Le genou du joueuse de Basket

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Comparative Study > Am J Sports Med. 1982 Sep-Oct;10(5):297-9.
doi: 10.1177/0363546582010000507.

A comparison of men's and women's professional basketball injuries

J A Zelisko, H B Noble, M Porter

Injuries sustained by male and female professional basketball teams were compared. Injuries from two consecutive seasons were coded, and computer-based cross-tabulations comparing sex, body part, and type of injury were performed. The women's injury frequency was 1.6 times that of men. The body part most frequently injured on both teams was the ankle. Women sustained significantly more knee and thigh injuries as well as sprains, strains, and contusions. Men had significantly more muscle spasms. Other injuries occurred in similar patterns in both sexes. Alterations in training programs are suggested with emphasis on women's strengthening and men's flexibility.

Incidence female / male ratio ACL rupture
- 3.5 basketball
- 2.8 soccer

Epidemiology

Arthrosc Sports Med Rehabil. 2020 Jun; 2(3): e213–e217.
Published online 2020 Apr 16. doi: 10.1016/j.asmr.2020.02.003

PMCID: PMC7
PMID: 32

Injury in the Women's National Basketball Association (WNBA) From 2015 to 2019

Hayden Baker, M.D.,* Andrew Rizzi, M.D., and Aravind Athiviraham, M.D.

Female basketball athletes have a greater risk of knee and ankle injury compared with male athletes

Arthrosc Sports Med Rehabil. 2020 Jun; 2(3): e213–e217. PMCID: PMC7
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Injury in the Women's National Basketball Association (WNBA) From 2015 to 2019

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Injury Rate by Body Area

	Total		Games Missed		Rate (per 1000 Athletic Exposures)
	N	%	N	%	
Body area					
Lower extremity	143	0.73	1189	0.88	4.38
Upper extremity	11	0.06	31	0.02	0.34
Torso	2	0.01	17	0.01	0.06
Head	27	0.14	82	0.06	0.83
Spine/back	11	0.06	33	0.02	0.34
Totals	195	100	1352	100	

Knee and ankle injuries account for more than one half of the reported injuries

Injury Rate by Structure

	Total		Games Missed		Rate (per 1000 Athletic Exposures)
	N	%	N	%	
Ankle	43	0.22	176	0.13	1.32
Spine/back	12	0.06	60	0.04	0.37
Patella	1	0.01	0	0.00	0.03
Knee	56	0.29	683	0.51	1.72
Foot	18	0.09	202	0.15	0.55
Tibia/leg	8	0.04	42	0.03	0.25
Femur/thigh	15	0.08	46	0.03	0.46
Hip	3	0.02	17	0.01	0.09
Hand/wrist	2	0.01	12	0.01	0.06
Face	5	0.03	7	0.01	0.15
Shoulder	4	0.02	21	0.02	0.12
Eye	1	0.01	1	0.00	0.03
Fingers	2	0.01	3	0.00	0.06
Thumb	2	0.01	8	0.01	0.06
Elbow	1	0.01	7	0.01	0.03
Concussion	20	0.10	58	0.04	0.61
Rib/chest	2	0.01	9	0.01	0.06
Total	195	100	1352	100.00	

Table 4. Injury Rate by Specific Pathology

	Total		Games Missed		
	N	%	N	%	Rate (per 1000 Athletic Exposures)
Lateral ankle sprain	39	0.2	117	0.09	1.195
Achilles tendinopathy	4	0.02	20	0.01	0.123
ACL tear	18	0.09	376	0.28	0.55
Lumbar sprain/strain	9	0.05	32	0.02	0.28
Hand/wrist fracture	3	0.02	27	0.02	0.092
Nose fracture	5	0.03	8	0.01	0.15
Calf sprain/strain	5	0.03	32	0.024	0.15
Cervical sprain/strain	2	0.01	2	0.0015	0.06
Osteochondral injury (knee)	4	0.02	81	0.06	0.12
Plantar fasciitis	2	0.01	9	0.007	0.061
Concussion	19	0.10	55	0.041	0.58
Foot inflammation	2	0.01	6	0.004	0.061
Foot sprain	2	0.01	8	0.006	0.061
Hamstring strain	10	0.05	37	0.027	0.31
Hip contusion	3	0.02	17	0.013	0.092
Lumbar disc degeneration	1	0.01	26	0.019	0.031
Periorbital contusion	2	0.01	3	0.002	0.061
Foot fracture	2	0.01	27	0.02	0.061
Knee/patella contusion	8	0.04	72	0.053	0.25
Patellofemoral inflammation	16	0.08	41	0.03	0.49
Ankle fracture	1	0.005	17	0.013	0.03
Peroneal strain	2	0.01	40	0.030	0.06
High ankle sprain	1	0.005	4	0.0030	0.03
Knee sprain	1	0.005	9	0.0067	0.03
AC sprain	3	0.02	21	0.016	0.092
Meniscal tear	9	0.05	113	0.084	0.28
MCL sprain	1	0.005	4	0.0030	0.031
Finger sprain	2	0.01	3	0.002	0.061
Patella tendonitis	1	0.005	0	0	0.031
Shoulder labrum tear	1	0.005	0	0	0.031
Quadriceps contusion	2	0.01	2	0.0015	0.06
Elbow contusion	1	0.005	7	0.0052	0.031
Adductor strain	1	0.005	2	0.0015	0.031
Leg contusion	3	0.015	10	0.0074	0.092
Thumb sprain	1	0.005	2	0.0015	0.031
Rib contusion	2	0.01	9	0.0067	0.061
Achilles tendon tear	3	0.015	101	0.075	0.092
Hip flexor strain	2	0.01	5	0.0037	0.061
Thumb UCL tear	1	0.005	6	0.004	0.031
Wrist sprain	1	0.005	1	0.001	0.031
Total	195	100	1352	100	

AC, acromioclavicular; ACL, anterior cruciate ligament; MCL, medial collateral ligament; UCL, ulnar collateral ligament.

Lateral ankle sprain most frequent
Knee injuries more games missed

Epidemiology

> Orthop J Sports Med. 2022 Sep 15;10(9):23259671221120832.
doi: 10.1177/23259671221120832. eCollection 2022 Sep.

Epidemiology With Video Analysis of Knee Injuries in the Women's National Basketball Association

Kobi Axelrod [1], Neal Canastra [1], Nicholas J Lemme [2], Edward J Testa [2], Brett D Owens [2]

Analysed players knee injury 1997 -2019
retrospectively
99 knee injuries – 1 missed game

Epidemiology

Table 2

Number of Injuries, RTP Times, and RTP Rates (N = 99 injuries) [a]

	Injuries, n (%)	Average RTP Time, d	RTP Rate, %
ACL tear	37 (37)	375	70
Torn meniscus	20 (20)	231	95
MCL strain	6 (6)	124	100
Knee contusion [b]	14 (14)	77	94
Patellar contusion [b]	4 (4)	166	100
Knee sprain [b]	18 (18)	56	77

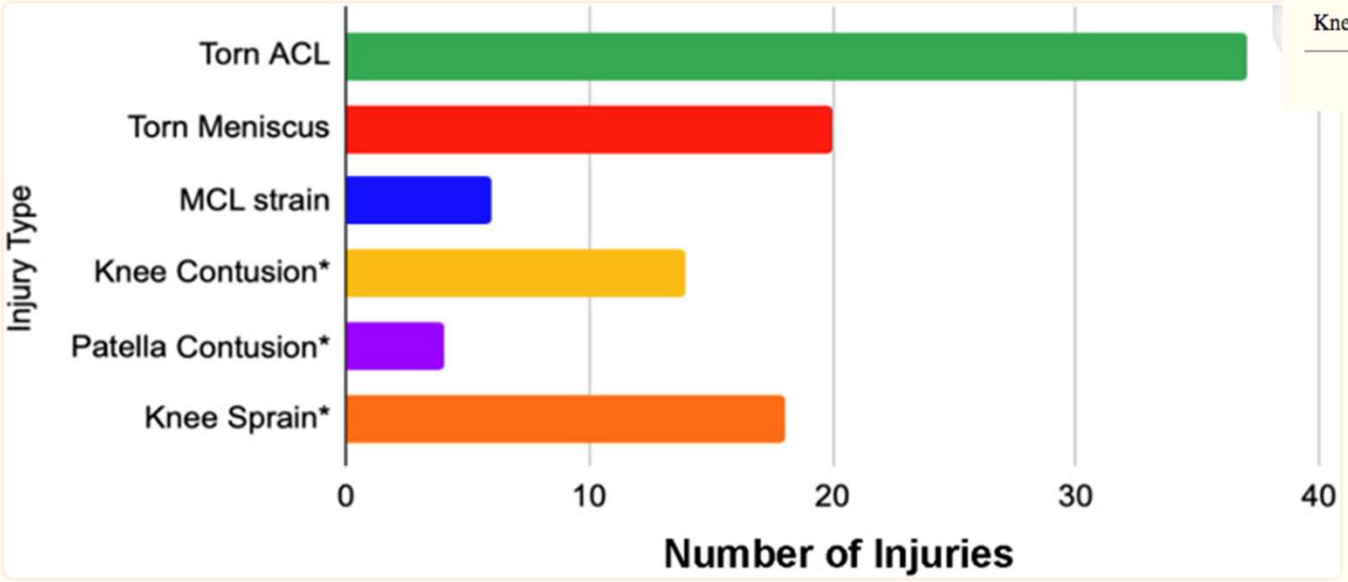
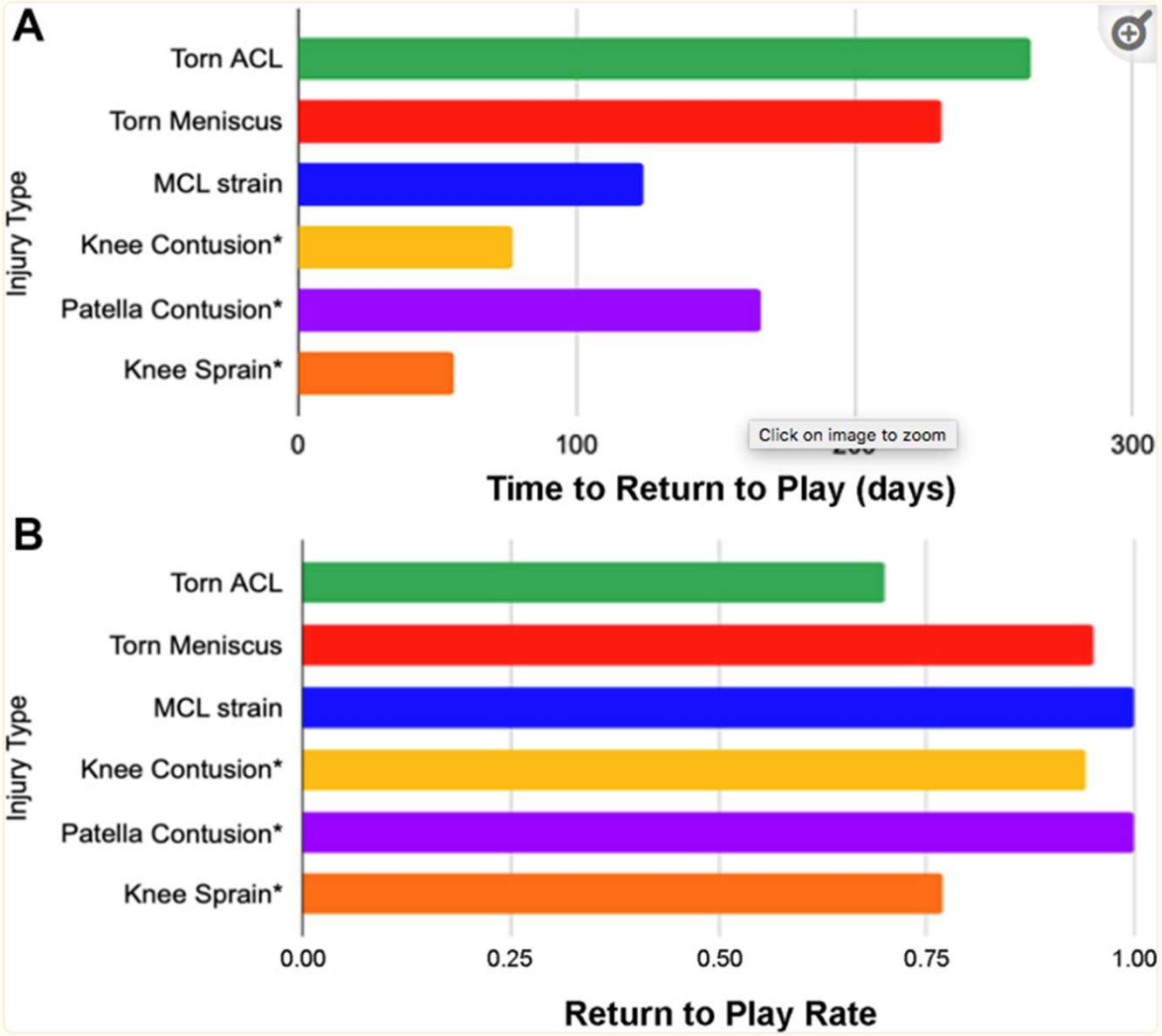


Figure 1.

Injury types. *Nonspecific/other injuries. ACL, anterior cruciate ligament; MCL, medial collateral ligament.



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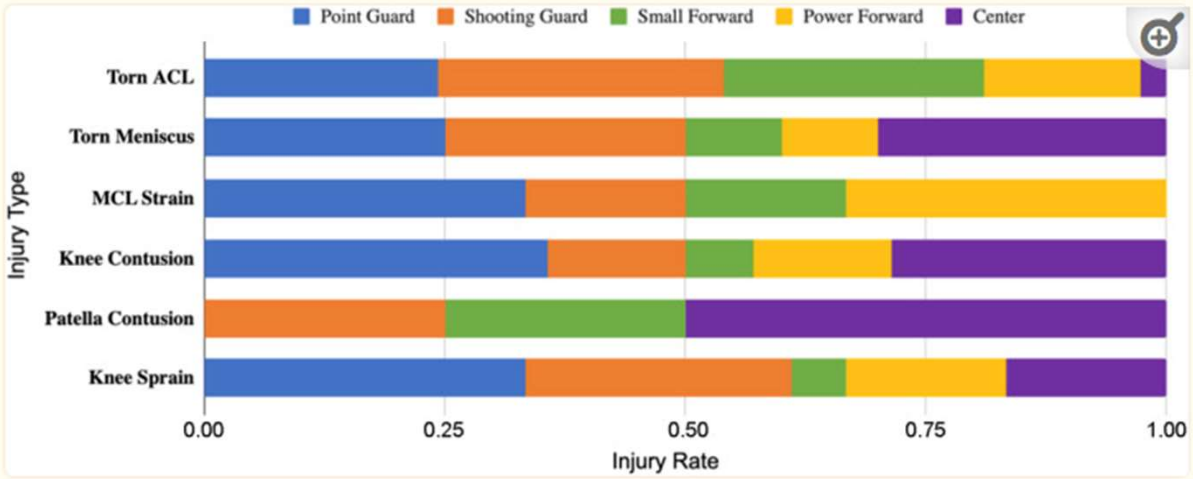
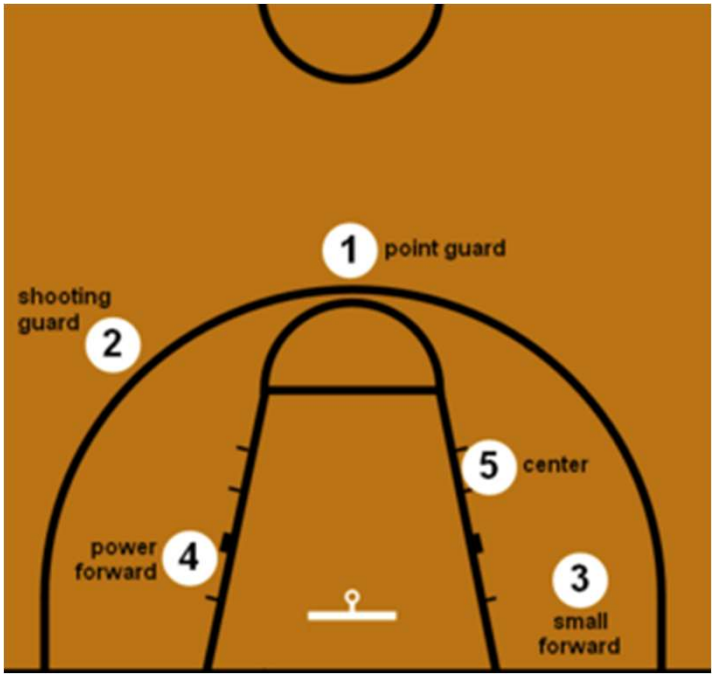
Injury Rate by Position [a]

	Injury Rate, %					
	Point Guard	Shooting Guard	Small Forward	Power Forward	Center	*P*
ACL tear, n=37	24	30	27	16	3	.11
Torn meniscus, n=20	25	25	10	10	30	.29
MCL strain, n=6	33	16	16	33	0	.15
Knee contusion [b], n=14	35	14	7	14	28	.18
Patellar contusion [b], n=4	0	25	25	0	50	.07
Knee sprain [b], n=18	33	27	5	16	11	.21

Open in a separate wi





Epidemiology

Injury Mechanism of ACL Tear and MCL Strain According to Video Analysis [a]

Injury Mechanism	ACL Tear (n = 10)	MCL Strain (n = 2)
Injury type: contact	1 (10)	1 (50)
Injury type: noncontact	9 (90)	1 (50)
Action: jumping	0 (0)	1 (50)
Action: landing	4 (40)	0 (0)
Action: planting	6 (60)	1 (50)
Leg position: flexion	10 (100)	2 (100)
Knee position: valgus	10 (100)	2 (100)
Knee position in sagittal plane: flexion	10 (100)	2 (100)

17 % contact injuries
83% non- contact injuries

58% Planting/pivoting the foot
33% Landing

92% hip flexion

ALL leg flexion, knee flexion and valgus

Epidemiology

> Orthop J Sports Med. 2022 Sep 15;10(9):23259671221120832.
doi: 10.1177/23259671221120832. eCollection 2022 Sep.

Epidemiology With Video Analysis of Knee Injuries in the Women's National Basketball Association

Kobi Axelrod [1], Neal Canastra [1], Nicholas J Lemme [2], Edward J Testa [2], Brett D Owens [2]

Conclusion: Study findings indicated that ACL tears are the most common clinically significant knee injuries sustained in the WNBA, accounting for 37% of total knee injuries with a mean RTP rate of 375 days. The most common mechanism of injury was planting the foot or landing from a jump with a flexed knee in the valgus position. Knee injuries had a high RTP rate in WNBA players but resulted in them missing a significant amount of playing time.

Why is the female ACL more prone to injury

J Orthop. 2016 Jun; 13(2): A1–A4.
Published online 2016 Mar 24. doi: 10.1016/S0972-978X(16)00023-4

The female ACL: Why is it more prone to injury?

- Hormonal
- Anatomic differences
- Neuromuscular !!
- Environmental (playing surface)

Hormonal

Orthop J Sports Med. 2017 Jul; 5(7): 2325967117718781.
Published online 2017 Jul 21. doi: 10.1177/2325967117718781

PMCID: PMC5524267
PMID: 28795075

The Effect of Menstrual Cycle and Contraceptives on ACL Injuries and Laxity: A Systematic Review and Meta-analysis

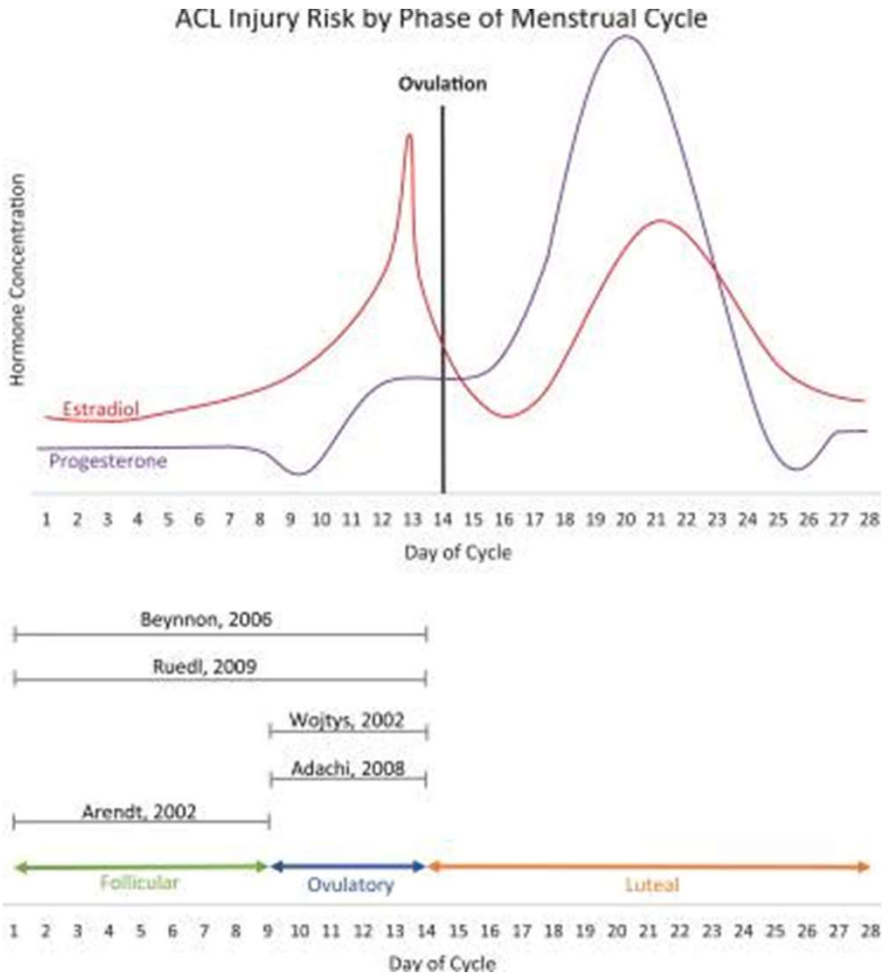
Simone D. Herzberg,[*†‡] Makalapua L. Motu'apuaka, BS,[§‖] William Lambert, PhD,[§] Rongwei Fu, PhD,[§¶] Jacqueline Brady, MD,[#] and Jeanne-Marie Guise, MD, MPH[‡§‖¶**]

- ACL injury and menstrual cycle
- ACL injury and hormonal contraceptive
- Knee laxity and menstrual cycle

ACL injury and menstrual cycle

- Laboratory studies
  - Exposure of ACL to Estradiol
    - ➢ Dose-dependent reduction in fibroblast and collagen synthesis
    - ➢ this effect is attenuated by progesterone

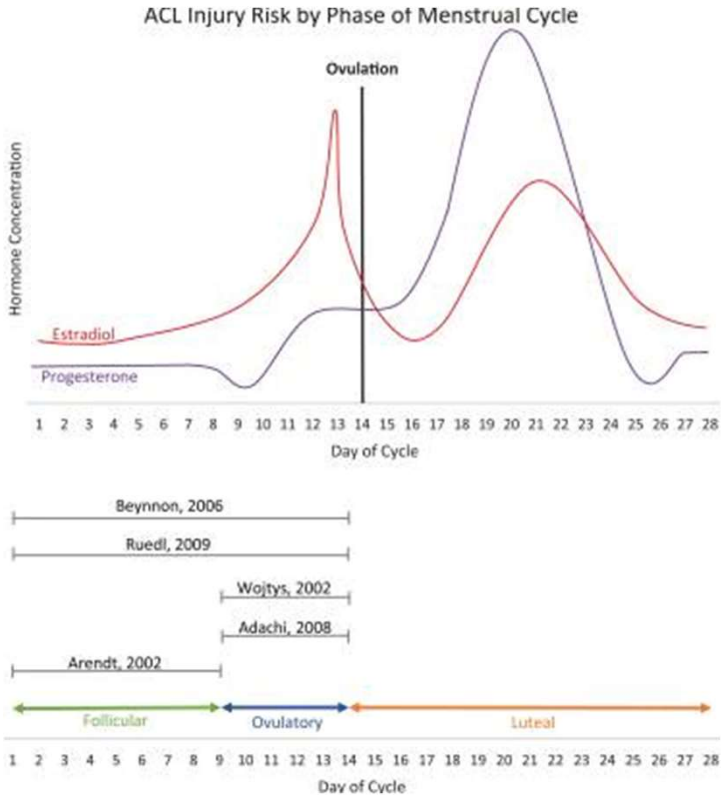
- 4 poor quality / 1 fair quality study
  > Lowest risk for ACL injury in luteal phase



ACL injury and hormonal contraceptive

- 7 studies > 2 large and high quality studies
  - ➢20% reduced risk for ACL injury while on OC
  - ➢Progesterone dominance of OC reduces the effect of Estradiol > progesterone only OC?

- No recommendations to modify practices during menstrual cycle or place female athletes on oral contraceptives



Knee laxity and menstrual cycle

- 6 studies – fair quality
  - ➢ Knee laxity significantly increased in ovulatory phase compared to follicular phase
  - ➢ Measured differences clinical significant?
- Other 6 studies- fair quality
  - ➢ 3 ovulatory phase / 1 luteal phase / 1 no difference
- Relation ACL laxity – Estradiol?
  - ➢ 4/ 5 studies highest ligament laxity when Estradiol concentration is high.

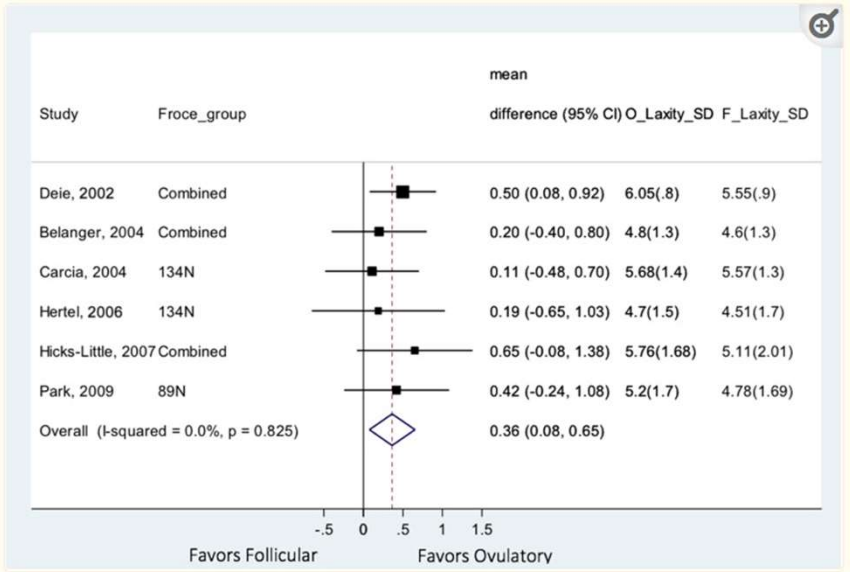


Figure 3.

Meta-analysis: knee laxity in follicular versus ovulatory phases.

Hormonal

Orthop J Sports Med. 2017 Jul; 5(7): 2325967117718781. PMCID: PMC5524267
Published online 2017 Jul 21. doi: 10.1177/2325967117718781 PMID: 28795075

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No consensus

Conclusion:

The literature suggests an association between hormonal fluctuations and ACL injury. Recent studies have suggested that oral contraceptives may offer up to a 20% reduction in risk of injury. The literature on ACL injuries and the menstrual cycle has more than doubled over the past decade, permitting quantitative analysis for the first time. However, the overall strength of this evidence is low. Promising potential directions for future research include long-term observational studies with ongoing hormonal assays and large interventional trials of follicular suppression, including newer hormonal methods.

Anatomic differences

> Curr Sports Med Rep. 2015 Sep-Oct;14(5):368-72. doi: 10.1249/JSR.0000000000000188.

Anatomic Factors that May Predispose Female Athletes to Anterior Cruciate Ligament Injury

Edward C Cheung [1], Daniel V Boguszewski, Nirav B Joshi, Dean Wang, David R McAllister

- Tibial anatomy
- Femoral anatomy
- ACL size
- Lower extremity alignment

Anatomic differences - Tibial plateau slope

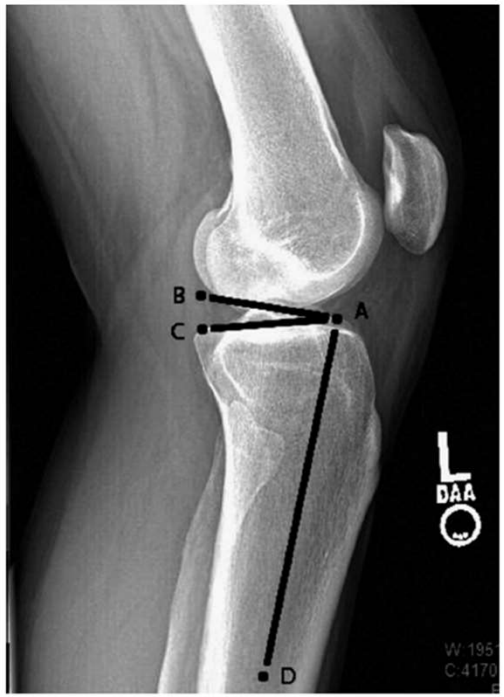

Figure 1: Tibial slope is the angle formed between lines A–B and A–C. A–D is a line parallel to the tibial shaft, and A–B is a perpendicular line to A–D. Points A and C are on the anterior and posterior aspects of the tibial plateau.

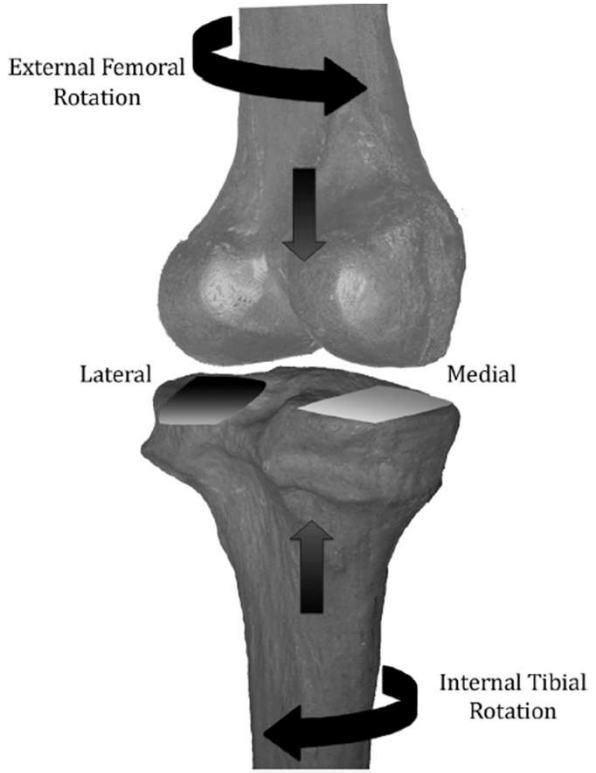

Figure 2: Increased lateral tibial slope compared with the medial slope causes tibial internal rotation during axial loading.

Tibial plateau slope

= normal posterior to anterior inclination of the tibial plateau

Woman:

- Increased PTS
- Greater lateral PTS > medial PTS
  - Increase anterior tibial translation
  - Internal rotation of tibia during weight bearing
  - greater ACL strain

Increased PTS will accentuate normal anterior tibial translation and internal rotations commonly seen during sudden loading conditions like landing from a jump or cutting manoeuver

Anatomic differences - meniscal slope

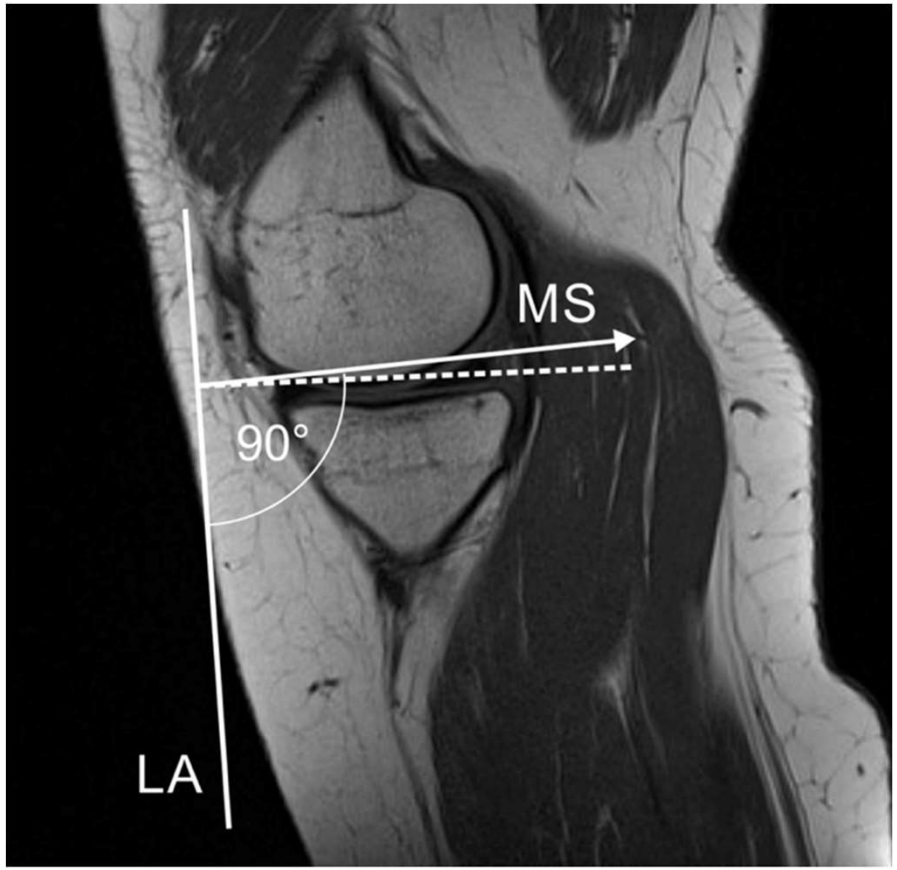

Figure 8: MR PD sagittal image used for the measurement of meniscal slope (MS), longitudinal axis (LA).

- Antero-posterior meniscal slope
- Meniscal slope and PTS not always equivalent
- Hudeck et al. 2011
  - Greater meniscal slope in uninjured women compared with uninjured men
  - Greater lateral meniscal slope among men and women with non-contact ACL injury

Anatomic differences – femoral notch

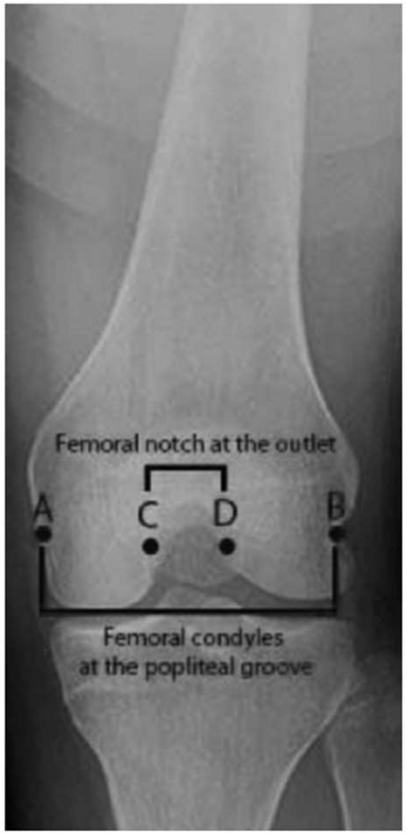

Figure 3: Femoral NWI is the ratio of the width of the femoral notch at the outlet (CD) to the width of the femoral condyles at the level of the popliteal groove (AB).

- No consensus but trend toward woman have smaller femoral notch than men.

- Zeng et al. meta-analyse: Narrow femoral notch strongly associated with increased risk of ACL injury
  - Impingement ACL during non-contact twisting movement

- Conflicting evidence
  - no universal consensus measurement methodology for notch size

Anatomic differences – ACL size smaller

Various studies show that

- Gender difference in ACL size
  - woman have smaller ACL compared to men
  - Smaller ACL, when subjected to the same force, more prone to injury than larger ligaments
- Gender difference in structural properties
  - female ACL lower strain stress and elasticity at failure compared with men ACL ?
- Ligament size and notch size are related ? > further studies
  - Smaller notch > smaller ACL > less resistant to tensile force
  - Smaller notch > big ACL > impingement during internal rotation and valgus

BUT : no universal consensus measurement methodology for ACL size

Anatomic differences – lower extremity alignment

- Lower extremity STATIC alignment
  - Not predictive
  - Ratios hip width to femoral length about equal male and female
    - Ratios better measurement than absolute with

Anatomic differences

> Curr Sports Med Rep. 2015 Sep-Oct;14(5):368-72. doi: 10.1249/JSR.0000000000000188.

Anatomic Factors that May Predispose Female Athletes to Anterior Cruciate Ligament Injury

Edward C Cheung [1], Daniel V Boguszewski, Nirav B Joshi, Dean Wang, David R McAllister

Conclusions

Women are more likely to injure their ACL compared with men. Women have been shown to have increased posterior tibial and meniscal slopes, decreased femoral notch sizes, and smaller native ligaments compared with men. These anatomic differences may help explain the gender disparity in ACL injury rates. Because of differences in methodology and relatively small sample sizes, further research is needed to determine whether these anatomic differences can be used to predict if certain women are more prone to ACL injury.

Neuromuscular differences

0363-5465/96/2424-0187$02.00/0
THE AMERICAN JOURNAL OF SPORTS MEDICINE, Vol. 24, No. 2

Neuromuscular Adaptations in Isokinetic, Isotonic, and Agility Training Programs*

Edward M. Wojtys,† MD, Laura J. Huston, MS, Paul D. Taylor, and Steven D. Bastian

- Gender differences in neuromuscular activation patterns > ACL injury
  - Maximal contraction of knee musculature reduces anterior tibial translation
  - Female athletes
    - more anterior tibial laxity (arthrometry)
    - take longer time to generate maximum hamstrings torque during isokinetic testing
    - Contract initially the quadriceps, instead of the hamstrings
    - less muscle strength and muscle endurance
    - less effective in stiffening the knee

Neuromuscular – core stability

- Proximal control dictates distal function
  - Abdominal
  - Back extensor
  - Hip musculature
- Lack of control > getting in at risk position for ACL injury

Prevention

- Intrinsic risk factors
- Extrinsic risk factors > changeable
  - Avoid sport-specific at-risk motions and positions
    - Land safely –in control
      - Avoid one-leg landing, out-of-control baseline landings, straight leg landings
    - Foot movement during cutting
  - Activate protective neuromuscular responses when at-risk situations are encountered

Randomized Controlled Trial > J Orthop Sports Phys Ther. 2022 Jan;52(1):40-48.
doi: 10.2519/jospt.2022.10959.

The "SHRed Injuries Basketball" Neuromuscular Training Warm-up Program Reduces Ankle and Knee Injury Rates by 36% in Youth Basketball

Carolyn A Emery, Oluwatoyosi B A Owoeye, Anu M Räisänen, Kimberley Befus, Tate Hubkarao, Luz Palacios-Derflingher, Kati Pasanen

https://www.youtube.com/watch?v=QLvB9eTC5J8

Objective: To evaluate the effectiveness of a neuromuscular training warm-up prevention program, Surveillance in High school and community sport to Reduce (SHRed) Injuries Basketball, for reducing all-complaint ankle and knee injuries in youth basketball players.

Conclusion: The SHRed Injuries Basketball program was associated with a 36% lower rate of ankle and knee injuries. Neuromuscular training warm-ups are recommended as the minimal standard of practice for injury prevention in youth basketball. *J Orthop Sports Phys Ther 2022;52(1):40-48. doi:10.2519/jospt.2022.10959*.