

Gait Alterations After Anterior Cruciate Ligament Injury and Implications for Return-to-Play Testing

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INTRODUCTION

- Reoccurring injury to the anterior cruciate ligament (ACL) is a major problem for individuals who undergo ACL reconstructive surgery despite them meeting current requirements for return-to-play¹.
- Previous studies have found alterations in gait kinetics and kinematics of ACL deficient and ACL reconstruction patients².
- It is unknown if gait parameters, such as peak joint angles and moments, provide different information about patient function from what is provided by return-to-play outcomes.

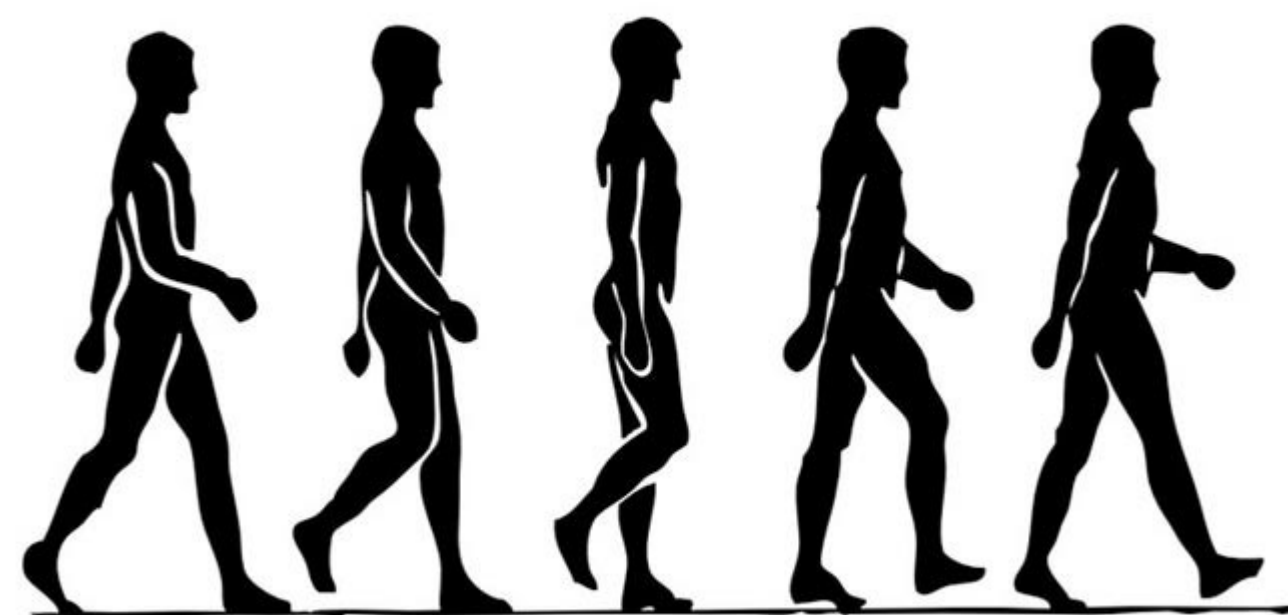


Figure 1: Gait Cycle.

PURPOSE

To assess the relationships between peak joint angles, peak joint moments, and return-to-play outcomes for individuals with ACL injury.

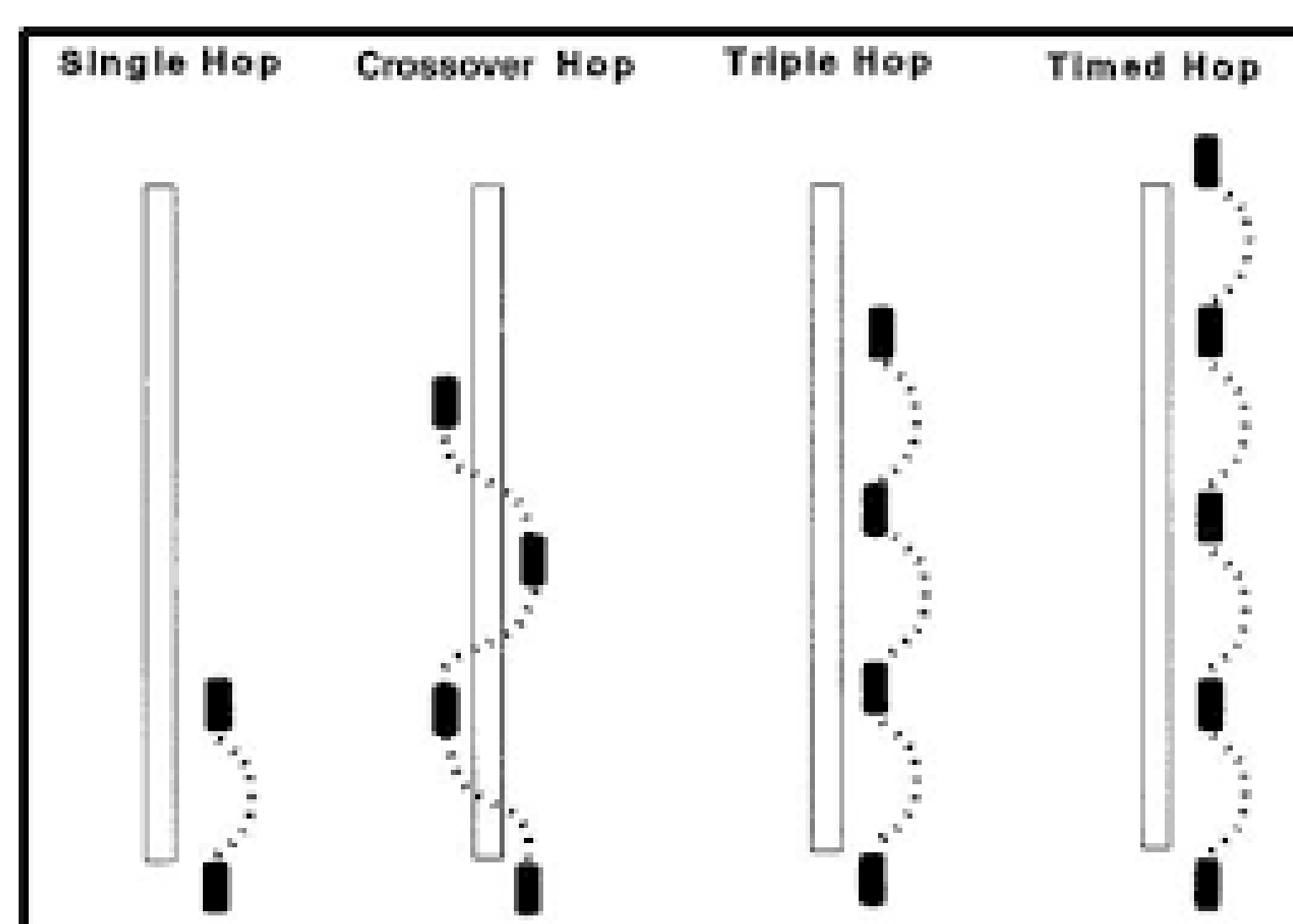


Figure 2: Return-to-Play Outcomes.

MATERIALS & METHODS

Subjects: 6 subjects (3 ACL reconstruction, 3 ACL deficient) volunteered to participate in the study.

Time Since Injury In Months (mean \pm std)	Injured Limb	Graft Type
6.31 \pm 3.41	4 Right 2 Left	2 Patellar Tendon 1 Allograft

Table 1: Subject Demographics.

Return-to-Play Outcomes: Each subject was assessed with the following clinical measures: single hop test, triple hop test, cross hop test, timed hop test, and quadriceps strength symmetry (QI).

Gait Assessment: Each subject performed two-minute walk trials on an instrumented split-belt treadmill while kinetics and kinematics were collected

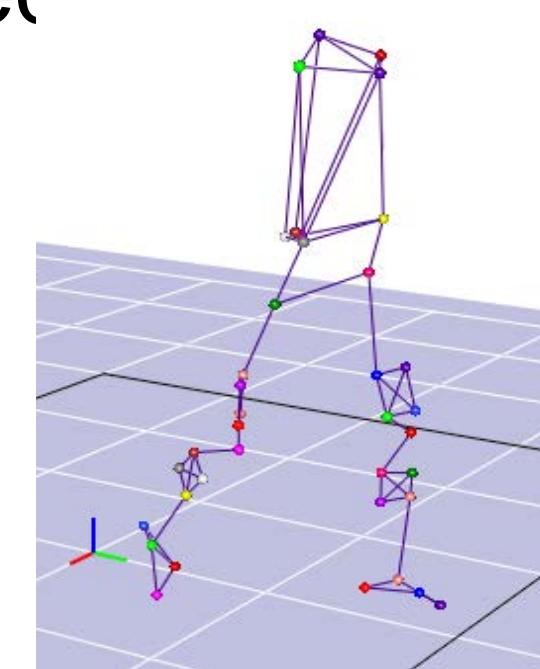


Figure 3: Marker model used during motion capture.

Data Processing & Analysis: Peak knee joint moments and angles for participant's involved limb were calculated using Visual3D. Relationships between joint moments, joint angles, and return-to-play outcomes were assessed using Pearson Correlation Coefficients.

RESULTS

Pearson Correlation Coefficients				
	Peak KEA	Peak KFA	Peak KEM	Peak KFM
Single Hop Score	0.0168	-0.2133	-0.5316	-0.0491
Cross Hop Score	0.3585	-0.3150	0.4630	0.0210
Triple Hop Score	0.2361	-0.0852	-0.2651	0.1728
Timed Hop Score	0.6393	-0.3263	-0.5207	-0.3008
QI Score	0.1501	-0.2812	-0.2095	0.2434

Table 2: Pearson Correlation Coefficients for Knee Extension Angle (KEA), Knee Flexion Angle (KFA), Knee Extension Moment (KEM), and Knee Flexion Moment (KFM).

RESULTS

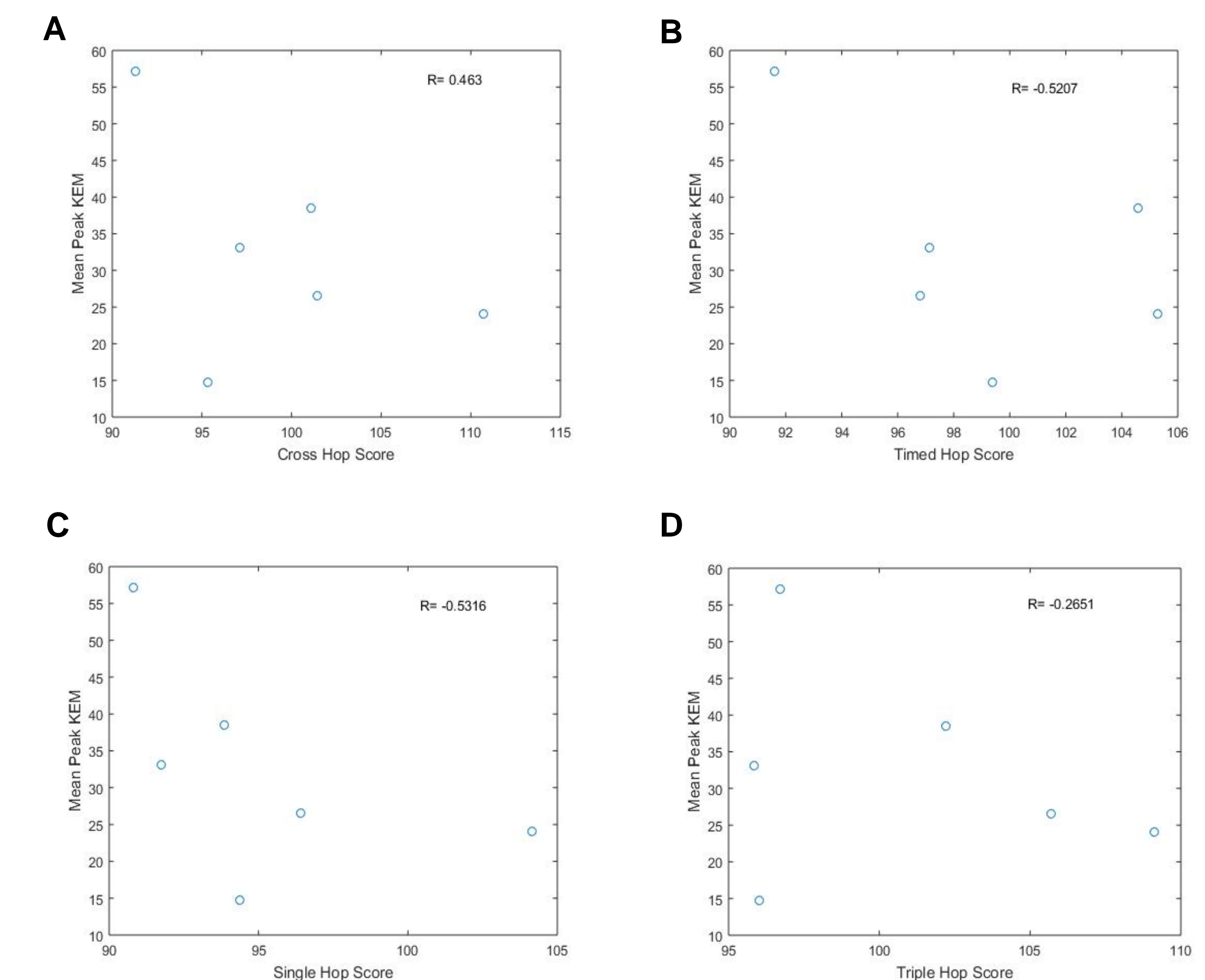


Figure 4: Correlation Plots. (A) Mean Peak Knee Extension Moment vs. Cross Hop Score. (B) Mean Peak Knee Extension Moment vs. Timed Hop Score. (C) Mean Peak Knee Extension Moment vs. Single Hop Score. (D) Mean Peak Knee Extension Moment vs. Triple Hop Score.

CONCLUSIONS

- Mean peak joint angles and moments had weak to moderately strong relationships with return-to-play outcomes with knee extension moments generally showing the strongest relationships
- Because of the weak relationships between return-to-play outcomes and other gait parameters, these values may provide unique information about patient outcomes
- Future research should further explore this relationship to determine clinical relevance of gait testing for return-to-play assessment

REFERENCES

- Webster KE, Feller JA, Leigh WB, Richmond AK (2014) Younger patients are at increased risk for graft rupture and contralateral injury after anterior cruciate ligament reconstruction. Am J Sports Med 42:641-647.
- Ferber R, Osternig LR, Woollacott MH, Wasielweski NJ, Lee JH (2002) Gait mechanics in chronic ACL deficiency and subsequent repair. Clin Biomechanics 17:274-285.