Sex Differences in Hip Range of Motion: A Meta-Analysis

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Disclosures

Mary K Mulcahey, MD, FAAOS
AAOS: Board or committee member
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All other authors; No disclosures

Introduction

- Approximately 10% of injuries in sports medicine clinics are hip and/or groin related
- Frequent causes
  - Femoroacetabular impingement
  - Labral injury, which is more common in females
  - Hip osteoarthritis
- No known meta-analyses on sex-related differences in hip ROM

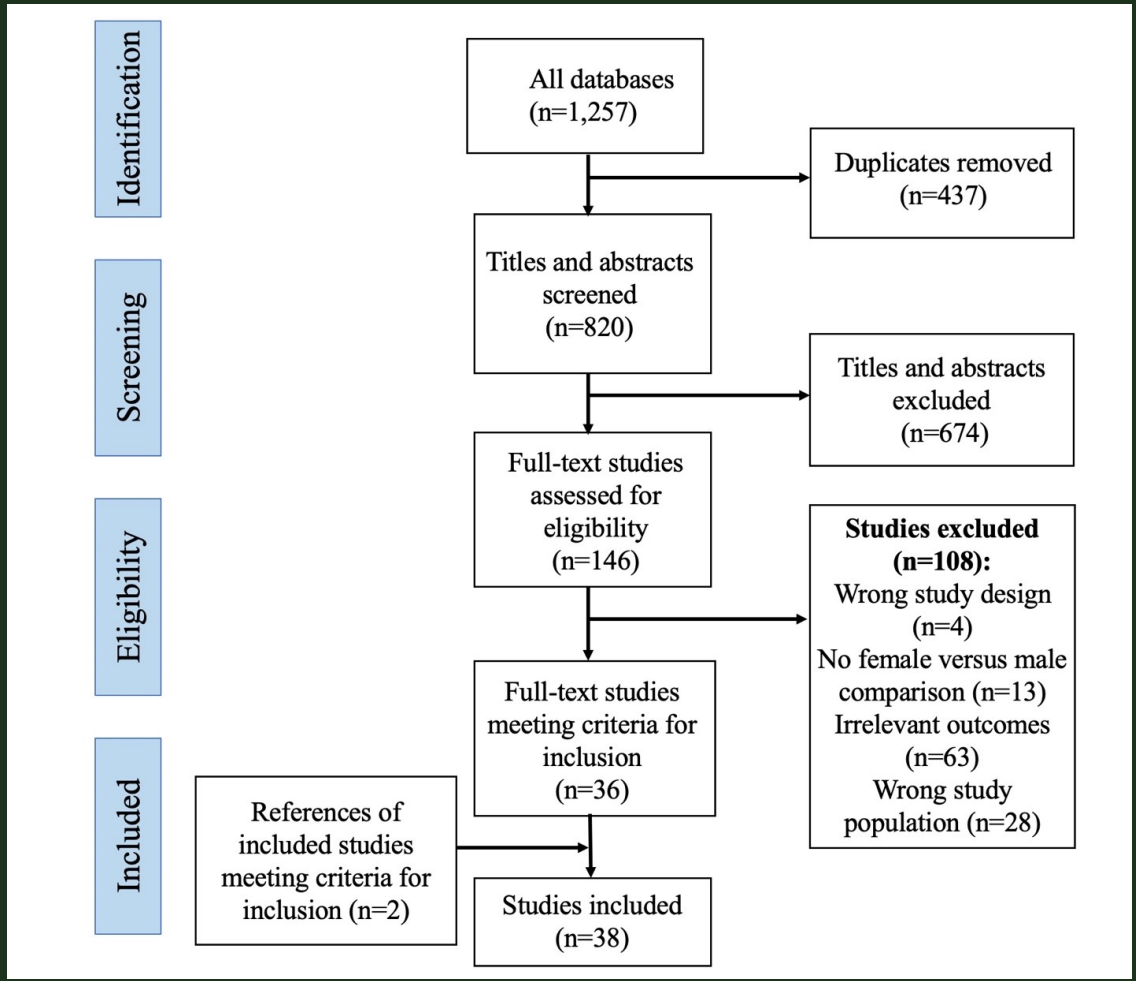
- Purpose: to identify baseline hip ROM values in females versus males to help guide hip injury prevention programs.

Methods

- Systematic review under PRISMA-IPD guidelines
- Sex-specific hip ROM values in healthy adults (≥18 years old) with an average age of ≤40 years old in PubMed, CINAHL, EMBASE from 2000 to 2022
- Primary outcomes: mean difference (D) for…
  - Flexion, extension, abduction, adduction, internal rotation, and external rotation
- For pooled effects sizes: DerSimonian and Laird random-effects model
- Subgroup analyses compared hip ROM by physical activity group

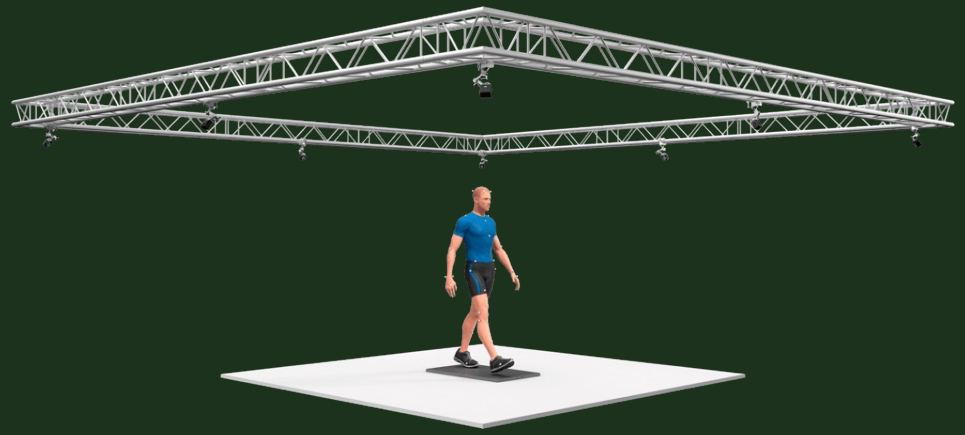
Results

PRISMA style flowchart outlining identification process of included studies



Results

- 3,234 total subjects
- 1,639 (50.1%) females with weighted average age of 25.3 years
- Measurement instruments: camera motion caption system (n=21, 55.3%), electromagnetic sensors (n=5, 13.2%), and goniometer/ inclinometer (n=12, 31.6%)



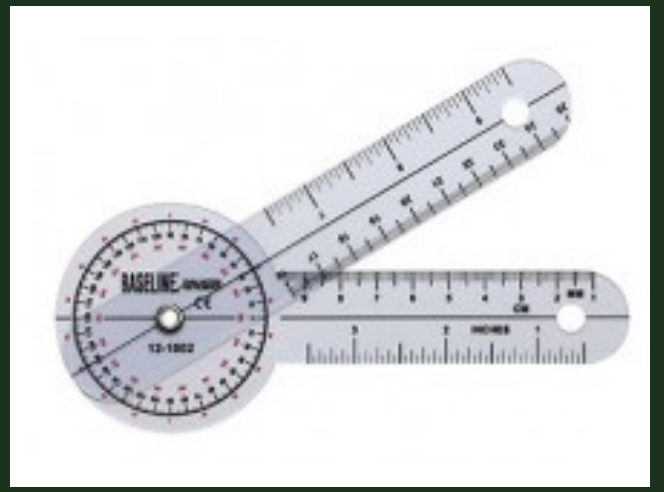


Table 1. Meta-analysis: Mean differences between males and females for ROM exercises

*Positive mean difference favors females, negative mean difference favors males, *p < 0.05*

★ Females significantly greater (p<.05)

★ Males significantly greater (p<.05)

	Outcome	No. of Studies	Mean Difference (95% CI)	I^2
★	**Flexion**	33	2.90 (1.07, 4.73)*	82.1%, p = <0.001
★	Passive Static ROM	9	6.44 (3.86, 9.03)*	81.3%, p = <0.001
★	1 Leg Hop or Jump	3	6.51 (2.77, 10.25)*	0.0%, p = 0.903
★	2 Leg Hop or Jump	2	-9.08 (-12.86, -5.31)*	0.0%, p = 0.569
	2 Leg Drop or Landing	4	0.81 (-6.34, 8.46)	56.8%, p = 0.074
	1 Leg Squat	5	-0.11 (-7.16, 6.94)	71.4%, p = 0.007
	2 Leg Squat	4	0.76 (-6.13, 7.64)	78.0%, p = 0.003
★	Walking	4	3.54 (0.19, 6.90)*	62.6%, p = 0.046
	Jogging, Running	2	-1.74 (-3.55, 0.06)	0.0%, p = 0.798
	Extension	9	0.13 (-1.89, 2.14)	81.2%, p = <0.001
	Passive Static ROM	5	0.72 (-0.70, 2.14)	52.5%, p = 0.077
	1 Leg Squat	2	1.26 (-8.43, 10.94)	91.7%, p = 0.001
★	Walking	2	-3.97 (-7.68, -0.25)*	0.0%, p = 0.360
	Abduction	6	-0.17 (-2.17, 1.82)	80.0%, p = <0.001
★	Passive Static ROM	2	2.85 (0.90, 4.80)*	33.0%, p = 0.222
	1 Leg Hop or Jump	1	-1.40 (-4.54, 1.74)	N/A
	2 Leg Drop or Landing	1	-1.70 (-4.89, 1.49)	N/A
★	Walking	2	-1.69 (-2.69, -0.69)*	0.0%, p = 0.439

Table 1 (Cont'd). Meta-analysis: Mean differences between males and females for ROM exercises

*Positive mean difference favors females, negative mean difference favors males, *p < 0.05*

★ Females significantly greater (p<.05)

★ Males significantly greater (p<.05)

	Outcome	No. of Studies	Mean Difference (95% CI)	I^2
★	**Adduction**	22	3.22 (2.49, 3.94)*	45.7%, p = 0.011
	Passive Static ROM	1	3.40 (1.50, 5.30)*	N/A
★	1 Leg Hop or Jump	3	4.54 (1.99, 7.08)*	0.0%, p = 0.519
★	2 Leg Drop or Landing	3	2.74 (0.70, 4.78)*	0.0%, p = 0.646
★	1 Leg Squat	6	4.39 (2.75, 6.04)*	49.5%, p = 0.078
	2 Leg Squat	2	2.48 (-5.24, 10.20)	88.6%, p = 0.003
★	Walking	3	2.60 (1.60, 3.59)*	25.6%, p = 0.261
★	Jogging, Running	4	2.26 (0.82. 3.70)*	38.6%, p = 0.180
★	**Internal Rotation**	19	2.90 (0.51, 5.30)*	91.5%, p = <0.001
★	Passive Static ROM	5	8.18 (4.23, 12.13)*	91.5%, p = <0.001
	1 Leg Hop or Jump	2	0.52 (-3.57, 4.61)	36.6%, p = 0.209
★	2 Leg Drop or Landing	2	-3.21 (-5.77, -0.64)*	0.0%, p = 0.667
	1 Leg Squat	3	-0.17 (-2.54, 2.19)	22.6%, p = 0.275
	2 Leg Squat	2	1.53 (-6.90, 9.97)	86.4%, p = 0.007
	Walking	1	2.70 (1.17, 4.23)*	N/A
★	Jogging, Running	4	3.16 (0.23, 6.10)*	55.4%, p = 0.081
	External Rotation	9	2.59 (-0.43, 5.61)	89.2%, p = <0.001
★	Passive Static ROM	6	3.50 (0.03, 6.98)*	91.9%, p = <0.001
	1 Leg Hop or Jump	1	-1.90 (-7.30, 3.50)	N/A
	1 Leg Squat	2	0.53 (-5.71, 6.76)	29.2%, p = 0.235

Conclusion

- Provides baseline mobility values for clinicians to compare patient values to
- Results may guide prospective trials to assess impact of various exercises on not only raw patient ROM and strength values, but also patient satisfaction, athletic ability, and injury risk
- In comparing a patient's flexibility in relation to the average female or male, this study will better inform the development of hip injury prevention programs

References

1. Paluska SA. An overview of hip injuries in running. *Sports medicine.* 2005;35(11):991-1014.
2. Rankin AT, Bleakley CM, Cullen M. Hip joint pathology as a leading cause of groin pain in the sporting population: a 6-year review of 894 cases. *The American journal of sports medicine.* 2015;43(7):1698-1703. PMID: 25964274
3. Keogh MJ, Batt ME. A review of femoroacetabular impingement in athletes. *Sports Medicine.* 2008;38(10):863-878. PMID: 18803437
4. Wright JG, Swiontkowski MF, Heckman JD. Introducing levels of evidence to the journal. In. Vol 85: LWW; 2003:1-3.

Thank you!

Feel free to contact our team with any questions:

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