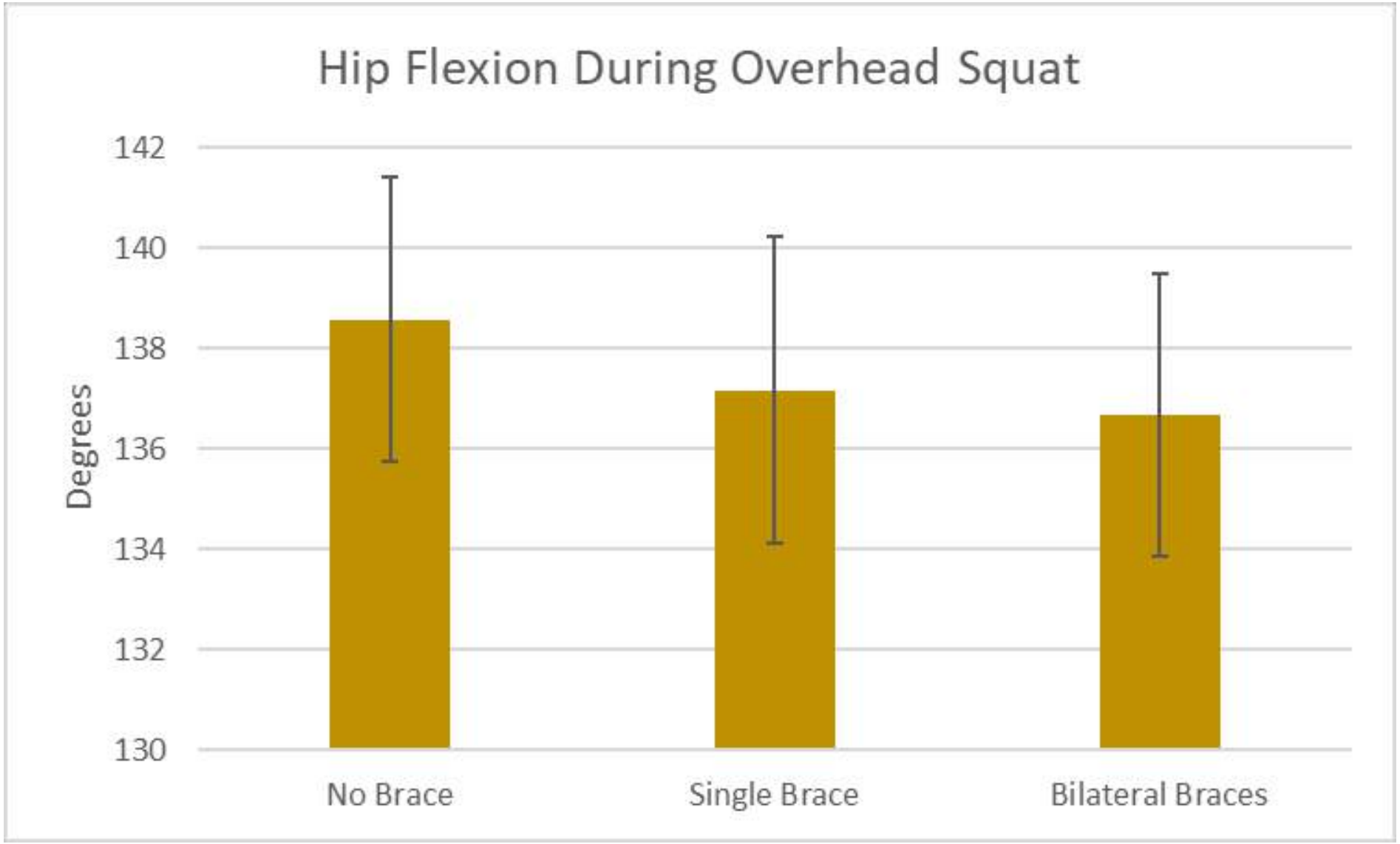
Results



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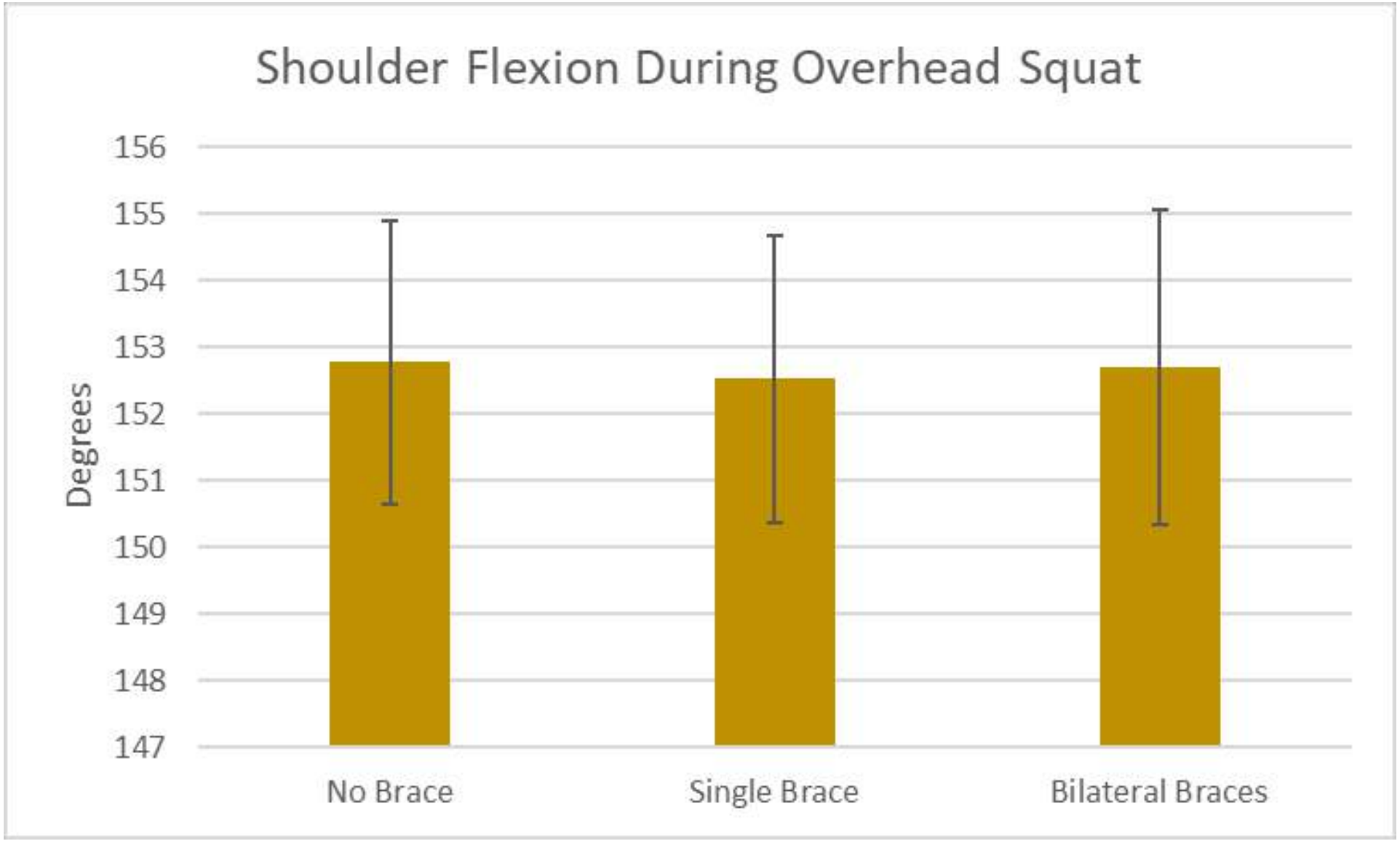
Results



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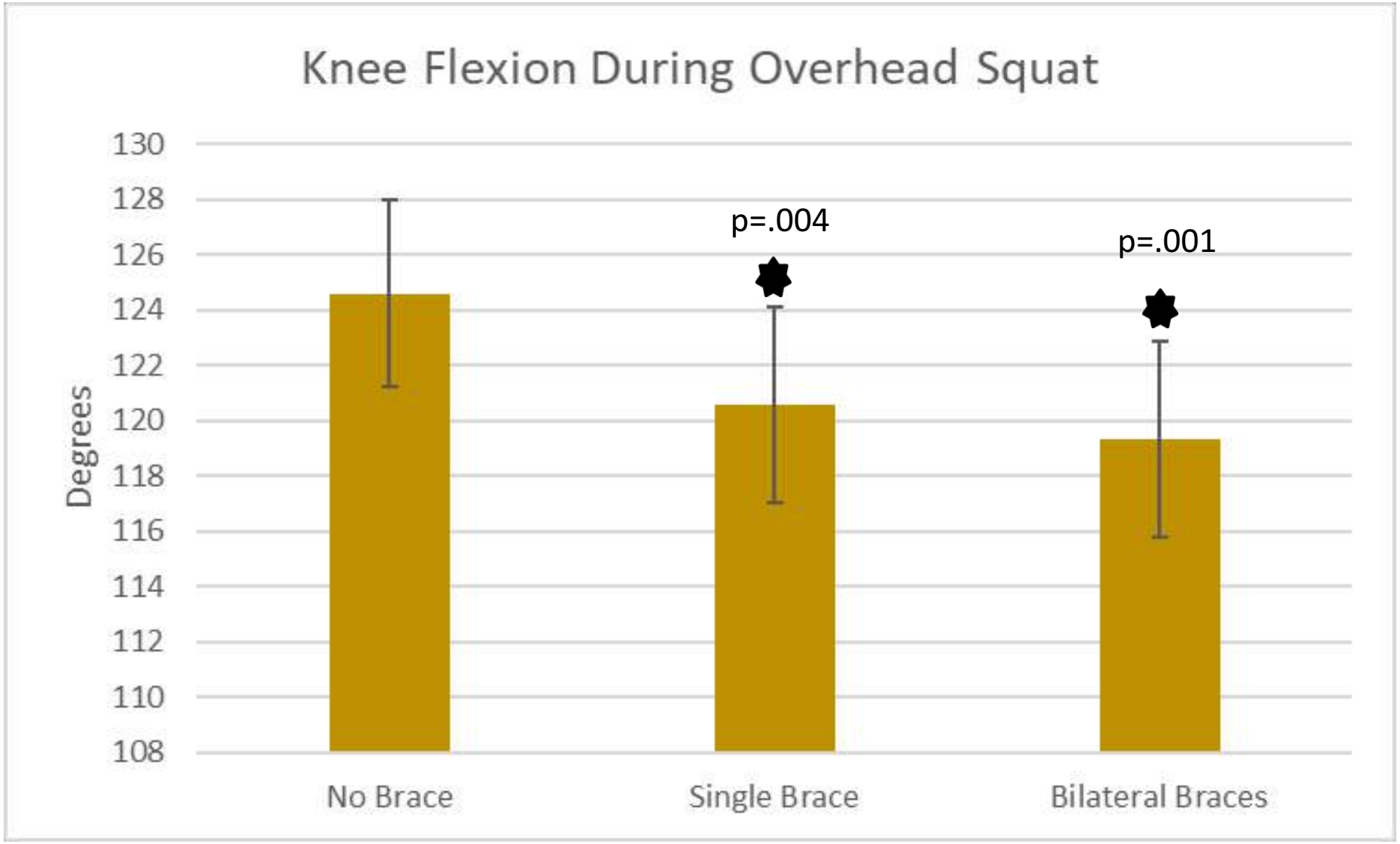
Results



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Discussion

Findings ***consistent with previous literature*** showing altered knee mechanics during jumping and landing tasks

First study, to our knowledge, to demonstrate altered mechanics during ***closed chain movement***

Reductions in Hip Flexion and Dorsiflexion angle may be ***clinically*** significant, even if not ***statistically*** significant

Finding ***may be relevant to athletes*** such as football linemen or athletes who wear ankle braces during strength and conditioning

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Limitations

- Population
  - Homogenous
  - Asymptomatic
  - N of 30
- Only 1 trial per condition
- Did not find statistically significant differences in dorsiflexion
- Lack of established research on reliability and validity of Hudl Technique

Conclusion

Wearing either a single ankle brace or bilateral ankle braces significantly reduces knee flexion angle during a BW OH squat

- Areas for future research
  - Clinical population
  - Ankle taping
  - Effects on weight distribution and squat depth
  - Relationship between observed effects and potential for risk of injury

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Special Thanks To…

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Questions??

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Additional Info

Joint Motion	No Brace	Single Brace	Bilateral Bracing	Significance
Ankle Dorsiflexion	16.87	15.53	15.53	$p = .082$
Knee Flexion	124.60	120.57	119.30	$p = .001$
Hip Flexion	138.57	137.17	136.67	$p = .377$
Shoulder Flexion	152.77	152.53	152.70	$p = .975$

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Additional Info

- Standard Script: *“Stand with your feet shoulder-width apart in a comfortable position. Place your arms overhead. Next, squat down as low as you can go in a slow and controlled fashion and then stand up”.*
- Demographic data collected: height, weight, BMI, age, gender, foot dominance
- Inclusion Criteria
  - Healthy
  - Ages 18-65
  - Read/Write English
- Exclusion Criteria
  - Inability to provide informed consent
  - History of back, hip, knee or ankle pathology within last one year
  - Any “yes” response on the PAR-Q+
- Warm-up consisted of step-ups on an 8-inch step at a self-selected comfortable pace for one minute
- Baseline Testing
  - Craig’s Test for femoral retroversion/anteversion
  - Dorsiflexion via weight-bearing lunge and the digital goniometer

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Additional Info