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Altered Abductor Mechanism In FAI Patients During Walking and Squatting

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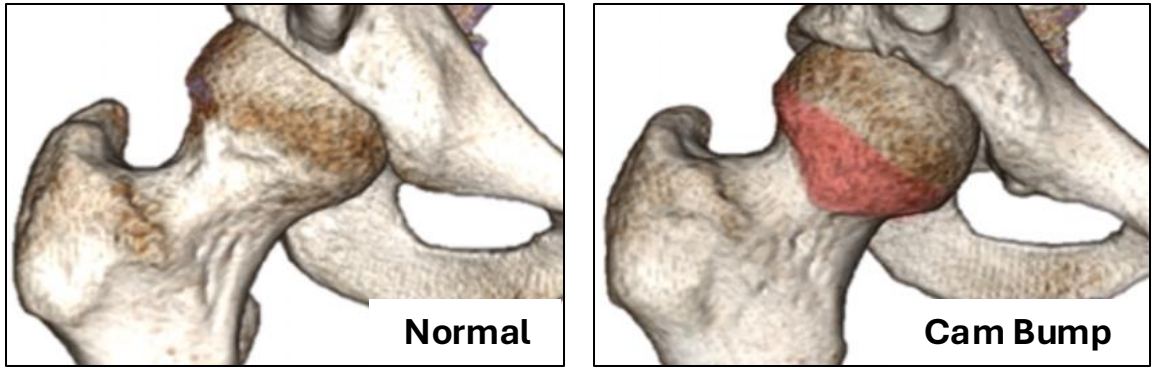
Faculty Disclosure Information

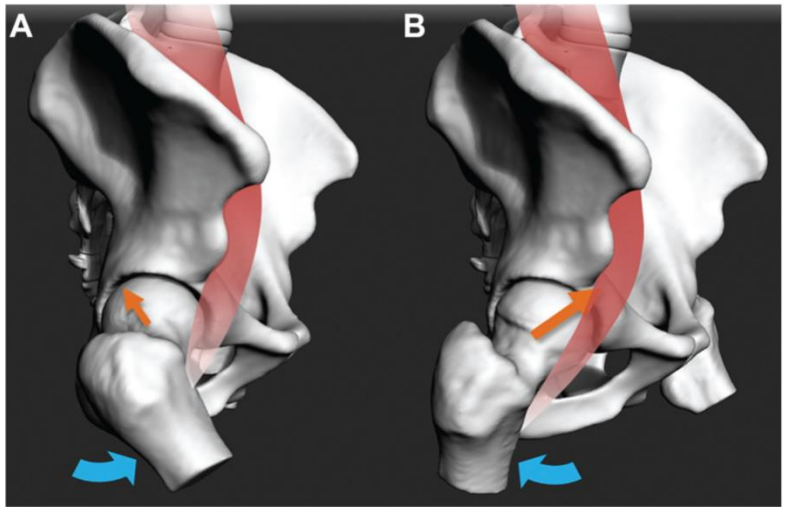
We have no relevant conflicts of interest.

Background

- *Cam-type femoroacetabular impingement (FAI):*
  a leading cause of OA in young adults (1)
- Often asymptomatic, present in 20 % of population (2)
- Symptomatic — 1 in 4 exhibit OA evidence (3)
- Changes in movement to reduce joint loads (4,5):
  1. ↓ Hip motions during walking
  2. ↓ Pelvic & hip motions during squats
- Although previous studies looked at symptomatic FAI function during ADLs:

➡ It is unclear if the contralateral-unaffected hip contributes to altered hip biomechanics





1. Beaulé PE, et al. 2018 2. Mascarenhas VV, et al. 2016 3. Agricola R, et al. 2013 4. Ng KCG, et al. 2018 5. Ng KCG, Lamontagne M, et al. 2018

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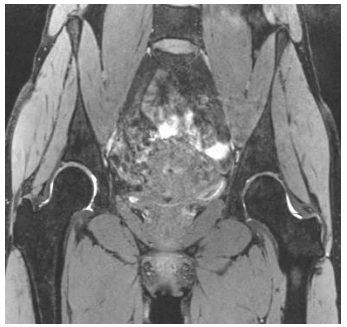
Background

AIM: To compare biomechanical differences between symptomatic-affected and contralateral-asymptomatic-unaffected hips in cam-FAI patients during walking and squatting

Methods

1. Study Design:

- 15 cam-FAI patients elected for surgery → Symptomatic-affected side
- 15 healthy controls (Age, Sex, & BMI-matched) → Contralateral-asymptomatic-unaffected side
- Recruitment at Fowler Kennedy Sports Medicine Clinic (FKSMC, Western University)
- Inclusion: 16-40 years. Exclusion: previous history of hip pathology, trauma, surgeries



2. Medical Imaging (3T MRI)

- Participants underwent MRI at the Center of Functional and Metabolic Mapping (CFMM, Western University)
- Hip, pelvic, and spine bone measurements

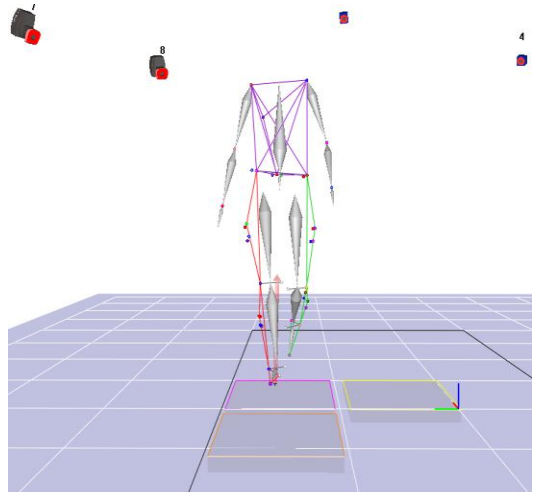
	Cam-FAI		Healthy controls
Age	27 ± 8 *years*		25 ± 7 *years*
BMI	24 ± 5 kg/m^2		23 ± 4 kg/m^2
M:F	8:7		6:9
	Affected	**Unaffected**	
3:00 AA	64 ± 8	52 ± 9	46 ± 6
1:30 AA	71 ± 8	62 ± 11	56 ± 9

Methods

3. Motion capture

3D kinematic and kinetic data collected at the Wolf Orthopaedic Biomechanics Laboratory (WOBL, Western University) using:

1. 12-camera motion capture system (Eagle, Motion Analysis)
2. Three floor-mounted force plates (AMTI)
3. Modified Helen-Hayes markerset



Functional Tasks:

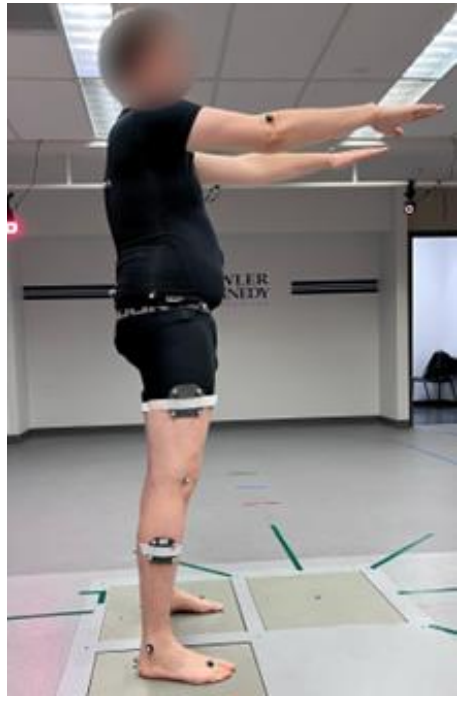
- Walking – stance phase
- Squats

➢ Average of 5 trials

STATS:

Statistical non-parametric mapping (SnPM):

1. Mann-Whitney U (indep. comparisons)
2. Wilcoxon signed-rank (same-group comparisons)



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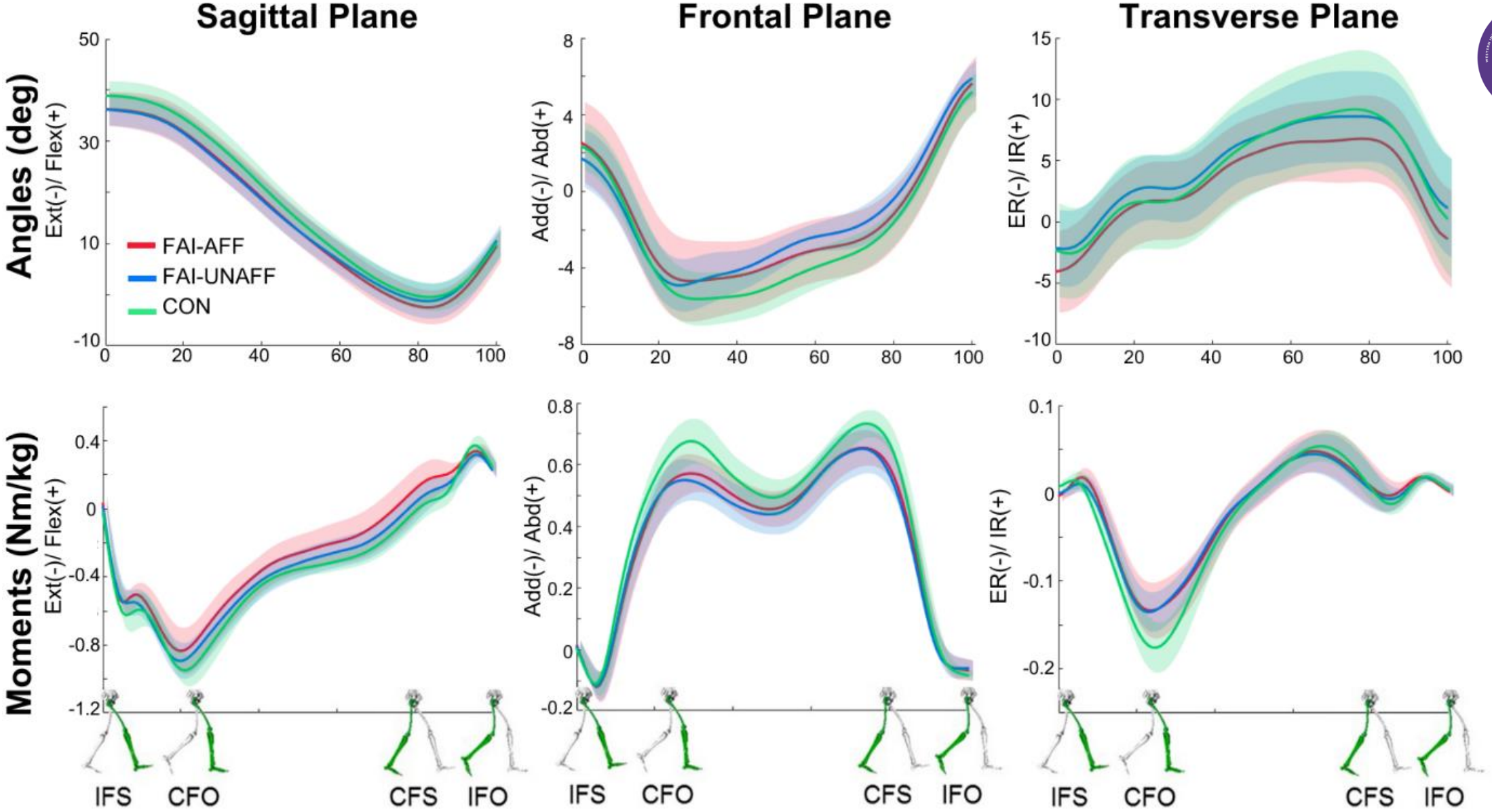
Results

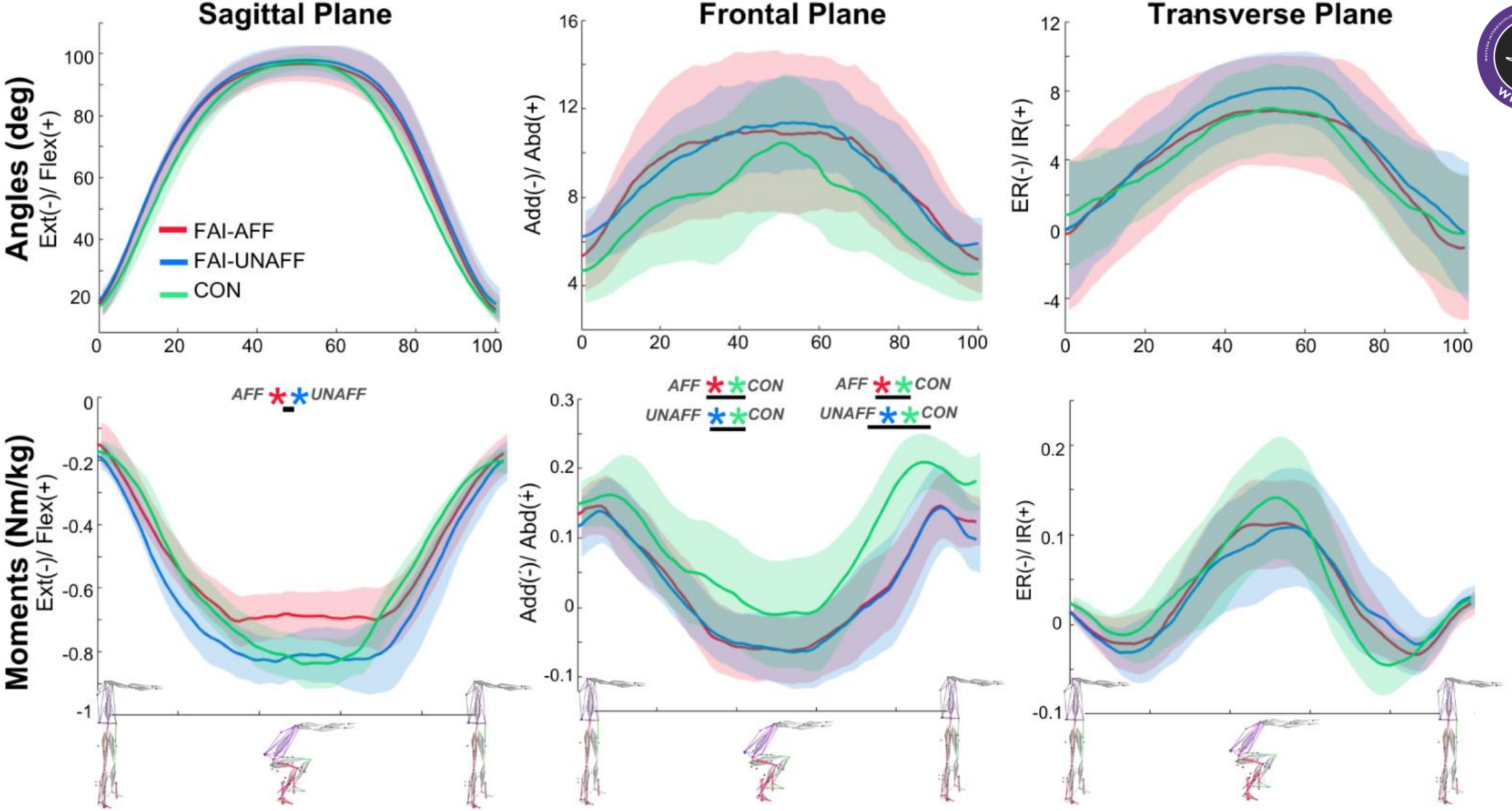


FAI-AFF ↓ EXT moments

FAI show bilateral ↓ ADDUCTION & ABDUCTION moments

↓ IR in FAI-AFF while UNAFF maintains IR levels

Results



FAI-AFF ↓ EXT moments

FAI group ↑ ABDUCTION
and ↓ moments bilaterally

Discussion

WALKING:

- **Bilateral Reductions in Adduction and Abduction Moments :**
  The unaffected side is just as much deviating from the control curves

SQUATS:

1. **Affected Hip's Reduced Extension Moments:**
   Impaired gluteal function may hinder the affected hip's ability to stabilize the joint during deep squatting

2. **Altered Abductor Mechanism:**
   To avoid impingement, FAI patients ↑ hip abduction bilaterally, altering the abductor mechanism and resulting in reduced abductor moments

3. **Compensatory Trunk Lean:**
   To attempt deep squat, FAI compensated by leaning trunks ➔ still did not squat as deep as CON:
   (FAI squat depth = 45% leg length vs. CON squat depth = 54% leg length)

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Conclusion

- **Bilateral Adaptations:** FAI leads to similar alterations in both AFF and UNAFF hips during walking and squatting, including decreased ROM and altered abductor mechanisms, highlighting the complexity of factors affecting hip biomechanics

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