Sex-Specific Differences in Gait Biomechanics within the First Year of ACL Reconstruction

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Disclosures

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Relevance to this Lecture
Developing wearable sensor solutions to objectively Detect, Treat, and Monitor joint loading that puts people at risk for osteoarthritis development and progression.

Knee OA Post ACLR

Decade 1	Decade 2
36%	48%

Luc & Pietrosimone et al. J Athl Train. 2014

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♀ OA Risk

Females 24%

Males 16%

Losina et al. Arth Care Res. 2013

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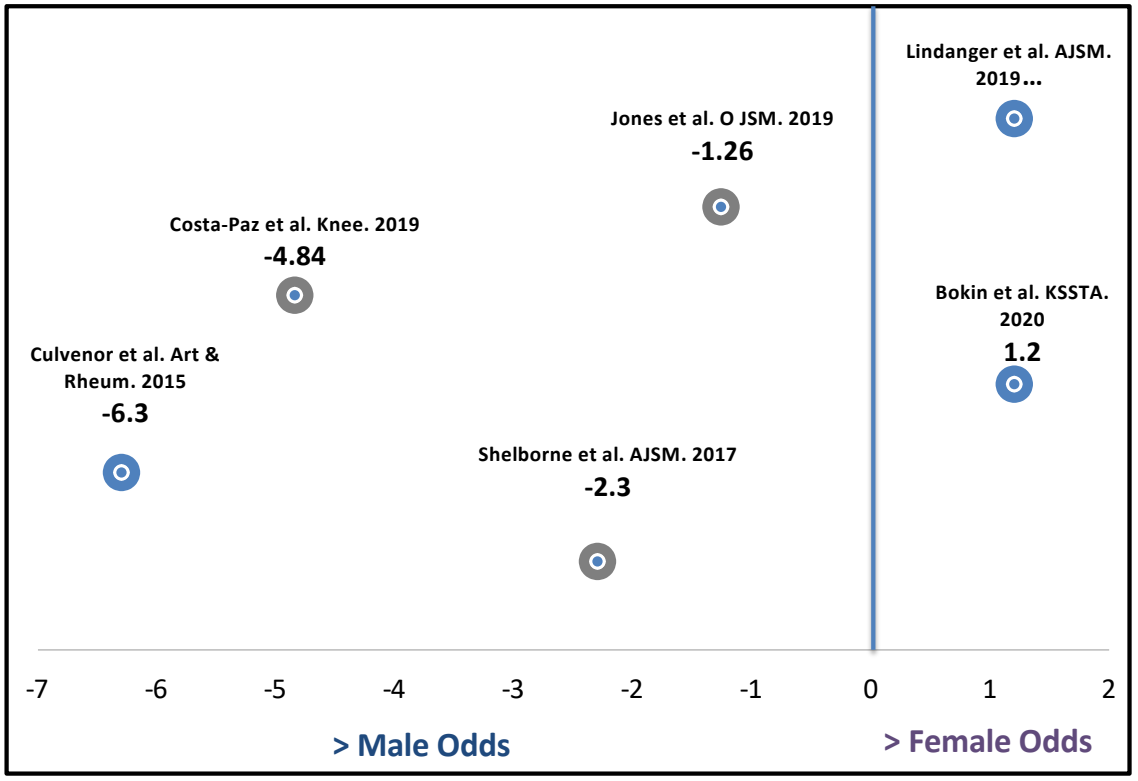
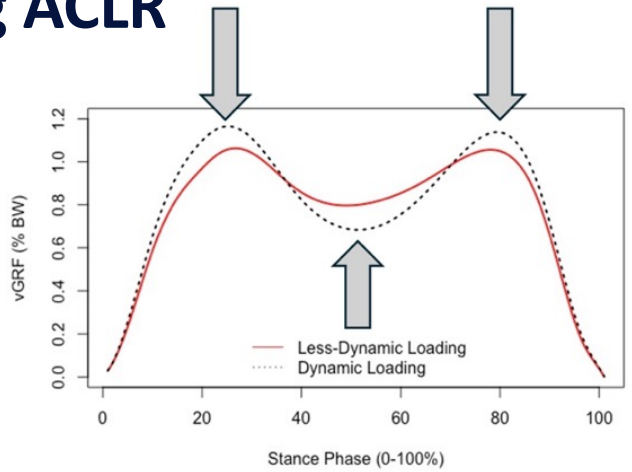
Sex Specific Odds of OA After ACLR



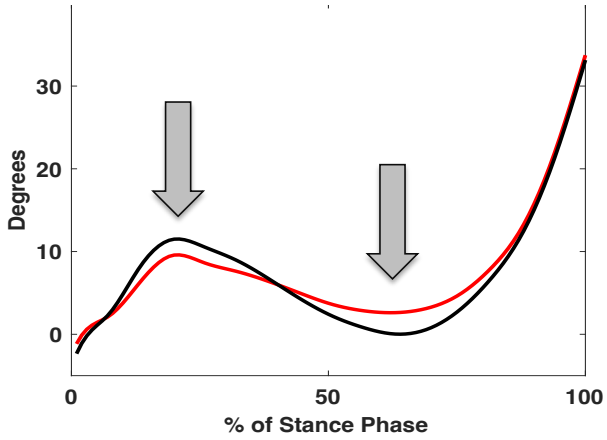
Significant Odds Ratio

Aberrant Gait Biomechanics Following ACLR

More Sustained Compressive Forces



Less Knee Flexion ROM

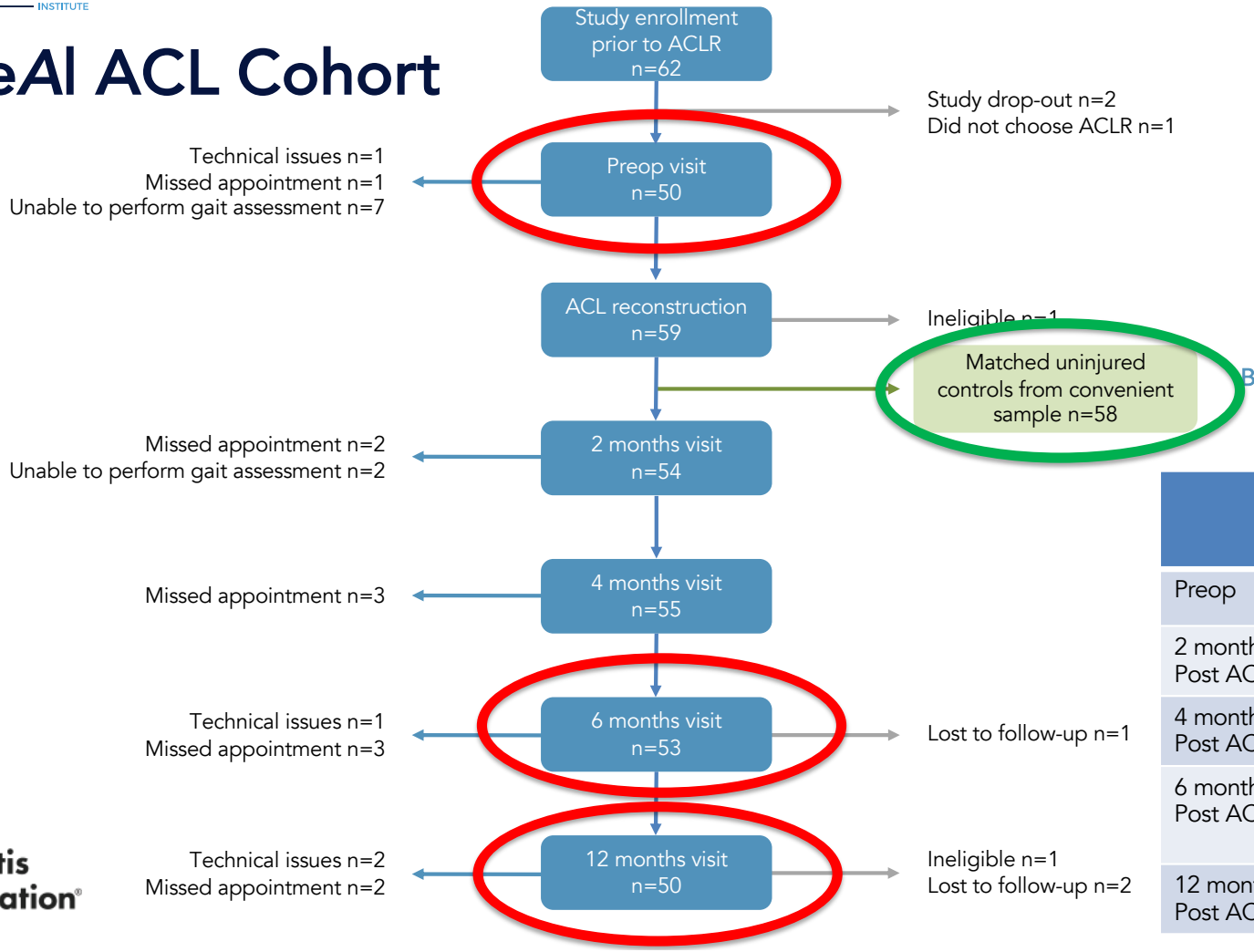


Scientific Gap & Study Purpose

- **Scientific Gap:** It remains unknown if a sex difference exists for gait biomechanics post-ACLR.

- **Study Purpose:** Compare compressive limb loading (i.e., vertical ground reaction force [vGRF]) and knee flexion angle (KFA) during gait between sexes at preoperative, 6 and 12 months post-ACLR time points.

Tar HeAl ACL Cohort



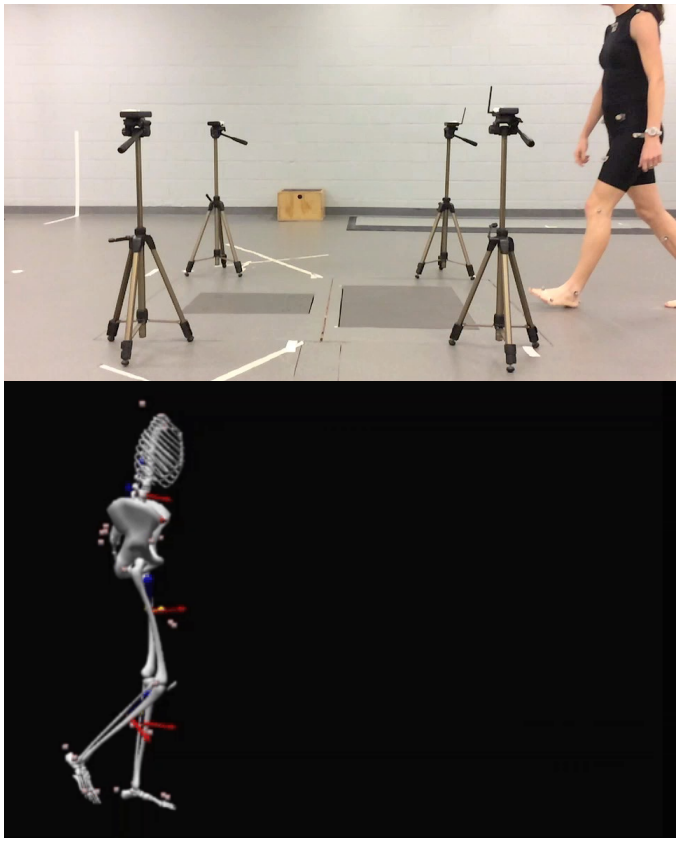
Biomechanics data available for 58 at least 1 timepoint

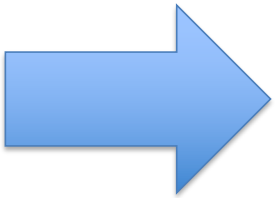
	Overall Retention Rate	Retention Excluding Ineligibility
Preop	95%	97%
2 month Post ACLR	94%	97%
4 month Post ACLR	94%	97%
6 month Post ACLR	92%	95%
12 month Post ACLR	87%	92%

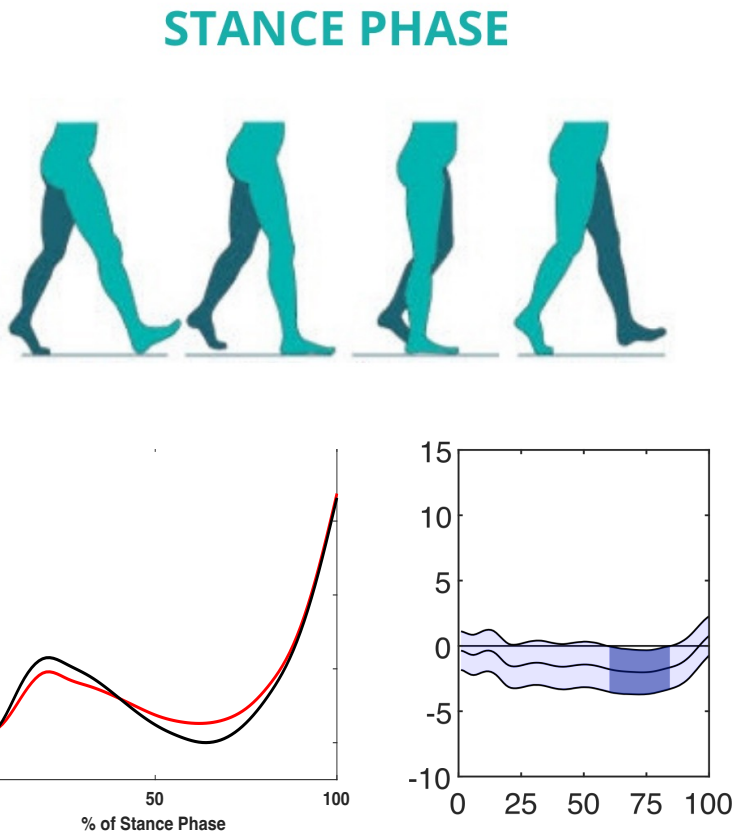
Characteristics	Timepoint	ACLR	Controls
Sex (% females)		57.0%	57.0%
Age (y)		21.8±4.7	21.6±4.3
BMI (kg/m^2)		24.2±3.2	24.5±3.2
Days after ACL injury	preop	21.2±46.3	-
Days before ACLR	preop	10.6±10.2	-
Days since ACLR	2 months	56.6±5.5	-
	4 months	114.4±6.3	-
	6 months	174.6±9.3	-
	12 months	346.9±15.8	-
Graft type (PT/QT/HT)		55/3/0	-
Medial meniscal injury (%)		24.1	-
Lateral meniscal injury (%)		69.0	-
Chondral injury (%)		27.6	-

ACLR – anterior cruciate ligament reconstruction, preop – preoperatively, PT – patellar tendon, QT – quadriceps tendon, HT – hamstring tendon

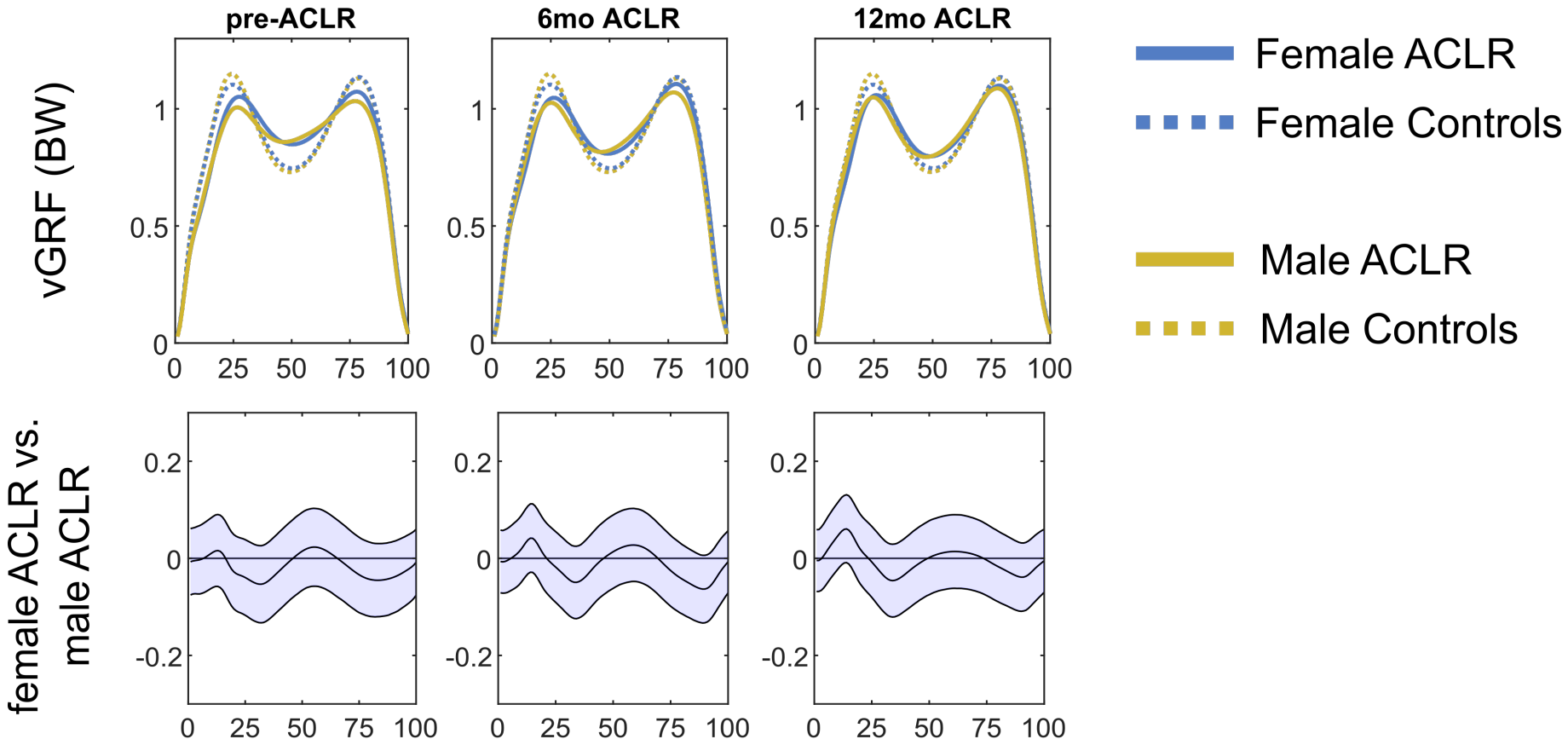
Methods



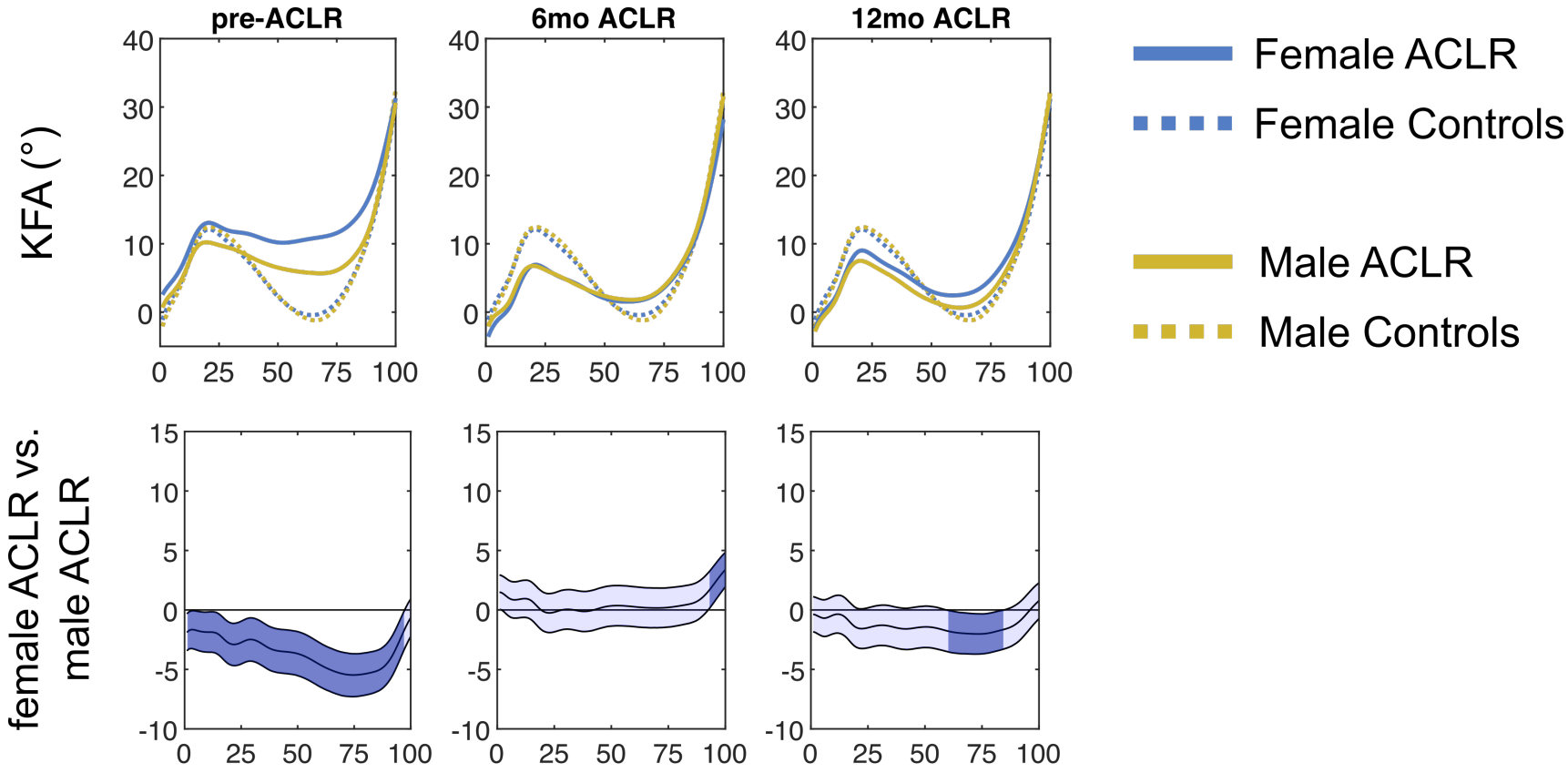



STANCE PHASE
Degrees
30
20
10
0
0
50
100
% of Stance Phase
15
10
5
0
-5
-10
0
25
50
75
100

Compressive Forces – Similar Between Sexes

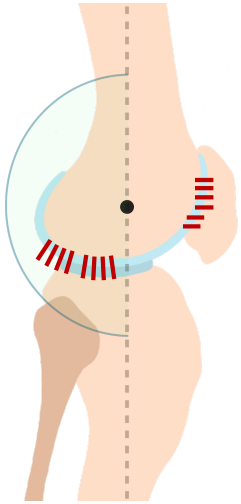


Knee Flexion – Females Less ROM & Remain More Flexed



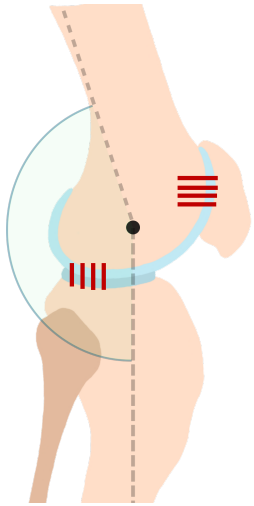
Stiffer More Flexed Knee Leads to Localized Loading

Diffuse Loading



Greater Knee Flexion ROM

Localized Loading

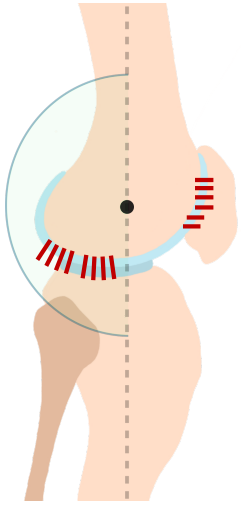


Lesser Knee Flexion ROM

Hypothesis

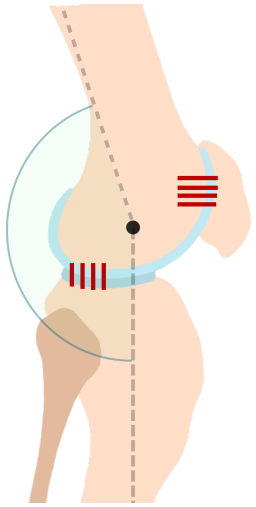
Stiffer More Flexed Knee Leads to Localized Loading

Diffuse Loading



Greater Knee Flexion ROM

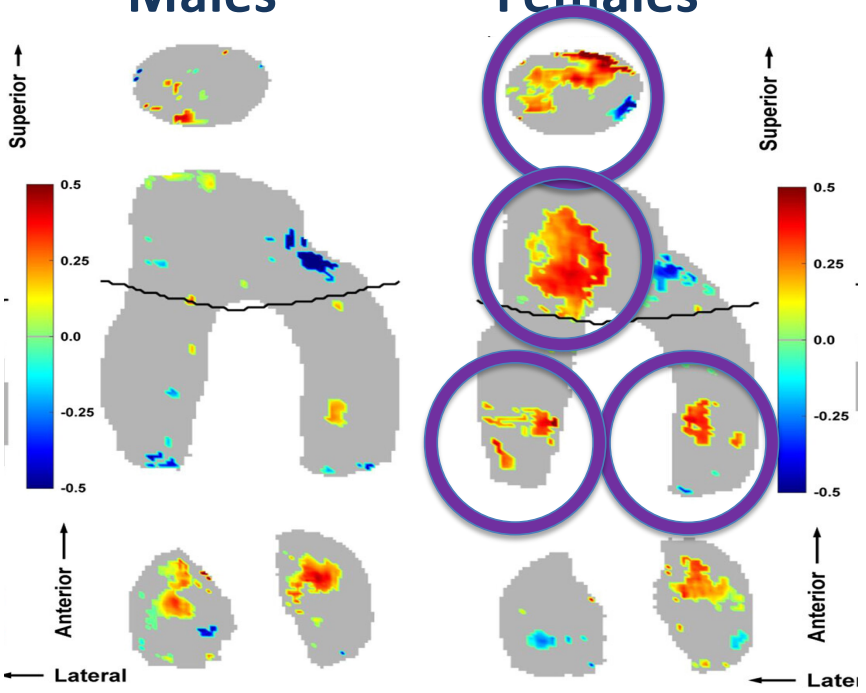
Localized Loading



Lesser Knee Flexion ROM

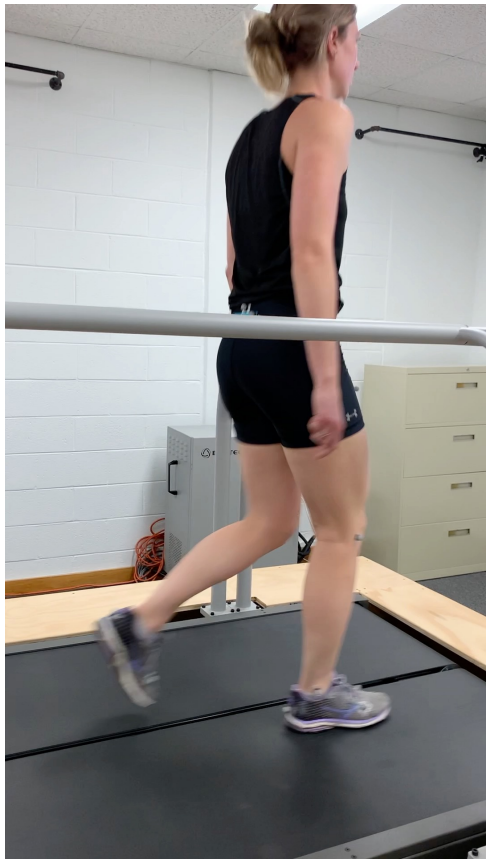
Hypothesis

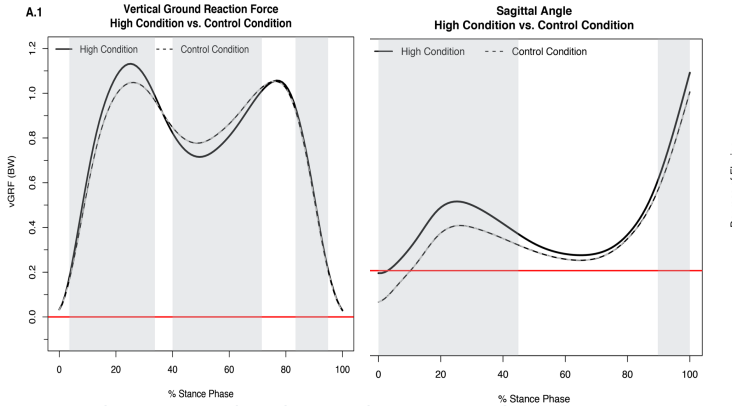
Males **Females**



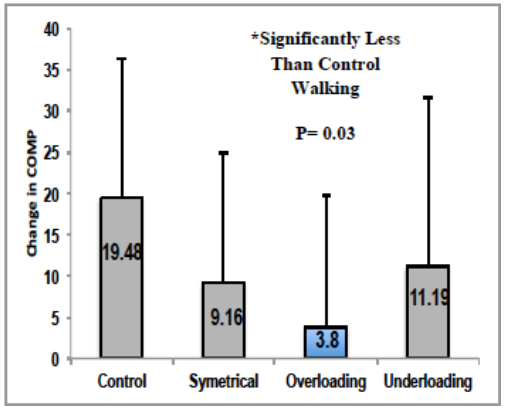
Pius et al. J Ortho Res. 2022

Clinical Potential - Real Time Gait Biofeedback





Pickett et al. Clinical Biomechanics. 2020



Luc-Harkey and Pietrosimone et al. J of Athl Training. 2018

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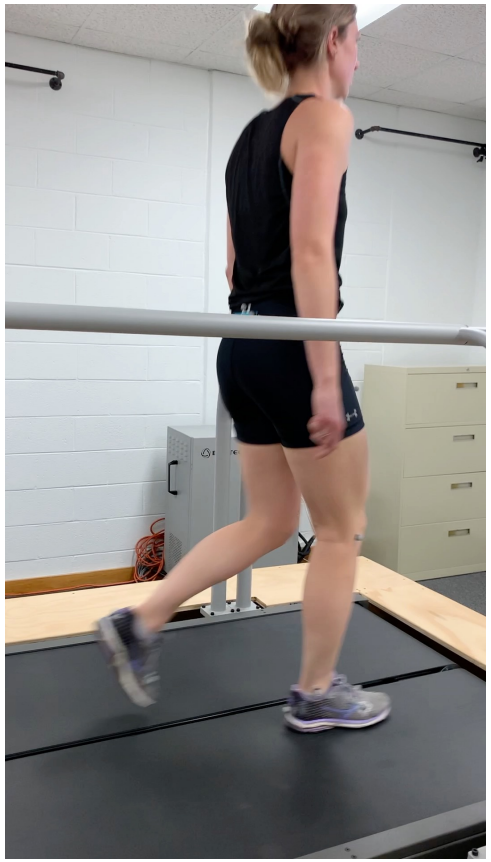
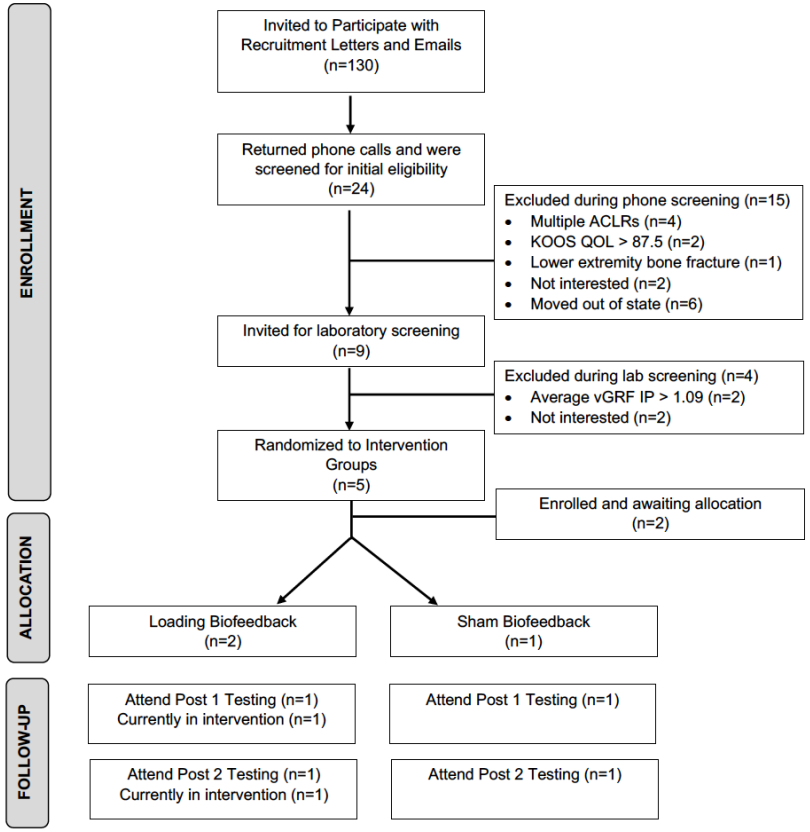
Clinical Potential - Real Time Gait Biofeedback





Thank You

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