

# DIFFERENCES IN TEMPOROSPATIAL HOP CHARACTERISTICS BETWEEN LIMBS AT RETURN TO SPORT AFTER ACL RECONSTRUCTION

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# Mandatory Faculty Disclosure

- Nothing to disclose for this project

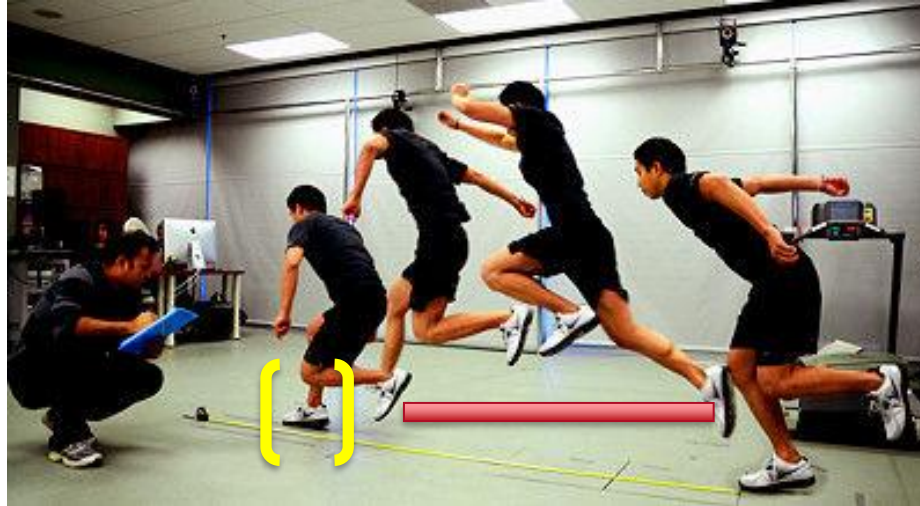
# Significance of Problem

- Return-to-sport (RTS) time is a primary concern after ACL reconstruction
  - Hop tests can be successfully completed despite presence of movement compensations
- Understanding movement compensations can aid orthopedic surgeons and physical therapists during decision making process for RTS



# Purpose & Hypothesis

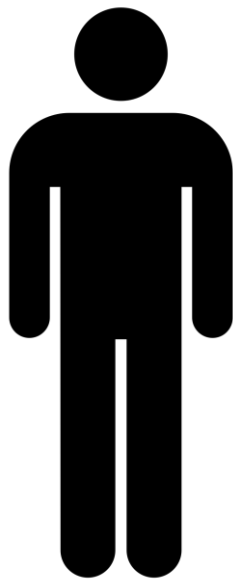
- Assess hop biomechanics between injured and uninjured limb after ACL reconstruction
- We hypothesized that patients who have undergone ACL reconstruction would present with shorter flight times and longer stance times in the injured limb compared to the uninjured limb



**Yellow Bracket: Stance Time, Red Line: Flight Time**



# Experimental Design



- 35 participants
- Ages 10-25 years
- Within 5-15 months of ACL reconstruction
- No prior knee injury or concomitant posterior cruciate ligament reconstruction
- Plan to return to 50 hours/year of cutting or pivoting sports



# Experimental Design Continued

- All participants demonstrated scores of **>90% symmetry** on physical testing and **>90%** on both self-reported knee function scores
- Return-to-sport components
  - Unilateral quadriceps strength
  - Two measures of self reported knee function
    - IKDC Subjective Knee Form 2000
    - Global Rating Scale
  - Four single-legged hop tests
    - Single hop, triple hop, crossover hop, and 6m timed hop



# Experimental Design Continued



Hops Completed On Protokinetics Zeno Walkway System

## Two Trials on Each Limb

- Single Hop
- Triple Hop
- 6m Timed Hop

\*Note: Crossover hop not completed due to narrow width of walkway

## Variables of interest

- Flight time
- Stance time
- Flight-to-stance ratio

- **Paired t-tests** were used to compare hop characteristics between limbs
- **Effect sizes** were calculated to evaluate interlimb differences



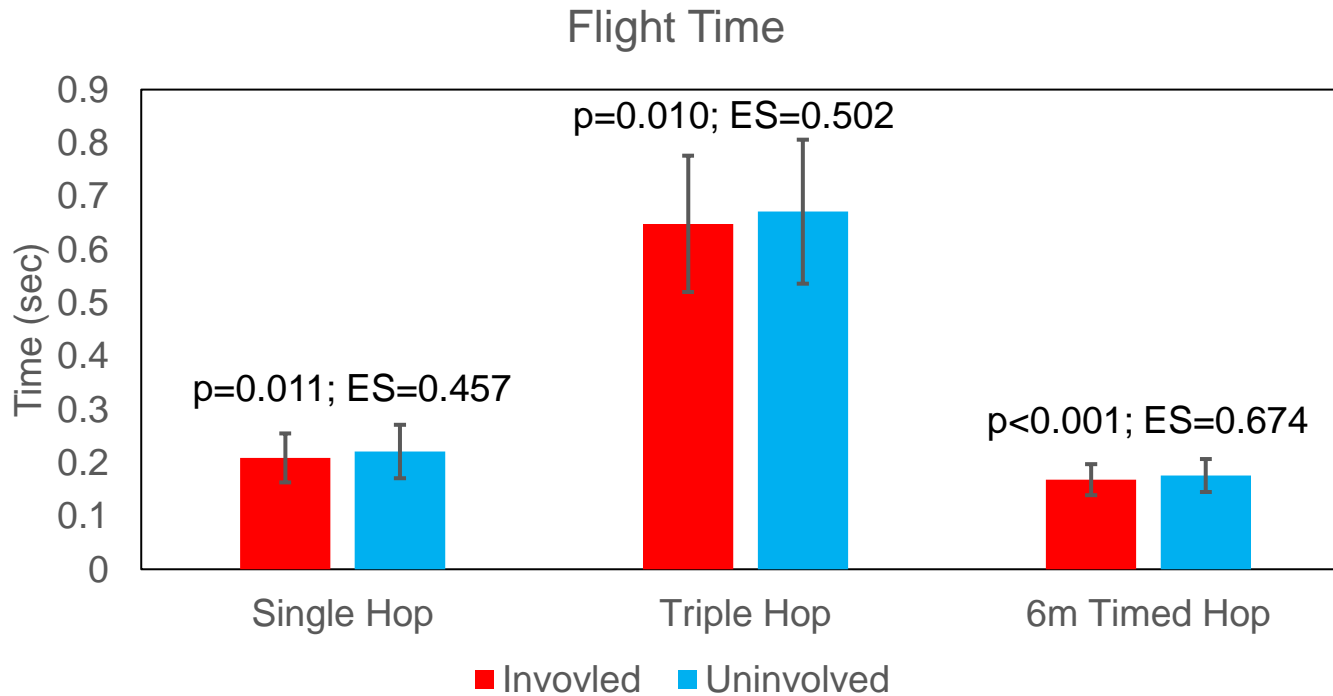
# Participant Characteristics

<b>Age at surgery (years)</b>	17.5±3.0			
<b>Sex (F/M)</b>	51.4%/48.6%			
<b>Mean RTS Time (mo)</b>	10.8±2.8			
<b>Graft Types</b>	Quadriceps 12/35 (34%)	Patellar 15/35 (43%)	Hamstring 6/35 (17%)	IT Band 2/35 (6%)





# Results



## ES= Effect Size

Small Effect =  $>0.2$

Medium Effect =  $>0.5$

Large Effect =  $>0.8$

**Triple Hop** = avg of total flight time per limb

**6m Timed Hop** = avg of flight time per hop per limb



# Results Continued

	Involved	Uninvolved	p-value	Effect Size
<b>Avg. Hop Distance</b>				
6m Timed Hop (cm)	135.9±21.3	140.6±21.8	<0.001	0.710
<b>Stance Time</b>				
Triple Hop (sec)	0.726±0.091	0.706±0.088	0.162	
6m Timed Hop (sec)	0.265±0.030	0.262±0.028	0.140	

**ES= Effect Size**

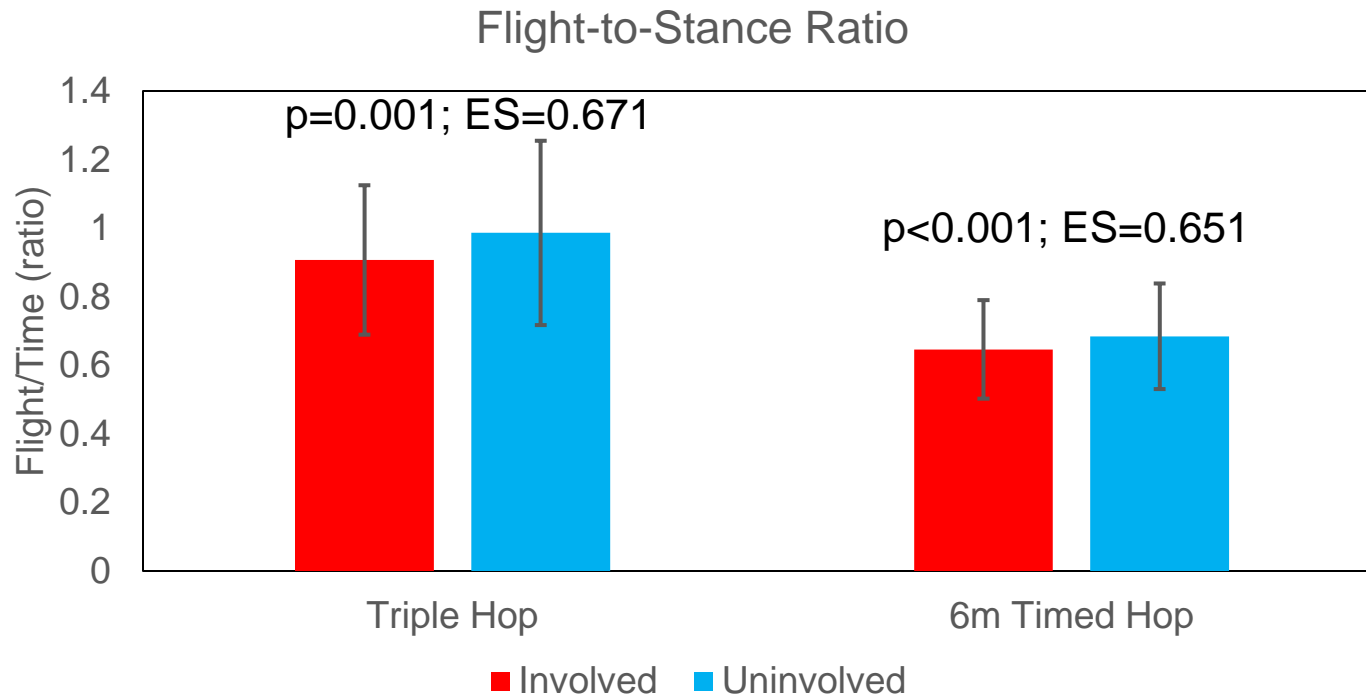
Small Effect = >0.2

Medium Effect = >0.5

Large Effect = >0.8



# Results Continued



## ES= Effect Size

Small Effect =  $>0.2$

Medium Effect =  $>0.5$

Large Effect =  $>0.8$

**Triple Hop** = avg of total flight time per limb divided by avg of total stance time per limb

**6m Timed Hop** = avg of flight time per hop per limb divided by avg of stance time per limb



# Conclusion

- **Interlimb differences** in temporospatial hop test characteristics were present in patients who **passed return-to-sport testing**
  - Differences in **flight time** were larger than differences in stance time
- Movement patterns **are not be restored** despite meeting traditional benchmarks
- Measuring hop distance and total time (6m timed hop) may be **insufficient**<sup>1,2</sup>
- Future work: Investigate the impact of hop characteristics **to aid ACL recovery** through interventions



# Thank You!



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### References

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