http://dx.doi.org/10.2106/JBJS.19.00535

The following content was supplied by the authors as supporting material and has not been copy-edited or verified by JBJS.

Appendix I: Search Strategy

Medline: 2124 studies	Embase: 4547 studies	PubMed: 6629 studies
Strategy	**Strategy**	**Strategy**
1. 'anterior cruciate ligament' OR ACL	1.'anterior cruciate ligament' OR ACL	((anterior cruciate ligament OR ACL) AND (injury OR tear OR sprain)) AND ((((((((((((risk factor) OR tibial spine) OR notch) OR patellofemoral) OR condyle) OR wedge angle) OR slope) OR hip) OR femoroacetabular impingement) OR alignment) OR limb length discrepancy) OR ankle) OR anatomic) OR pivot shift) OR morphology)
2. injury OR tear OR sprain	2. injury OR tear OR sprain	
3. 'risk factor' OR 'tibial spine' OR notch OR patellofemoral OR condyle OR 'wedge angle' OR slope OR hip OR 'femoroacetabular impingement' OR alignment OR 'limb length discrepancy' OR ankle OR anatomic OR 'pivot shift' OR morphology	3. 'risk factor' OR 'tibial spine' OR notch OR patellofemoral OR condyle OR 'wedge angle' OR slope OR hip OR 'femoroacetabular impingement' OR alignment OR 'limb length discrepancy' OR ankle OR anatomic OR 'pivot shift' OR morphology	
4. 1 and 2	4. 1 and 2	
5. 3 and 4	5. 3 and 4	

Appendix II: Methodology—Justification for Synthesis and Against Meta-Analysis

Although we would have preferred to conduct analyses on the published estimates, we found that the data did not support meta-analyses. Consistent with Institute of Medicine Standards for systematic reviews and COSMOS-E guidance for systematic reviews of observational studies, our decision whether to pool the data was based on "study diversity, sensitivity, and risk of bias rather than solely on statistical measures of heterogeneity..."[1,2]

Specifically, the reasons for not pooling the data included

- Important variation in the conceptual definitions of morphological factors that would not be addressed sufficiently by a random-effects model. For example, tibial slope has been represented both as the subchondral bone slope and as the slope of the articulating cartilage.
- Insufficient number of odds ratios reported for specific morphological factors. In Appendix II, Table 2, for example, only two studies report an odds ratio. We do not think that meta-analysis of only two studies would be appropriate.
- Variation in statistical methods. For example, the studies reporting multivariate analyses demonstrate substantial heterogeneity in the morphologies that are included in each multivariate model.

Unfortunately, the quality and level of evidence of the available literature limits our ability to provide statistically pooled estimates of morphologies associated with an increased risk of ACL injury. Nevertheless, from the included studies, we can clearly identify several morphological risk factors (notch stenosis, increased tibial slope, and increased condylar offset) that are associated with increased risk of ACL injury. These morphologies merit further study and should be accounted for in future work, and so the present review adds substantial value to the literature, even in the absence of a meta-analysis. We hope that this review will prompt high quality, LOE 2 studies on this topic so that a rigorous, high quality meta-analysis can be performed in the future.

All of the evidence was from observational studies, and the bulk were case-control studies. Since both case-control and cohort studies are appropriate study designs to address our question, we felt that it was appropriate to summarize the data across these designs. Specific reasons for our approach include:

1) The LOE 2 studies do not necessarily address the same morphologies as LOE 3 studies
2) Excluding the LOE 3 studies would omit many of the multivariable analyses that represent the highest quality data
3) Prior orthopaedic systematic reviews, previously published in journals of a similar caliber[3], have aggregated data across multiple levels of evidence when a meta-analysis was deemed inappropriate. Our approach is consistent with prior literature and accepted within the field.

We hope that this study will illustrate that the quality and level of evidence of the literature is limiting our ability to conduct a meta-analysis and draw more statistically rigorous conclusions on this topic.

We believe that this work will serve as the foundation for a renewed effort to produce high-quality LOE 2 studies that can be included in a future meta-analysis. It is also our hope that this data will drive a consensus regarding a required minimum dataset for publication on this topic.

1. Institute of Medicine. Finding What Works in Health Care: Standards for Systematic Reviews. Jill E, Laura L, Alfred B, Sally M, editors. Washington, DC: The National Academies Press; 2011.

2. Dekkers OM, Vandenbroucke JP, Cevallos M, Renehan AG, Altman DG, Egger M. COSMOS-E: Guidance on conducting systematic reviews and meta-analyses of observational studies of etiology. PLoS Med. 2019;16(2):e1002742.

3. de Sa D, Holmich P, Phillips M, Heaven S, Simunovic N, Philippon MJ, et al. Athletic groin pain: a systematic review of surgical diagnoses, investigations and treatment. Br J Sports Med. 2016;50(19):1181-6.

Appendix III: Tables

Table 1. Characteristics of Included Studies

Author	Year	Study Design	AAOS Grade	Total of ACL Injured Knees	% Female	Age Mean±SD (range) [95%CI]	Injury Mechanism	Imaging	MINORS Score (max 24)
Al-Saeed	2013	Retrospective, case-control	III	280	Inj: 13% Int: 47%	M:38[a] (20-60) F: 36[a] (22-58)	NR	MRI	17
Al-Moosawi	2010	Retrospective, case-control	III	114	NR	(18-66)	NR	MRI	19
Alentorn-Geli	2015	Retrospective, case-control	III	46	0%	Inj: 33.1, 16-49 Int: 33.7, 16-51	Non-contact	MRI	18
Anderson	1987	Retrospective, case-control	III	**Bil:** 28 (14 pts) **Uni:** 17	Bil:42.9% Uni:41.2% Int: 41.2%	Bil: 26 Uni:23	NR	CT	15
Blanke	2016	Retrospective, case-control	III	80	61%	39.0±12.3[b]	Non-contact	MRI	21
Bojicic	2017	Retrospective, case-control	III	76	Inj: 47.4% Int: 50%	Inj: 24.6±7.1 Int: 26.5±8.3	NR	MRI	19
Bouras	2017	Retrospective, case-control	III	58	100%	Inj: 29.9±5.3 Int: 28.4±5.3	NR	MRI	19
Brandon	2006	Retrospective, case-control	III	100	Inj: 34% Int:51%	NR	Non-contact	XR	19
Chaudhari	2009	Cross sectional, case-control	III	27	Inj: 37% Int:37%	Inj: 33.0 Int: 34.4	Non-contact	MRI	22
Chen	2016	Retrospective, case-control	III	38	Inj: 73.7% Int: 58.5%	Inj: 57.55±8.45 Int: 56.68±9.03	NR	MRI	18
Chung	2011	Cross sectional, case control	III	28	Inj: 10.71% Int: 20%	Inj: 26 (18-39) Int: 28 (24-31)	Sporting injuries	XR	18
Elmansori	2017	Retrospective, case-control	III	100	Inj: 33% Int: 48%	Inj: 33.7±10.8 (18-63) Int: 43.6±15.9 (18-86)	NR	MRI	22
Evans	2012	Prospective, case-control	III	49	14.997%	18[a], 17-19	Non-contact	XR	17
Everhart	2010	Prospective, case-control	III	27	37.04%	NR	Non-contact	MRI	18

Fernandez-Jaen	2015	Prospective, case-control	III	308	Inj: 27.27% Int: 36.94%	Inj: 33.8 ± 12.5 Int: 33.3 ± 11.1	Non-contact	MRI	19
Geng	2016	Retrospective, case-control	III	20	100%	41-65	NR	MRI	18
Good	1991	Retrospective, case-control	III	155	29.7%	Chronic ACL inj: 24.9±5.6 Acute ACL inj: 25.2±5.5	NR	Arth	15
Gormeli	2015	Retrospective, case-control	III	**Bil:** 36 (18 pts) **Uni:** 38	NR[1]	Inj: 29.9±9.3 Int: 31.02±7.9	NR	MRI	21
Hashemi	2010	Retrospective, case-control	III	49	Inj: 55.1% Int: 60%	Inj: 32.6, 16-41 Int: 13-64	NR	MRI	21
Hendrix	2017	Retrospective, cohort	II	**Bil:** 100 (50 pts) **Uni:** 50	Bil: 54% Uni: 50% Int: 64%	Bil: 20.4±8.4 Uni: 23.3±11.1 Int: 28.5±14.5	Non-contact	XR	21
Hertel	2004	Retrospective, case control	III	**Bil:** 8 (4 pts) **Uni:** 16	Inj: 50% Int: 50%	Inj: 20.4 ± 1.2 Int: 20.7 ± 1.4	NR	NA	20
Herzog	1994	Prospective, case-control	III	20	NR	NR	NR	XR, MRI	21
Hewett	2010	Prospective, case-control	III	2	100%	Inj: 16 Int: 15±1	Non-contact	XR	18
Hohmann	2011	Retrospective, case-control	III	272	Inj: 26.8% Int: 26.8%	Inj-M: 26, 16-54 Int-M: 26.5, 15-54 Inj-F: 29, 15-46[E] Int-F: 28, 16-46	Non-contact	XR	23
Hoshino	2012	Retrospective, case control	III	26	Inj: 46.2%. Int: 50%	All: 35±16	NR	CT	16
Houseworth	1987	Retrospective, case-control	III	50	NR	18-25	NR	XR	14
Hudek	2011	Retrospective, case-control	III	55	Inj: 56.4% Int: 56.4%	Inj M: 32±9 Inj F: 36±12 Int M: 32 ± 8 Int F: 37.0 ± 11	Noncontact	MRI	19
Keays	2016	Cross-sectional, case-control	III	24	Inj: 37.5% Int: 37.5%	Inj: 27±5.4 Int: 30.2±7.6	NR	XR	21
Kizilgoz	2018	Retrospective, case-control	III	86	40%	29, 18-50 Inj: 28, 20-50 Int: 29, 18-39	NR	MRI	20
LaPrade	1994	Prospective, case-control	III	7	Inj: 42.9% Int: NR	NR	6 Non-contact, 1 contact	XR	15
Lin	2005	Prospective, case-control	III	115	Inj: 32.2% Int: 37.3%	Inj:24.79±7.60, (16-40) Int:25.38±7.14, (15-40)	NR	XR	19
Lombardo	2005	Prospective, case-control	III	14	0%	NR	13 Non contact, 1 contact	XR	18

Lopes	2016	Cross-sectional, case-control	III	Con: 35 NC: 45	0%	Con: 28.6±7.6 NC: 27.8±7.3	35 contact, 45 non-contact	XR	21
Loudon	1996	Prospective, case-control	III	20	100%	Inj: 26.5±7.6 (16-41) Int: 26.2±7.8 (16-41)	Non-contact	NA	16
Lund-Hanssen	1994	Retrospective, case-control	III	20	100%	Inj: 20, 17-28 Int: 21, 16-27	NR	XR	17
Meister	1998	Retrospective, case-control	III	**Bil:** 2 (1 pt) **Uni:** 48	Inj: 51.0% Int: 56.4%	Inj: 26.5 Int: 28.3	Non-contact	XR	16
Miljko	2012	Retrospective, case-control	III	24	100%	Inj: 21.00±7 Int: 17.00±5	Non-contact	MRI	17
Ouyang	2016	Prospective, case-control	III	40	45%	32.2±2.3 (20-62)	NR	MRI	19
Park	2012	Retrospective, case-control	III	120	Inj: 36.7% Int: 33.0%	Inj M: 37.9 (19-50) Inj F: 42.5 (20-55) Int M: 40.5 (17-53) Int F: 47.2 (21-54)	38 traffic accidents, 23 soccer, 15 basketball, 44 other	MRI	17
Pecina	2001	Retrospective, case-control	III	171	Inj: 14% Int: 15.8%	Inj: 28 (17-47) Int: 27.5 (17-45)	NR	XR	15
Pedoia	2015	Retrospective, case-control	III	50	Inj: 42% Int: 36.8%	Inj: 29.6±8.2 Int: 31.1±4.4	NR	MRI	19
Pfeiffer	2018	Retrospective, case-control	III	85	Inj: 38% Cltl: 54% Int: 33%	Inj: 27.4 ± 9.4 Cltl: 27.2±11.1 Int: 29.8±10.6	NR	XR	21
Rahnemai-Azar	2016	Retrospective, case-control	III	45	0%	Inj: 20 ± 2 Int: 20 ± 2	NR	MRI	21
Senisik	2011	Cross-sectional, case-control	III	10	0%	22.7±3.5	non-contact	XR	16
Shelbourne	1998	Prospective, cohort	II	714	32.8%	M: 25.7 F: 21.7	NR	XR	10/16
Siebold	2010	Retrospective, case-control	III	37	NR	NR	NR	3D CT	17
Simon	2010	Cross-sectional, case-control	III	27	37.0%	NR	NR	MRI	17
Stein	2010	Prospective, case-control	III	23	Inj: 22% Int: 56%	Inj: 57.5±10.8 Int: 57.5±10.8	NR	MRI	17
Sturnick	2014	Prospective, case-control	III	88	Inj: 69.3% Int: 69.3%	NR	Non-contact	MRI	21
Sturnick	2014	Prospective, case-control	III	88	Inj: 69.3% Int: 69.3%	NR	Non-contact	MRI	20
Sturnick	2015	Prospective, case-control	III	88	Inj: 69.3% Int: 69.3%	NR	Non-contact	MRI	20
Sun	2015	Retrospective, cohort	II	87	All: 57.9% Inj: NR	20-59[E2]	NR	XR	17
Sundar	2016	Retrospective, case-control	III	199	Inj: 14.6% Int: 51.7%	40	NR	MRI	16

Teitz	1997	Retrospective, case-control	III	**Bil:** 4 (2 pts) **Uni:** 38	50%	M: 39, 19-70 F: 38.2, 19-71	Non contact	XR	16
Todd	2010	Retrospective, case-control	III	140	Inj: 32.1% Int: 70.4%	Inj: 24.9±7.9 Int: 25.4±8.7	Non-contact	XR	18
Uhorchak	2003	Prospective, cohort	II	24	13.97%	18.4 (17-23)	Non-contact	XR	18
van Diek	2014	Retrospective, case-control	III	45	46.6%	Inj: 26.3 Int: 41.3	NR	MRI	19
van Eck	2011	Retrospective, case-control	III	50	Inj: 38% Int: 52%	Inj: 26±10.7 Int: 39.9±14.5	NR	MRI	20
van Eck	2010	Retrospective cohort	II	102	45.1%	24 (14-66)[SM]	NR	Arth	11/16
Vasta	2018	Retrospective, case-control	III	200	50%	Inj M: 24.5±5.1 Inj F: 23.6±4.3 Int M: 24.4±4.8 Int F: 24.3±4.7	NR	XR	21
Vrooijink	2011	Retrospective, case-control	III	45	Inj: 40% Int: 50%	Inj M: 27.7 Int M: 40.7 Inj F: 23.7 Int F: 42.1	NR	MRI	19
Wahl	2012	Retrospective, case-control	III	**Bil:** 86 (43 pts) **Uni:** 69	Bil: 48.8% Uni: 37.7% Int: 40.98%	NR	noncontact	MRI	20
Waiwaiole	2016	Retrospective, case-control	III	107	Inj: 50% Int: 60%	Inj: 27±9 Int: 36±14	NR	MRI	18
Webb	2013	Prospective, case-control	III	15	All: 49.7% **Cltl:** NR	**Cltl:** NR	NR	XR	16
Whitney	2014	Prospective, case-control	III	88	69.3%	NR	non-contact	MRI	20
Wratten	2015	Retrospective, case-control	III	90	50%	Inj M: 27.4±9.6 Int M: 32.8±11.4 Inj F: 31.8±9.6 Int F:35.1±13.2 All: 16-50	NR	MRI	19
Xiao	2016	Retrospective, case-control	III	73	27.4%	Inj: 28.2±8.6 Int: 28.1±8.7	noncontact	XR	19
Zeng	2016	Retrospective, case-control	III	73	27.4%	Inj: 28.2±8.6 Int: 28.1±8.7	noncontact	XR	22

NR, Not Reported; NA, Not Applicable; Arth, arthroscopic measurement; **M**, Male; **F,** Female; **Bil:** bilateral injury; **Uni:** unilateral injury; **Inj:** ACL-injured; **Int:** ACL-intact; **Con:** Contact; **NC:** Non-contact; **Cltl:** Contralateral injury

[a]Median; [b]Standard Error; [E]Excluded: females excluded from qualitative synthesis due to age; [E2]Excluded: Patients aged 0-9 and 10-19 were excluded from qualitative synthesis; [SM]Skeletal maturity of patients explicitly stated

[1]The number of females reported was inconsistent

Table 2. Intercondylar Notch Shape, Notch Width, and Lateral Wall Angle

Variable	Author	Year	N torn [%][$]	Injured (mean±SD) [95%CI]	N intact (%)[$]	Intact (mean±SD) [95%CI]	p-value	OR [95%CI]
Notch Shape								
Type A	Al Saeed	2013	176 [73]	NA	64 (27)	NA	<0.001[¤]	NR

Type A	Bouras	2017	26 [61.9]	NA	16 (38.1)	NA	0.02[χ] 0.04[Reg]	2.3 [1.1-4.9][Reg]
Type A	Chen	2016	33 [55]	NA	27 (45)	NA	0.029[χ]	3.422
Type A-Steep	Keays	2016	12 [100]	NA	0	NA	NR	NR
Type A-Round	Keays	2016	9 [40.9]	NA	13 (59.1)	NA	NR	NR
Type A	Van Eck	2010	55	NA	NA	NA	NR	NR
Type U	Al Saeed	2013	100 [31.5]	NA	216 (68.5)	NA	<0.001[χ]	NR
#1 (U Shaped)	Anderson	1987	**Bil:** 2 (1pt) [7] **Uni:** 1 [6] **"narrowed":** 1 [12]	NA	3 (18)	NA	NR	NR
Type U	Bouras	2017	26 [44.8]	NA	43 (70.5)	NA	NR	NR
Type U	Chen	2016	5 [26]	NA	14 (74)	NA	0.029[χ]	NR
Round	Keays	2016	3 [21.4]	NA	11 (78.6)	NA	NR	NR
Type U	Van Eck	2010	42	NA	NA	NA	NR	NR
Type W	Al Saeed	2013	4 [100]	NA	0 (0)	NA	<0.001[χ]	NR
Type W	Bouras	2017	6 [75]	NA	2 (25)	NA	NR	NR
Type W	Van Eck	2010	5	NA	NA	NA	NR	NR
Shape #2	Anderson	1987	**Bil:** 2 (1pt) [7] **Uni:** 3 [18]	NA	2 (12)	NA	NR	NR
Shape #3	Anderson	1987	**Bil:** 4 (2pt) [28] **Uni:** 2 [12]	NA	3 (18)	NA	NR	NR
Shape #4	Anderson	1987	**Bil:** 6 (3 pt) [43] **Uni:** 5 [29]	NA	8 (47)	NA	NR	NR
#5 (Wave Shaped)	Anderson	1987	**Bil:** 2 (1 pt) [14] **Uni:** 6 [35]	NA	1 (6)	NA	NR	NR
Notch Shape Index (NSI)	Ouyang	2016	40	0.521±0.003	NR	0.564±0.005	0.029	NR

NSI	Geng	2016	**F:** 20	**F:** 0.55±0.05	**F:** 30	**F:** 0.63±0.10	P<0.05	NR
Notch Width (mm)								
NW (cm)	Alentorn-Geli	2015	46	**C:** 1.8 [1.2-2.4] **A:** 1.9 [1.5-2.3]	53	**C:** 1.9 [1.3-5.6] **A:** 1.9 [1.5-5.6]	**C:** 0.14 **A:** 0.72	NR
NW	Bouras	2017	58	18±1.8	61	17.8±2.0	n.s	NR
NW	Evans	2012	**M:** 37 **F:** 12	**M:**18.1±3.1 **F:** 14.8±2.3	**M:**1397 **F:** 241	**M:**18.3±3.0 **F:** 15.7±2.5	n.s. n.s.	**M-RR:** 0.8[b] **F-RR:** 1.3[b]
NW	Hewett	2010	2	12 mm, 13 mm	72	15±2.7	NR	NR
NW	Kizilgoz	2018	86 **M:**54 **F:** 32	19.1±0.2 [18.7-19.5] **M:** 20±0.3 [19.4-20.6] **F:**17.5±0.3 [16.9-18.1]	109 **M:** 63 **F:** 46	20.1±0.2 [19.7-20.5] **M:** 20.8±0.2 [20.4-21.2] **F:**19.1±0.2 [18.7-19.5]	0.001 **M:** 0.029 **F:** <0.001	NR
NW	Lombardo	2005	14	23.4±3.9	291	23.5±4.1	0.921	NR
NW	Miljko	2012	24	18.50±2.05[e]	27	21.50±1.40[e]	<0.001	NR
NW	Ouyang	2016	40	17.3±2.1	40	22.5±2.6	0.037	NR
NW	Park	2012	M: 76 F: 44	M: 17.37±2.12 F: 15.76±1.70	M: 71 F: 35	M:20.33±1.60 F:18.52±1.56	M: <0.001 F: <0.001	NR
NW	Rahnemai-Azar	2016	45	20.7±2.9	45	22±2.9	>0.05[Reg]	0.89 [0.77-1.02][Reg]
NW	Shelbourne	1998	5.9%<15mm 1.2%>16mm	NR	NA	NA	<0.01	NR
NW	Uhorchak	2003	24 **M:**16 **F:** 8	13.8±2.5, (9.0-18.0) **M:** 14.7±2.1, (11.0-18.0) **F:** 11.6±2.6, (9.0-16.0)	800 **M:** 695 **F:** 105	17.5±3.0, (8.0-27.0) **M:**17.8±3.0, 8.0-27.0 **F:** 15.5±2.8, (9.0-24.0)	<0.001 **M:** <0.001 **F:** <0.001	NR
NW	van Diek	2014	45	22.0	43	22.0	n.s[α1]	NR
NW	van Eck	2011	50	Bottom:16.2±2.6 Middle:14.7±2.6 2/3H: 10.4±2.8	NA	NA	NA	NA
NW	Vrooijink	2011	**M:** 27 **F:** 18	**M:** 21.3 **F:** 21.8	**M:** 22 **F:** 22	**M:** 23.0 **F:** 20.4	**M:** n.s. [α2] **F:** n.s. [α2]	NR
Notch Width-AM, PR	Herzog	1994	20	**A:**18.4±3.8 **C:** 18.0±2.8	20	**A:** 20.4±3.8 **C:** 18.0±2.4	n.s.	NR
Notch Width-PR	Herzog	1994	20	**A:** 20.6±2.4 **C:** 20.3±2.8	20	**A:** 21±3.4 **C:** 20.3±2.6	n.s	NR
NW-2/3H, PR	Herzog	1994	20	**A:** 16.1±3	20	**A:** 16.3±2.4	n.s.	NR

NW-AO	Everhart	2010	**M:** 17 **F:** 10	**M:**13.74±2.86 **F:** 12.53±1.92	**M:**17 **F:** 10	**M:**15.99±3.33 **F:**15.29±1.5	**M:**0.0294 **F:** 0.0011	NR
NW- AM, AO	Herzog	1994	20	**A:** 17.8±3.8 **C:** 14.6±2.2	20	**A:** 19±3.1 **C:** 13.8±3.2	n.s.	NR
NW-2/3H,AO	Herzog	1994	20	**A:** 15.2±2.9 **C:** 12.6±1.9	20	**A:** 14.8±3.2 **C:** 12.5±2.1	n.s.	NR
NW-AO	Lund-Hanssen	1994	20 Inj, 20 Cltl	**Inj:**18.2±2.1 **Cltl:** 16.7±2.0	26	18.5±3.1	0.003[c] 0.02[d]	NR
NW-Outlet	Simon	2010	27	21.0±2.5	27	22.6±2.5	0.02	NR
NW_Outlet	Whitney	2014	88 **M:** 27 **F:** 61	15.1±2.6 **M:** 16.4±2.7 **F:** 14.6±2.5	88 **M:** 27 **F:** 61	16.7±2.3 **M:** 18.0±2.4 **F:** 16.1±2.0	<0.01 **Reg** **M:** <0.05 **Reg** **F:** <0.01 **Reg**	0.701 [0.587-0.838]**Reg** **M:** 0.722 [0.528-0.986]**Reg** **F:** 0.692 [0.557-0.859]**Reg**
NW_AA	Whitney	2014	88 **M:** 27 **F:** 61	18.4±2.1 **M:** 19.4±2.1 **F:** 18.0±1.9	88 **M:** 27 **F:** 61	19.7±2.3 **M:** 21.1±2.5 **F:** 19.1±1.9	<0.01 **Reg** **M:** <0.05 **Reg** **F:** <0.01 **Reg**	0.714 [0.595-0.857]**Reg** **M:** 0.745 [0.566-0.979]**Reg** **F:** 0.693 [0.544-0.883]**Reg**
NW_MA	Whitney	2014	88 **M:** 27 **F:** 61	20.0±2.3 **M:** 21.0±2.3 **F:** 19.5±2.2	88 **M:** 27 **F:** 61	20.8±2.5 **M:** 22.2±2.9 **F:** 20.2±2.1	<0.05**Reg** **M:** n.s. **F:** <0.05**Reg**	0.815 [0.697-0.954]**Reg** **M:** 0.812 [0.628-1.051]**Reg** **F:** 0.817 [0.670-0.996]**Reg**
Notch Width-PO	Everhart	2010	**M:** 17 **F:** 10	**M:**22.36±1.95 **F:**18.72±1.27	**M:** 17 **F:** 10	**M:**23.34±2.66 **F:** 21.09±1.85	**M:** 0.116 **F:** 0.0018	NR
NW-PO	Lund-Hanssen	1994	20 Inj, 20 Cltl	Inj: 22.6±2.4 Cltl: 21.8±1.9	26	23.1±2.4	0.05[d]	NR
NW-Inlet	Simon	2010	27	13.3±2.6	27	15.6±2.9	0.003	NR
NW-inlet	Whitney	2014	88 **M:** 27 **F:** 61	22.5±2.7 **M:** 24.6±2.6 **F:** 21.5±2.2	88 **M:** 27 **F:** 61	23.4±3.0 **M:** 25.5±3.4 **F:** 22.4±2.3	<0.05**Reg** **M:** n.s.**Reg** **F:** <0.05**Reg**	0.878 [0.777-0.992]**Reg** **M:** 0.918 [0.773-1.090]**Reg** **F:** 0.845 [0.714-0.999]**Reg**

NW, Group 1A (Chronic instability, < 2 yr from injury to measurement)	Good	1991	34	16.8±2.9	NR	NR	P<0.05 (vs. 2A & 2B)	NR
NW, Group 1B (Chronic instability, > 2 yr from injury to measurement)	Good	1991	59	15.7±2.9	NR	NR	n.s. (vs. 1A)	NR
NW, Group 1A and 1B	Good	1991	93	16.1±3.0	NR	NR	P<0.001 (vs. 2A & 2B)	NR
NW, Group 2A (Acute repair, isolated ACL tear)	Good	1991	28	17.9±3.1	NR	NR	n.s. (vs. 2B)	NR
NW, Group 2B. (Acute repair, ACL tear+medial complex injury)	Good	1991	34	18.2±2.3	NR	20.4±2.5	P<0.001 (vs. cadaveric controls)	NR
NW, Group 2A and 2B	Good	1991	62	18.1±2.7	NR	20.4±2.5	P<0.001 (vs. cadaveric controls)	NR
N.E.W.(Axial)	Vrooijink	2011	**M:** 27 **F:** 18	**M:** 21.9 **F:** 22.5	**M:** 22 **F:** 22	**M:** 23.3 **F:** 21.5	**M:** n.s.[α2] **F:** n.s. [α2]	NR
N.E.W.(Axial)	Park	2012	**M:** 76 **F:** 44	**M:** 20.45±2.41 **F:** 18.72±1.63	**M:** 71 **F:** 35	**M:**21.36±2.42 **F:**18.95±1.70	**M:**0.026(n.s)[α2] **F:** 0.561	NR
Notch Depth								
Intercondylar Depth-Axial	Alentorn-Geli	2015	46	3.1 [2.3-3.9]	53	3.1 [2.3-9.2]	0.54	NR
Notch Depth Index (NDI)	Geng	2016	**F:** 20	**F:** 0.52±0.04	**F:** 30	**F:** 0.52±0.05	n.s.	NR
Notch Height								
Intercondylar Depth-Coronal	Alentorn-Geli	2015	46	**C:** 2.4 [1.8-3]	53	**C:** 2.4 [2-7.1]	**C:** 0.69	NR
Notch Height (cm)	Anderson	1987	**Bil:** 14 **Uni:** 17	**Bil:** 1.91 **Uni:** 2.03	17	1.97	**Bil:** 0.503 **Uni:** 0.450	NR
Intercondylar Angle (deg)								
Intercondylar Angle	Alentorn-Geli	2015	46	**C:** 51.2 [35.5-66.9] **A:** 46.5 [30-63]	53	**C:** 60.1 [41.7-177.9] **A:** 50.7 [37.2-150]	**C:** <0.001 **A:** 0.008	NR
Notch Angle	Anderson	1987	**Bil:** 14 **Uni:** 17	**Bil:** 45.4 **Uni:** 48.6	17	54.7	**Bil:** 0.0005 **Uni:** 0.004	NR

Notch Angle-AO, MRI	Herzog	1994	20	**C:** 52.0±11.4 **A:** 46.4±8.6	20	**C:** 49.2±8.9 **A:** 48.7±9	n.s.	NR
Notch Angle-PR, MRI	Herzog	1994	20	**A:** 45.7±10.9	20	**A:** 48.2±6.2	n.s.	NR
Notch Angle-XR	Herzog	1994	20	57.1±14.7	20	62.2±6.2	n.s.	NR
Intercondylar Notch Angle	Stein	2010	23	**C:** 48.0±8.1 [43.5-52.4] **A:** 55.3±10.3 [50.9-59.8]	137	**C:** 52.2±11.2 [50.4-54.1] **A:** 58.5±10.8 [56.7-60.3]	**C:** 0.08 **A:** 0.19	NR
Notch Width Angle (Intercondylar Angle in the Axial Plane)	Kizilgoz	2018	86 **M:** 54 **F:** 32	49.3 (41.3-52.4) **M:** 49.7±0.48 [48.73-50.67] **F:** 49.3 (41.3-52.4)	109 **M:** 63 **F:** 46	50.1 (44.9-53.7) **M:** 50.26±0.28 [49.70-50.83] **F:** 50.1 (44.9-53.7)	0.08 **M:** 0.297 **F:** 0.008	NR
Lateral Wall Angle (deg)								
Lateral Wall Angle-AO, MRI	Herzog	1994	20	**C:** 28.3±6.7 **A:** 17.6±7.1	20	**C:** 25.8±5.2 **A:** 18.7±7	n.s.	NR
Lateral Wall Angle-PR, MRI	Herzog	1994	20	**A:** 25.7±8.6	20	**A:** 22±4.4	n.s.	NR
Lateral Wall Angle-XR	Herzog	1994	20	31.1±11.1	20	32.3±4.8	n.s.	NR
Inner Angle	Miljko	2012	24	**A:** 75.00 [2]	27	**A:** 68.00 [3]	<0.001	NR

NW: Notch Width; C: coronal; A: axial; M: male; F: female; MF: males and females combined; RR: relative risk; Cltl: contralateral uninjured knee; 2/3H: two-thirds notch height; AM: Articular Margin; AO: Anterior Outlet; PO: Posterior Outlet; PR: Popliteal Recess; NW_AA: Notch width at the anterior attachment of the ACL to the femoral condyle; NW_MA: Notch width at the middle of the attachment of the ACL to the femoral condyle; N.E.W.: notch entrance width

$^{\chi}$Chi-Square analysis; $^{\$}$Percentage reported for categorical variables; ^{u}Unadjusted; ^{a}Adjusted; ^{b}Relative Risk for 1 SD ≤ mean; ^{c}Injured vs. Contralateral; ^{d}Contralateral knee vs. Control; ^{e}median±SE; ^{Reg}univariate logistic regression $^{\alpha 1}$p<0.005 was considered significant; $^{\alpha 2}$p<0.01 was considered significant

Table 3. Notch Width Index, Intercondylar Ridge, Notch Height, Notch Area, and Notch Volume

Notch Width Index							
Study Information		**Injured ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95% CI]**	**p value**
Measured at Maximum Notch Width							
Maximum notch width/condylar width	Anderson	**Bil:** 14 **Uni:** 17	**Bil:** 0.229 **Uni:** 0.251	17	0.266	NR	**Bil:** 0.010 **Uni:** 0.209
Measured at Notch Apex							

NW 2/3 NH/CW	Anderson	**Bil:** 14 **Uni:** 17	**Bil:** 0.196 **Uni**: 0.185	17	0.207	NR	**Bil:** 0.0267 **Uni:** 0.021
Measured at Popliteal Groove							
NWI	Al Moosawi	114	**A:** 0.296±0.0318	241	**A:** 0.300±0.0311	NR	0.707
NWI (>0.27)	Al Saeed	232 (83%)	NA	152 (34%[£])	NA	NR	n.s.[¤]
NWI (<0.27)	Al Saeed	48 (17%)	NA	128 (46%)	NA	NR	n.s.[¤]
NWI	Bouras	46	0.3±0.03	61	0.2±0.03	**U:**1.2 [0.5-2.6] **A:** 0.7 [0.3-1.8]	NS
NWI (Patients with OA)	Chen	38	**C:** 0.237±0.018 [0.231-0.243] **A:** 0.258±0.011 [0.255-0.262] **C_{Att}:** 0.240±0.019 [0.234-0.246]	41	**C:** 0.250±0.012 [0.246-0.254] **A:** 0.270±0.010 [0.267-0.274] **C_{Att}:** 0.259±0.015 [0.254-0.263]	NR	**C:** <0.001 **A:** <0.001 **C_{Att}:** <0.001
Notch Width Ratio	Chung	28	0.26 (0.21-0.33)	20	0.29 (0.23-0.34)	NR	0.02
Intercondylar width-condylar width index	Alentorn-Geli	46	**C:** 0.23 [0.2-0.3] **A:** 0.25 [0.2-0.3]	53	**C:** 0.24 [0.2-0.7] **A:** 0.25 [0.2-0.7]	NR	**C:** 0.17 **A:** 0.47
Notch width index	Evans	49	0.2 ± 0.02 **M:** 0.2 ± 0.02 **F:** 0.18 ± 0.03	1638	0.2 ± 0.03 **M:** 0.2 ± 0.03 **F:** 0.2 ± 0.03	NR	n.s.
NWI (Patients with OA)	Geng	**F:** 20	**F:** 0.25±0.2	**F:** 30	**F:** 0.28±0.03	NR	P<0.05
NWI	Gormeli	**Bil:**18 **Uni:**38	**Bil:** 0.227± 0.008 **Uni:** 0.245± 0.009	53	0.272± 0.01	**Bil:** 26.5 [6.71-104.95] **Uni:** 3.23 [2.23- 4.68]	p<0.05[Ω]
Notch Ratio-PR, MRI	Herzog	20	**C:** 0.287±0.04 **A:** 0.282±0.03	20	**C:** 0.29±0.04 **A:** 0.293±0.04	NR	**C:** n.s. **A:** n.s.
Notch ratio-XR	Herzog	20	0.23±0.05	20	0.23±0.04	NR	n.s.

Anterior NWI	Keays	20	0.18	20	0.24	NR	<0.001
NWI	Kizilgoz	86 **M:** 54 **F:** 32	0.258±0.002 [0.254-0.262] **M:** 0.259± 0.003 [0.253-0.265] **F:** 0.257± 0.003 [0.251-0.261]	109 **M:** 63 **F:** 46	0.276±0.002 [0.272-0.280] **M:** 0.274 ± 0.002 [0.270-0.278] **F:** 0.280± 0.002 [0.276-0.284]	NR	<0.001 **M:** 0.001 **F:** <0.001
NWI	LaPrade	7 **M:** 4 **F:** 3	0.193± 0.013 (0.17-0.21) **M:** 0.188± 0.013 **F:** 0.200± 0.010	408	0.243±0.039 **M:** 0.244±0.036 **F:** 0.238±0.037	NR	0.0008 **M:** NR **F:** NR
NWI	Lombardo	14	0.235± 0.031	291	0.242±0.041	NR	0.534
Intercondylar notch width index	Lopes	**Con:**3 **NC:** 45	**Con:** 0.2 ± 0.03 **NC:** 0.2 ± 0.03	0	NA	NR	n.s.
Notch width index	Lund-Hanssen	20	**Inj:** 0.243±0.028 **Cltl:** 0.224±0.026	26	0.243± 0.038	5 [1.3-17]	**Inj/Cltl:** 0.003 **Cltl/Ctrl:** 0.04
NWI	Ouyang	40	0.201± 0.03	40	0.253± 0.04	NR	0.035
NWI	Park	120	0.23±0.03	NR	0.24±0.02	NR	0.083
Notch width index	Rahnemai-Azar	45	0.26±0.03	45	0.26±0.04	0.001 [0.00001-342.67][Reg]	>0.05[Reg]
NWI	Stein	23	**C:** 0.246±0.03 [0.234-0.258] **A:** 0.181±0.03 [0.168-0.194]	137	**C:** 0.263±0.03 [0.258-0.268] **A:** 0.190±0.03 [0.184-0.195]		**C:** 0.01 **A:** 0.23
NWI	Teitz	42 (2 **Bil**) **M:** 21 **F:** 21	0.248±0.04 (0.18-0.34) **M:** 0.252±0.03 (0.19-0.31) **F:** 0.244±0.04 (0.18-0.34)	40 **M:** 20 **F:** 20	0.253±0.04 (0.15-0.35) **M:** 0.263±0.03 (0.19-0.32) **F:** 0.243±0.04 (0.15-0.35)		0.53

Notch width index	Uhorchak	24	0.18±0.03 (0.1-0.2) **M:** 0.18±0.02 (0.1-0.2) **F:** 0.16±0.04 (0.1-0.2)	800 **M:**695 **F:** 105	0.21±0.03 (0.1-0.3) **M:** 0.21±0.03 (0.1-0.3) **F:** 0.22±0.03 (0.1-0.3)	NR	<0.001 **M:** <0.001 **F:** <0.001
NWI	van Diek	45	0.3 **M:** 0.3 **F:** 0.3	43	0.3 **M:** 0.3 **F:** 0.3	NR	n.s. [α1]
NWI	Vrooijink	45	**M:** 0.3 **F:** 0.3	**M:** 22 **F:** 22	**M:** 0.3 **F:** 0.3	NR	n.s. [α2]
Measured at Posterior Notch							
Posterior NWI	Keays	20	0.26	20	0.30	NR	0.006
Notch width-Eminence width ratio							
Notch width /eminence width ratio	Uhorchak	24	1.19±0.2 (0.8-1.6) **M:** 1.25±0.2 (0.9-1.6) **F:** 1.06±0.02 (0.8-1.3)	800 **M:**695 **F:** 105	1.33±0.2 (0.7-2.1) **M:** 1.33±0.2 (0.7-2.1) **F:** 1.25±0.2 (0.7-1.9)	NR	0.018 **M:** 0.085 **F:** 0.011
Intercondylar Ridge							
Study Information		**ACL injured**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**N**	**mean±SD**	**N**	**mean±SD**	**OR (95%CI)**	**p value**
Ridge Thickness	Everhart	27	3.87±2.17 **M:** 4.65±1.77 **F:** 2.54±2.21	27 **M:** 17 **F:** 10	2.16±1.8 **M:** 2.24±2 **F:** 2±1.47	NR	0.00142 **M:** 0.0014 **F:** 0.46
Ridge Thickness	Whitney	88 **M:**27 **F:** 61	3.7±1.2 **M:** 3.7±1.5 **F:** 3.7±1.1	88 **M:**27 **F:** 61	3.4±1.1 **M:** 3.7±1.3 **F:** 3.3±0.9	1.273 (0.969-1.672)[Reg] **M:** 0.972 (0.662-1.427)[Reg] **F:** 1.658 (1.100-2.500)[Reg]	n.s.[Reg] **M:** n.s.[Reg] **F:** <0.05[Reg]
Notch Height (mm)							
Study Information		**ACL injured**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**N**	**mean±SD**	**N**	**mean±SD**	**OR [95%CI]**	**p value**

Notch Height (cm)	Anderson	**Bil:** 14 **Uni:** 17	**Bil:** 1.91 **Uni:** 2.03	17	1.97	NR	**Bil:** 0.503 **Uni:** 0.450
Notch Height-AO	Herzog	20	**C:** 15.6±2.5 **A:** 19.9±2.9	**C:** 20 **A:** 20	**C:** 15.2±2.9 **A:** 20.5±3.2	NR	n.s.
Notch Height-PR	Herzog	20	**A:** 21.8±2.8	**A:** 20	**A:** 22.8±2.7	NR	n.s.
intercondylar notch height	Ouyang	40	31.3±2.6	40	30.9±2.5	NR	0.483
notch height	van Eck	50	21±3.6	50	NA	NA	NA
Notch Area (cm^2)							
Study Information		**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**N**	**mean±SD (range)**	**N**	**mean±SD (range)**	**OR (95%CI)**	**p value**
Notch Area/Condylar Area	Anderson	**Bil:** 14 **Uni:** 17	**Bil:** 0.0938 **Uni:** 0.0992	17	0.108	NR	**Bil:** 0.209 **Uni:** 0.362
Notch Area/Condylar Area (Middle)	Anderson	**Bil:** 14 **Uni:** 17	**Bil:** 0.072 **Uni:** 0.083	17	0.077	NR	**Bil:** 0.408 **Uni:** 0.262
Notch Area/Condylar Area (Posterior)	Anderson	**Bil:** 14 **Uni:** 17	**Bil:** 0.063 **Uni:** 0.068	17	0.067	NR	**Bil:** 0.464 **Uni:** 0.815
Cross Sectional Area (CSA)	Geng	**OA+ACL:** 20	487.91±56.68	**OA-only:**30 **Ctrl:** 89	**OA-only:** 522.82±78.18 **Ctrl:** 530.30±62.80	NR	**OA-only:** n.s. **Ctrl:** P<0.05
Notch Area-ANT	Houseworth	50	1.8386 (1.2978-2.5422)	50	1.9447 (1.3091-2.4858)	NR	NR
Notch Area-POST	Houseworth	50	2.16 (1.4356-2.9215)	50	2.3176 (1.7721-3.4789)	NR	NR
Notch Area-TOTAL	Houseworth	50	34.043 (28.5609-38.417)	50	33.6737 (26.6838-39.5081)	NR	NR
Notch Area Ratio-ANT/TOTAL	Houseworth	50	0.053968 (0.0436-0724)	50	0.0576 (0.0413-0.0874)	NR	0.0597
Notch Area Ratio-POST/TOTAL	Houseworth	50	0.063384 (0.0483-0.0806)	50	0.0687 (0.0466-0.0799)	NR	0.00496
Notch Area Ratio-(POST-ANT)/TOTAL	Houseworth	50	0.009226 (0.0002-0.0226)	50	0.0111 (0.0015-0.0230)	NR	0.0658
Notch volume (cm^3)							

Study Information		Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD**	**OR [95%CI]**	**p value**
Notch volume	Simon	27	10.3±2.5	27	11.2±2.6	NR	0.24
Notch volume	van Eck	50	6.5±1.7	50	5.9±1.4	NR	0.054
Notch volume (mm^3)	Whitney	88 **M:**27 **F:** 61	6609.0±1444.0 **M:**7782.0±1524.0 **F:** 6091.0±1061.0	88 **M:** 27 **F:** 61	7193.0±1711.0 **M:**8835.0±1599.0 **F:** 6466.0±1178.0	0.960 [0.932-0.987]^{Reg} **M:** 0.943 [0.892-0.996]^{Reg} **F:** 0.968 [0.935-1.003]^{Reg}	<0.05^{Reg} **M:** <0.05^{Reg} **F:** n.s.^{Reg}
Notch volume	Wratten	**M:**45 **F:** 45	**M:** 4.5±1.1[±0.3] **F:** 3.1±0.70 [±0.2]	**M:** 45 **F:** 45	**M:** 5.3±1.2 [±0.4] **F:** 3.6±0.7 [±0.2]	NR	**M:** 0.02 **F:** 0.0002
Notch volume/condylar volume	Anderson	**Bil:** 14 **Uni:** 17	**Bil:** 0.0999 **Uni:** 0.1014	17	0.1037	NR	**Bil:** 0.547 **Uni**: 0.656

C: Coronal; **A:** Axial; **C_{Att}:** Coronal, measured at level of femoral ACL insertion; **M:** Male; **F:** Female; **Inj:** Injured Knee; **Cltl:** Contralateral Knee**; Con:** Contact**, NC:** Non-contact**; NA:** Not Applicable**; NR:** Not Reported**; ND:** Normal/Damaged**;** $^{\alpha}$p<0.01 was considered significant; $^{\mathcal{B}}$Contact vs. Non-contact; $^{\Omega}$ANOVA between all groups; ^{Reg}univariate logistic regression

Table 4. Tibial Plateau Morphology

Posterior Tibial Slope

Study Information			Torn ACL		Intact ACL		Significance	
Variable	Authors	Year	N	mean±SD (range) [95%CI]	N	mean±SD (range) [95%CI]	OR [95%CI]	p value
Mean Posterior Tibial Slope-Sagittal	Alentorn-Geli	2015	46	6.3 [-0.2-12.8]	53	4.1 [-3.4-12.1]	NR	0.003
Posterior Inclination of the Tibial Plateau-Method 1[1]	Meister	1998	50 **M:** 24 (1 bilateral) **F:** 25	9.7±1.8	50	9.9±2.1	NR	0.67
Posterior Inclination of the Tibial Plateau-Method 2[2]	Meister	1998	49 **M:** 24 **F:** 25	9.5±2.1	39	9.7±1.8	NR	0.72
Posterior Inclination of the Tibial Plateau-Method 3[3]	Meister	1998	49 **M:** 24 **F:** 25	9.7±2.0	39	9.7±1.8	NR	0.98
Tibial slope-Longitudinal Axis	Zeng	2016	73 **M:** 53 **F:** 20	11.5±3.3 **M:** 11.7±3.5 **F:** 11±2.7	73 **M:** 53 **F:** 20	9.4±2.6 **M:** 9.2±2.5 **F:** 10.1±2.9	NR	<0.001 **M:** <0.001 **F:** n.s.
Tibial slope-Posterior Tibial Cortex	Zeng	2016	73 **M:** 53 **F:** 20	9.1±3.1 **M:** 9.2±3.3 **F:** 8.9±2.6	73 **M:** 53 **F:** 20	7.2±2.6 **M:** 7±2.5 **F:** 7.6±2.9	NR	<0.001 **M:** 0.001 **F:** n.s.
Tibial slope-Anterior Tibial Cortex	Zeng	2016	73 **M:** 53 **F:** 20	13.8±3.3 **M:** 13.8±3.5 **F:** 13.7±2.9	73 **M:** 53 **F:** 20	11.6±2.7 **M:** 11.5±2.6 **F:** 12±3	NR	<0.001 **M:** <0.001 **F:** 0.028

Medial Posterior Tibial Slope (degrees)

Study Information			Torn ACL		Intact ACL		Significance	
Variable	Authors	Year	N	mean±SD (range) [95%CI]	N	mean±SD (range) [95%CI]	OR [95%CI]	p value
Posterior-medial tibial slope	Alentorn-Geli	2015	46	6.4 [0.3-12.5]	53	3.4 [-4.8-10.1]	NR	<0.001
Posterior-Inferior Tibial Slope	Brandon	2006	100 **M:** 66 **F:** 34	11.2±3.8 **M:** 10.8±3.9 **F:** 12.0±3.5	100 **M:** 49 **F:** 51	8.5±3.0 **M:** 8.4±3.4 **F:** 8.6±2.7	NR	<0.001 **M:** <0.001 **F:** <0.001
MTS	Hashemi	2010	49 **M:** 22 **F:** 27	6[m] (-2-14) **M:** 5.95±2.72 **F:** 6.85±3.61	55 **M:** 22 **F:** 33	5[m] (-3-10) **M:** 3.68±3.11 **F:** 5.91±2.96	NR	0.01 **M:** 0.007 **F:** 0.14
MTS	Kizilgoz	2018	86 **M:** 54 **F:** 32	5±0.17 [4.20-4.64] **M:** 4.82 ± 0.24 [4.34-5.30]	109 **M:** 63 **F:** 46	3.96±0.15 [3.66-4.26] **M:** 3.85 ± 0.20 [3.45-4.25]	NR	<0.001 **M:** 0.003 **F:** <0.001

				F: 5.31± 0.20 [4.91-5.71]		**F:** 4.12± 0.22 [3.68-4.56]		
MTS	Elmansori	2017	100	9.4±3.3 (1.4-16)	100	7.0±3.7 (-0.6-15.0)	NR	NR[Sig]
Medial Tibial Slope	Rahnemai-Azar	2016	45	3.1±2.5	45	1.7±1.8	1.42 [1.09-1.85][Reg]	<0.01[Reg]
Tibial Slope	Senisik	2011	10	**Dom:** 12.90±2.73 **ND:** 11.25±3.52	54	**Dom:** 8.98±2.39 **ND:** 9.27±2.43	NR	**Dom:** <0.001 **ND:** n.s.
Posterior Tibial Slope	Sun	2015	**A:** 19 **B:** 22 **C:** 31 **D:** 15	**A:** 12.57±0.51 **B:** 12.67±0.43 **C:** 11.68±0.48 **D:** 11.18±0.73	**A:**156 **B:**145 **C:**158 **D:**160	**A:** 10.89±0.21 **B:** 10.22±0.24 **C:** 10.01±0.25 **D:** 9.83±0.24	NR	**A:** 0.008 **B:** <0.001 **C:** 0.006 **D:** 0.102
Posterior Tibial Slope	Todd	2010	140 **M:** 95 **F:** 45	9.39±2.67 **M:** 9.20±2.69 **F:** 9.80±2.62	179 **M:**126 **F:** 53	8.5±2.58 **M:** 8.63±2.65 **F:** 8.20±2.4	NR	0.003 **M:** 0.113 **F:** 0.002
Medial Posterior Tibial Slope	Waiwaiole	2016	107	6±4	109	5±3	NR	0.002
MTS	Blanke	2016	80 **M:** 23 **F:** 57	8.77±0.38 [8.0-9.5] **M:** 7.33±0.71 [5.9-8.8] **F:** 9.34±0.42 [8.5-10.2]	41 **M:** 24 **F:** 17	7.80±0.51 [6.8-8.8] **M:** 6.60±0.67 [5.1-8.0] **F:** 9.55±0.60 [8.3-10.8]	NR	0.14 **M:** 0.83 **F:** 0.99
Medial Posterior tibial slope	Chung	2011	28	13 (2-20)	20	12 (6-19)	NR	0.61
Posterior Tibial Slope[A]	Hohmann	2011	272 **M:** 199 **F:** 73	**M:** 5.5 ± 3.4 (0-16) [5.0-5.9] **F:** 6.7 ± 3.7 (0-17) [5.8–7.5]	**M:** 199 **F:** 73	**M:** 5.8 ± 3.1 (1-14) [5.3-6.2] **F:** 5.0 ± 3.4 (1-15) [4.3-5.8]	NR	**M:** n.s. **F:** 0.004
Medial PTS	Hudek	2011	55 **M:** 24 **F:** 31	4.7 [3.9-5.4] **M:** 4.3 [3.1-5.5] **F:** 5.0 [4.0-5.7]	55 **M:** 24 **F:** 31	4.1 [3.5-4.8] **M:** 3.0 [1.9-4.2] **F:** 4.9 [4.0-5.8]	NR	0.12 **M:** n.s. **F:** n.s.
Medial Tibial Plateau Slope (MTPS)	Simon	2010	27	-1.8±3.7	27	-2.9±2.8	NR	0.20
MTPS	Sundar	2016	199 **M:** 170 **F:** 29	6.72±2.72 (0-14) **M:** 6.72±2.72 (0-14) **F:** 6.73±2.72 (2-13)	290 **M:**140 **F:** 150	6.73±2.73 (0-16) **M:** 6.73±2.73 (0-12) **F:** 6.75±2.71 (0-16)	NR	0.07 **M:** NR **F:** NR

MTS	van Diek	2014	45	5.9 **M:** 6.0 **F:** 5.7	43	5.3 **M:** 4.7 **F:** 5.8	NR	n.s[α1] **M:** n.s.[α1] **F:** n.s.[α1]
Posterior Tibial Slope	Webb	2013	15	9.9±2.3	131	8.5±2.3	NR	0.16
Medial postero-inferior cartilage slope	Sturnick	2014	**M:** 27 **F:** 61	**M:** -6.5±3.4 **F:** -6.0±3.3	**M:** 27 **F:** 61	**M:** -6.6±3.1 **F:** -6.6±3.4	**M:** 1.012 [0.85–1.204] **F:** 1.049 [0.941–1.169]	**M:** 0.89 **F:** 0.39
medial subchondal bone slope	Sturnick	2014	**M:** 27 **F:** 61	**M:** NR **F:** NR	**M:** 27 **F:** 61	**M:** NR **F:** NR	**M:** 0.95 [0.77-1.17] **F:** 1.02 [0.9-1.16]	**M:** 0.63 **F:** 0.75
Middle Cartilage Slope								
Lateral Middle Cartilage Slope	Bojicic	2017	76	4.4±3.7	42	2.9±3.3	1.125 [1.007-1.254]	0.037
middle cartilage slope-medial	Sturnick	2014	**M:** 27 **F:** 61	**M:** -1.6±2.5 **F:** -0.6±2.8	**M:** 27 **F:** 61	**M:** -0.8±3.5 **F:** -0.5±3.5	**M:** 0.925 [0.778–1.099] **F:** 0.985 [0.879–1.104]	**M:** 0.37 **F:** 0.80
Middle cartilage slope-lateral	Sturnick	2014	**M:** 27 **F:** 61	**M:** -1.3±3.5 **F:** 0.6±3.8	**M:** 27 **F:** 61	**M:** -1.8±3.8 **F:** -3.7±4.2	**M:** 1.054[Reg] [0.895-1.24] **F:** 1.303[Reg] [1.142-1.486]	**M:** 0.5[Reg] **F:** 0.0001[Reg]
Lateral Posterior Tibial Slope (degrees)								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95%CI]**	**p value**
Posterior-lateral tibial slope	Alentorn-Geli	2015	46	6.2 [-3.2-15.6]	53	4.1 [-3.9-12.1]	NR	0.02
Lateral Posterior Tibial Slope	Bojicic	2017	76	6.7±3.9	42	5.4±3.4	1.118 [1.003-1.247]	0.043
LTS	Elmansori	2017	100	10.4±3.1 (1.9-15.8)	100	7.3±3.4 (0-15.4)	NR	NR[Sig]

LTS	Hashemi	2010	49 **M:** 22 **F:** 27	9^{m} (0-12) **M:** 7.22±2.71 **F:** 8.44±2.82	55 **M:** 22 **F:** 33	6^{m} (0-14) **M:** 5.40±2.77 **F:** 7.03±3.07	NR	0.005 **M:** 0.02 **F:** 0.03
Posterior Tibial Slope	Hendrix	2017	**Bil:** 100 (50 pts) **Uni:**50	**Bil:** 11.8±2.3 **Uni:** 9.3±2.4	50	7.5±2.3	NR	**BU:** 0.20 **BC:** 0.001 **UC:** 0.035
Lateral Tibial Slope	Rahnemai-Azar	2016	45	7.7±3.5	45	4.7±2.8	1.43 (1.15-1.78)^{Reg}	<0.01^{Reg}
Lateral Tibial Plateau Slope (LTPS)	Simon	2010	27	1.8±3.2	27	-0.3±3.6	NR	0.02
Lateral postero-inferior cartilage slope	Sturnick	2014	**M:** 27 **F:** 61	**M:** 9.5±57 **F:** 13.3±6.4	**M:** 27 **F:** 61	**M:** 9.3±6.1 **F:** 8.5±5.6	**M:**1.005^{Reg} [0.918–1.099]. **F:** 1.155^{Reg} [1.068–1.25]	**M:** 0.92^{Reg} **F:** 0.0003^{Reg}
lateral subchondral bone slope	Sturnick	2014	**M:** 27 **F:** 61	**M:** NR **F:** NR	**M:** 27 **F:** 61	M: NR F: NR	**M:**1.023 [0.862-1.213] **F:** 1.203 [1.065-1.359]	**M:** 0.79^{Reg} **F:** 0.003^{Reg}
Tibial Slope	Vasta	2018	**M:** 100 **F:**100	8.0±3.3 **M:** 8.4±2.4 **F:** 7.6±3.9	**M:**100 **F:**100	7.8±2.5 **M:** 7.6±2.6 **F:** 8.0±2.4	NR	NS **M:** 0.031 **F:** NS
Lateral Posterior Tibial Slope	Waiwaiole	2016	107	7±4	109	5±4	NR	<0.001
Lateral PTS	Hudek	2011	55 **M:** 24 **F:** 31	5.6 [4.7-6.4] **M:** 5.3 [4.2-6.4] **F:** 5.7 [4.6-6.9]	55 **M:** 24 **F:** 31	4.9 [4.1-5.8] **M:** 4.0 [2.7-5.3] **F:** 5.7 [4.5-6.9]	NR	0.08 **M:** 0.0872^{Sig} **F:** n.s.
LTS	Kizilgoz	2018	86 **M:** 54 **F:** 32	5.21±0.18 [4.85-5.57] **M:** 4.84 ± 0.24 [4.36-5.32] **F:** 5.83± 0.25 [5.33-6.33]	109 **M:** 63 **F:** 46	4.98±0.11 [4.76-5.20] **M:** 4.79 ± 0.15 [4.49-5.09] **F:** 5.24± 0.17 [4.90-5.58]	NR	0.279 **M:** 0.847 **F:** 0.054
LTPS	Sundar	2016	199 **M:** 170 **F:** 29	5.68±3.23 (0-13) **M:** 5.67±3.22 (0-13)	290 **M:**140 **F:** 150	5.70±3.23 (0-18) **M:** 5.70±3.23 (0-13)	NR	0.09 **M:** NR **F:** NR

http://dx.doi.org/10.2106/JBJS.19.00535

				F: 5.70±3.23 (0-13)		**F:** 5.72±3.22 (0-18)		
LTS	van Diek	2014	45	7.3 **M:** 7.7 **F:** 6.5	43	7.1 **M:** 6.2 **F:** 7.8	NR	n.s.[α1] **M:** n.s.[α1] **F:** n.s.[α1]

Coronal Tibial Slope

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95%CI]**	**p value**
CTS	Alentorn- Geli	2015	46	4 [-1.9-9.9]	53	4.7 [-8.2-13.9]	NR	0.48
CTS	Blanke	2016	80 **M:** 23 **F:** 57	3.82±0.23 [3.3-4.2] **M:** 3.96±0.46 [3.0-4.9] **F:** 3.75±0.26 [3.2-4.3]	41 **M:** 24 **F:** 17	3.99±0.31 [3.3-4.6] **M:** 3.95±0.45 [3.0-4.9] **F:** 4.04±0.45 [3.1-4.9]	NR	0.65 **M:** >0.99 **F:** 0.95
CTS	Hashemi	2010	49 **M:** 22 **F:** 27	3[m], (-1-8) **M:** 3.27±2.53 **F:** 2.59±2.12	55 **M:** 22 **F:** 33	3[m], (-1-8) **M:** 3.51±1.87 **F:** 2.54±1.85	NR	0.48 **M:** 0.37 **F:** 0.46
CTS	Kizilgoz	2018	86 **M:** 54 **F:** 32	5.21±0.18 [4.85-5.59] **M:** 4.84 ± 0.24 [4.36-5.32] **F:** 5.83± 0.25 [5.33-6.33]	109 **M:** 63 **F:** 46	4.98±0.11 [4.76-5.20] **M:** 4.79 ± 0.15 [4.49-5.09] **F:** 5.24± 0.17 [4.90-5.58]	NR	0.279 **M:** 0.847 **F:** 0.054

Anterior Tibial Slope

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95%CI]**	**p value**
Anterior tibial Slope	Alentorn-Geli	2015	46	-8.7 [-21-3.6]	53	-12 [-35.5 to -24.1]	NR	0.01

Plateau Width

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95%CI]**	**p value**
Medial tibial Plateau width	Rahnemai-Azar	2016	45	34.2±2.9	45	34.3±2.5	NR	NR

Lateral tibial plateau width	Rahnemai-Azar	2016	45	37±3.6	45	37.9±2.9	NR	NR
Tibia width	Xiao	2016	73 **M:** 53 **F:** 20	81.5±6.2 **M:** 84.2±5.0 **F:** 74.5±2.9	73 **M:** 53 **F:** 20	80.5±5.4 **M:** 82.5±4.3 **F:** 75.1±4.3	NR	n.s. **M:** n.s. **F:** n.s.
Tibial width	Uhorchak	2003	24	78.8±7.1 (67.0-91.0)	800	81.7±5.2 (65.0-97.0)	NR	0.666

Tibial Plateau Antero-posterior length (mm)

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95%CI]**	**p value**
Tibial AP length	Wahl	2012	69[U],86 (43 pts)[B] **M:** 43[U], 44 (22pts)[B] **F:** 26[U], 42 (21 pts)[B]	31.52±3.65 [30.85-32.19] **M:**32.99±3.22 [32.19-33.79] **F:** 29.49±2.97 [28.62-30.36]	61 **M:** 36 **F:** 25	33.13±4.02 [32.11-34.16] **M:**35.53±3.03 [34.50-36.55] **F:** 29.69±2.47 [28.67-30.71]	NR	0.007 **M:** 0.0002 **F:** 0.77
Parameter "AB" (Tibial AP distance)	Vasta	2018	**M:** 100 **F:**100	48.6±7.7 **M:** 49.1±10.0 **F:** 47.6±4.1	**M:**100 **F:**100	53.4±6.7 **M:** 53.7±8.4 **F:** 53.2±4.5	NR	<0.001 **M:** <0.001 **F:** 0.006

Tibial Eminence/Tibial Spine

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95%CI]**	**p value**
Eminence width	Uhorchak	2003	24 **M:** 16 **F:** 8	11.6±1.4 (10.0-14.0) **M:** 11.9±1.2 (10.0-14.0) **F:** 10.9±0.8 (10.0-12.0)	800 **M:**695 **F:** 105	13.3±1.9 (8.0-20.0) **M:**13.5±2.0 (8.0-20.0) **F:** 12.5±1.8 (8.0-17.0)	NR	0.001 **M:** <0.001 **F:** 0.012
Eminence width	Xiao	2016	73 **M:** 53 **F:** 20	11.3±1.9 **M:** 11.5±1.9 **F:** 10.7±1.7	73 **M:** 53 **F:** 20	13.0±1.8 **M:** 13.3±1.8 **F:** 12.1±1.5	NR	<0.001 **M:** <0.001 **F:** 0.01

Eminence width index	Uhorchak	2003	**M:** 16 **F:** 16[e]	**M:** 0.14±0.01 (0.1-0.2) **F:** 0.15±0.01 (0.1-0.2)	**M:** 695 **F:** 695[e]	**M:** 0.16±0.02 (0.1-0.2) **F:** 0.17±0.02 (0.1-0.2)	NR	**M:**<0.001 **F:** 0.014
Eminence width index	Xiao	2016	73 **M:** 53 **F:** 20	0.14±0.02 **M:** 0.14±0.02 **F:** 0.14±0.02	73 **M:** 53 **F:** 20	0.16±0.02 **M:** 0.16±0.02 **F:** 0.16±0.02	NR	<0.001 **M:** <0.001 **F:** 0.02
Medial Tibial Spine Volume (100 mm3)	Sturnick	2014	88 **M:** 27 **F:** 61	295.8±136.4 **M**:340.8±173.6 **F:**275.9±112.3	88	325.9±170.6 **M:**462.1±202.1 **F:**265.7±111.6	0.86 [0.69-1.07]^{Reg} **M:** 0.67 [0.45-0.98]^{Reg} **F:**1.09 [0.79-1.51]^{Reg}	0.16^{Reg} **M:** 0.04^{Reg} **F:** 0.61^{Reg}
Lateral Tibial Spine Volume (100 mm3)	Sturnick	2014	88 **M:** 27 **F:** 61	587.1±219.8 **M:**719.0±251.8 **F:**528.8±177.0	88	576.1±209.2 **M**:704.1±262.7 **F:**519.5±151.5	1.03 [0.88-1.2]^{Reg} **M:** 1.02 [0.83-1.27]^{Reg} **F:** 1.04 [0.83-1.29]^{Reg}	0.71^{Reg} **M:** 0.83^{Reg} **F:** 0.75^{Reg}
Medial Tibial Spine Height	Sturnick	2014	88 **M:** 27 **F:** 61	10.1±1.2 **M:** 10.7±1.3 **F:** 9.8±1.1	88	10.2±1.5 **M:** 11.4±1.3 **F:** 9.6±1.2	0.94 [0.72-1.22]^{Reg} **M:** 0.63 [0.38-1.06]^{Reg} **F:** 1.17 [0.83-1.66]^{Reg}	0.64^{Reg} **M:** 0.08^{Reg} **F:** 0.38^{Reg}
Lateral Tibial Spine Height	Sturnick	2014	88 **M:** 27 **F:** 61	7.8±1.3 **M:** 8.1±1.3 **F:** 7.6±1.2	88	8.0±1.4 **M:** 8.8±1.6 **F:** 7.7±1.2	0.85 [0.67-1.08]^{Reg} **M:** 0.73 [0.48-1.11]^{Reg} **F:** 0.94 [0.69-1.27]^{Reg}	0.18^{Reg} **M:** 0.14^{Reg} **F:** 0.67^{Reg}
Medial Tibial Spine Width	Sturnick	2014	88 **M:** 27 **F:** 61	17.8±2.0 **M:** 19.3±1.9 **F:** 17.1±1.6	88	17.8±2.2 **M:** 19.7±1.8 **F:** 16.9±1.8	1.01 [0.84-1.22]^{Reg} **M:** 0.9 [0.69-1.18]^{Reg} **F:** 1.14 [0.87-1.48]	0.89^{Reg} **M:** 0.46^{Reg} **F:** 0.35^{Reg}

Lateral Tibial Spine Width	Sturnick	2014	88 **M:** 27 **F:** 61	17.0±2.3 **M:** 18.8±2.1 **F:** 16.2±2.0	88	17.0±2.5 **M:** 19.1±2.3 **F:** 16.0±2.0	1.01 [0.86-1.19] **Reg** **M:** 0.91 [0.67-1.23] **Reg** **F:** 1.06 [0.87-1.28] **Reg**	0.90 **Reg** **M:** 0.54 **Reg** **F:** 0.59 **Reg**
Medial Tibial Spine Length	Sturnick	2014	88 **M:** 27 **F:** 61	34.1±5.5 **M:** 37.0±4.4 **F:** 32.9±5.4	88	34.6±6.4 **M:** 38.4±6.2 **F:** 32.9±5.7	0.99 [0.94-1.04] **Reg** **M:** 0.96 [0.87-1.05] **Reg** **F:** 1.0 [0.94-1.06] **Reg**	0.60 **Reg** **M:** 0.38 **Reg** **F:** 0.96 **Reg**
Lateral Tibial Spine Length	Sturnick	2014	88 **M:** 27 **F:** 61	27.8±5.5 **M:** 29.4±5.1 **F:** 27.1±5.5	88	27.9±5.6 **M:** 30.6±6.3 **F:** 26.8±4.9	0.99 [0.93-1.06] **Reg** **M:** 0.94 [0.82-1.07] **Reg** **F:** 1.01 [0.94-1.09] **Reg**	0.80 **Reg** **M:** 0.33 **Reg** **F:** 0.74 **Reg**
Medial Spine Location	Sturnick	2014	88 **M:** 27 **F:** 61	1.1±2.0 **M:** 1.7±1.8 **F:** 0.8±2.0	88	1.6±2.3 **M:** 2.2±2.2 **F:** 1.3±2.3	0.89 [0.77-1.03] **Reg** **M:** 0.9 [0.68-1.18] **Reg** **F:** 0.89 [0.75-1.06] **Reg**	0.13 **Reg** **M:** 0.43 **Reg** **F:** 0.20 **Reg**
Lateral Spine Location	Sturnick	2014	88 **M:** 27 **F:** 61	-5.7±1.7 **M:** -5.4±1.9 **F:** -5.9±1.6	88	-5.6±1.5 **M:** -6.0±1.1 **F:** -5.5±1.6	0.97 [0.8-1.17] **Reg** **M:** 1.32 [0.87-2.0] **Reg** **F:** 0.87 [0.69-1.09] **Reg**	0.72 **Reg** **M:** 0.19 **Reg** **F:** 0.23 **Reg**
Tuberculum intercondylare tibiae tertium (Parson's knob)—**height/base**	Pecina	2001	55	0.81±0.33	16	0.60±0.23	NR	<0.05
Tuberculum intercondylare tibiae tertium (Parson's knob)—	Pecina	2001	55	0.12±0.04	16	0.10±0.02	NR	<0.05

height/plateau length								
Tuberculum intercondylare tibiae tertium (Parson's knob)—**plateau length/base**	Pecina	2001	55	6.68±2.85	16	6.08±1.78	NR	<0.05
Medial Tibial Plateau Depth								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR [95%CI]**	**p value**
MTD	Blanke	2016	80 **M:** 23 **F:** 57	3.03±0.09 [2.8-3.2] **M:** 3.13±0.19 [2.7-3.5] **F:** 3.00±0.10 [2.8-3.2]	41 **M:** 24 **F:** 17	3.25±0.12 [2.9-3.5] **M:** 3.56±0.19 [3.3-3.8] **F:** 2.81±0.19 [2.4-4.2]	NR	0.16 **M:** 0.23 **F:** 0.84
Depth of medial tibial condyle (DMC)	Kizilgoz	2018	86 **M:** 54 **F:** 32	2.82±0.08 [2.66-2.98] **M:** 2.84±0.10 [2.64-3.04] **F:** 2.78±0.13 [2.62-2.94]	109 **M:** 63 **F:** 46	2.94±0.07 [2.80-3.08] **M:** 2.85±0.08 [2.69-3.01] **F:** 3.07±0.11 [2.95-3.29]	NR	0.249 **M:** 0.954 **F:** 0.103
Medial Tibial Plateau Depth (MTPD)	Sundar	2016	199	1.74±1.011	290	1.73±1.012	NR	0.356
MTD	Hashemi	2010	49 **M:** 22 **F:** 27	1.9[m], (0-4.4) **M:** 1.98±0.98 **F:** 1.91±0.98	45 **M:** 22 **F:** 33	2.9[m], (1.4-5.2) **M:** 3.04±0.98 **F:** 2.75±0.75	NR	0.000001 **M:** 0.0004 **F:** 0.0003
Lateral Tibial Plateau Height (mm)								
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR[95%CI)**	**p value**
Lateral Tibial Plateau Height	Sundar	2016	199	2.21±0.79	290	2.22±0.79	NR	0.393
Tibial Plateau Radius of Curvature (mm)								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean±SD (range) [95%CI]**	**N**	**mean±SD (range) [95%CI]**	**OR[95%CI)**	**p value**

Lateral Tibial Plateau Radius of Curvature	Wahl	2012	69[U], 86 (43pts)[B] **M:** 43[U],44 (22pts)[B] **F:** 26[U], 42 (21 pts)[B]	33.88±7.41, [32.49-35.27] **M:** 35.50±8.04, [33.51-37.50] **F:** 31.63±5.81, [29.93-33.34]	61 **M:** 36 **F:** 25	37.48±8.89, [35.21-39.76] **M:** 41.13±8.85, [38.14-44.13] **F:** 32.23±5.89, [29.80-34.66]	NR	0.005 **M:** 0.002 **F:** 0.68

A: 20-29 years; **B:** 30-39 years; **C:** 40-49 years; **D:** 50-59 years; **M:** Male; **F:** Female; **NR:** Not Reported; **MTS:** Medial Tibial Slope; **LTS:** Lateral Tibial Slope; **CTS:** Coronal Tibial Slope; **MTD:** Medial Tibial Depth; **Bil:** Bilateral; **Uni:** Unilateral; **Dom:** Dominant; **ND:** Non-dominant; **BU:** Bilateral v. Unilateral; **BC:** Bilateral v. Controls; **UC:** Unilateral v. Controls

[1]Method 1: include both knees of subjects with bilateral injury; [2]Method 2: include smallest angle of bilaterally injured subjects; [3]Method 3: include largest angle of bilaterally injured subjects; [m]Median;[e]Likely typographical error—reported as published; [A]age-females excluded due to subjects <16; [U]unilateral; [B]bilateral; [Reg]Univariate regression; [BU]Bilateral vs. Unilateral; [BC]Bilateral vs. Control; [UC]Unilateral vs. Control; [Sig]Authors reported statistical significance; [α1]p<0.005 was considered significant; [α2]p<0.01 was considered significant

Table 5. Condylar Morphology

Condylar Width								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p-value**
Condylar width	Alentorn-Geli	2015	46	**C:** 7.7 [6.5-8.9] **A:** 7.8 [6.8-8.8]	53	**C:** 7.8 [6.4-23.1] **A:** 7.6 [6.4-22.5]	NR	**C:** 0.35 **A:** 0.87
Intercondylar width	Bouras	2017	58	70.4±4.0	61	70.4±4.1	NR	NR
Condylar width	Evans	2012	49 **M:** 37 **F:** 12	89.2 ± 8.3 **M:**92.1 ±7.0 **F:** 80.7 ± 5.3	1638 **M:** 1397 **F:** 241	89.9 ± 7.1 **M:** 91.7 ± 5.8 **F:** 80.7 ± 5.3	NR	n.s **M:** n.s. **F:** n.s.
BCW	Kizilgoz	2018	86 **M:** 54 **F:** 32	74.01±0.63 [72.75-75.27] **M:** 77.49 ± 0.48 [76.57-78.71] **F:** 68.13± 0.72 [66.69-69.57]	109 **M:** 63 **F:** 46	72.84±0.54 [71.76-73.92] **M:** 76.18 ±0.55 [75.08-77.28] **F:** 68.27± 0.54 [67.19-69.35]	NR	0.163 **M:** 0.08 **F:** 0.877
Condylar Width	Lombardo	2005	14	99.1±7	291	97±6.2	NR	0.215
Total width	Lund-Hanssen	1994	**Inj:** 20 **Cltl:** 20	**Inj:** 74.8±2.9 **Cltl:**74.6±2.2	26	76.2±3.6	NR	0.07 (Cltl vs. Ctrl)
Epicondylar width	Ouyang	2016	40	77.5±3.8	40	78.2±3.9	NR	0.416

Bicondylar width	Rahnemai-Azar	2016	45	80.7±5.7	45	83.2±4.2	0.92 [0.85-1.00]^{Reg}	>0.05^{Reg}
condylar width	Uhorchak	2003	24	77.9±7.0 (64.0-82.0)	800	81.9±5.4 (64.0-95.0)	NR	0.241
BCW	van Diek	2014	45	72.9 **M:** 73.0 **F:** 72.7	43	73.0 **M:** 78.1 **F:** 68.6	NR	n.s. $^{\alpha 1}$ **M:** 0.005 (n.s) $^{\alpha 1}$ **F:** 0.002
BCW	Vrooijink	2011	**M:** 27 **F:** 18	**M:** 73.3 **F:** 73.7	**M:** 22 **F:** 22	**M:** 78.7 **F:** 69.7	NR	**M:** 0.002 **F:** 0.009
Bicondylar width	Park	2012	**M:** 76 **F:** 44	**M:**76.00±3.74 **F:** 67.47±3.37	**M:**71 **F:** 35	**M:**77.46±3.02 **F:** 68.17±2.81	NR	**M:** 0.013 (ns) $^{\alpha 2}$ **F:** 0.323

Lateral Condylar Width (mm)

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
LCW (cm)	Alentorn-Geli	2015	46	**C:** 3.1 [2.1-4.1] **A:** 3 [2.4-3.6]	53	**C:** 3.1 [1.9-9.2] **A:** 3 [2-8.9]	NR	**C:** 0.9 **A:** 0.91
LCW	Kizilgoz	2018	86 **M:** 54 **F:** 32	28.2±0.3 [27.6-28.8] **M:** 29.3 ± 0.3 [28.7-29.9] **F:**26.3± 0.3 [25.7-26.9]	109 **M:** 63 **F:** 46	27.5±0.2 [27.1-27.9] **M:** 28.9 ± 0.3 [28.3-30.5] **F:** 25.7± 0.2 [25.3-26.1]	NR	0.074 **M:** 0.310 **F:** 0.114
LCW	Rahnemai-Azar	2016	45	32.8±2.7	45	34.3±2.5	0.82 [0.68-0.97]^{Reg}	0.01^{Reg}
LCW (mm)	van Diek	2014	45	26.1 **M:** 26.1 **F:** 26.2	43	26.1 **M:** 28.2 **F:** 24.2	NR	n.s. $^{\alpha 1}$ **M:** n.s$^{\alpha 1}$ **F:** 0.002
LCW	Vrooijink	2011	**M:** 27 **F:** 18	**M:** 26.6 **F:** 26.8	**M:** 22 **F:** 22	**M:** 28.3 **F:** 24.8	NR	**M:** ns$^{\alpha 2}$ **F:** 0.002
LCW	Park	2012	**M:** 76 **F:** 44	**M:** 30.80±2.45. **F:** 26.71±1.84	**M:** 71 **F:** 35	**M:** 31.53±1.65 **F:** 27.20±1.61	NR	**M:** 0.033(n.s) $^{\alpha 2}$ **F:** 0.215

Medial Condylar Width (mm)

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
MCW (cm)	Alentorn-Geli	2015	46	**C:** 2.8 [2.4-3.2] **A:** 2.9 [2.5-3.3]	53	**C:** 2.8 [2.4-8.3] **A:** 2.8 [2.4-8.3]	NR	**C:** 0.36 **A:** 0.56
MCW	Kizilgoz	2018	86 **M:** 54 **F:** 32	26.4±0.2 [26-26.8] **M:** 26.6 ± 0.3 [26-27] **F:** 26.2± 0.4 [25.6-27]	109 **M:** 63 **F:** 46	25.1±0.2 [24.7-25.9] **M:** 26.4 ± 0.3 [25.8-27] **F:** 23.4± 0.3 [22.8-24]	NR	<0.001 **M:** 0.634 **F:** <0.001

http://dx.doi.org/10.2106/JBJS.19.00535

MCW	Rahnemai-Azar	2016	45	30±3.4	45	29.4±2.7	1.08 [0.93-1.25][Reg]	>0.05[Reg]
MCW	van Diek	2014	45	24.9 **M:** 25.2 **F:** 24.6	43	25.1 **M:** 26.7 **F:** 23.7	NR	n.s[α1] **M:** n.s.[α1] **F:** n.s. [α1]
MCW	Vrooijink	2011	**M:** 27 **F:** 18	**M:** 25.2 **F:** 24.8	**M:** 22 **F:** 22	**M:** 27.0 **F:** 24.2	NR	**M:** 0.008 **F:** n.s.[α2]
MCW	Park	2012	**M:** 76 **F:** 44	**M:**27.83±2.62 **F:** 25.00±1.92	**M:** 71 **F:** 35	**M:**25.60±1.58 **F:** 22.45±1.32	NR	**M:**<0.001 **F:**<0.001

Condylar Width Index

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
Lateral-Medial condylar width index	Alentorn-Geli	2015	46	**C:** 1.1 [0.7-3.3] **A:** 1 [0.8-1.2]	53	**C:** 1.1 [0.7-3.3] **A:** 1 [0.6-3]	NR	**C:** 0.97 **A:** 0.95
MCW/LCW	Kizilgoz	2018	86 **M:** 54 **F:** 32	0.912±0.006 [0.9-0.924] **M:** 0.909 ± 0.006 [0.897-0.921] **F:** 0.918± 0.007 [0.904-0.932]	109 **M:** 63 **F:** 46	0.914±0.005 [0.904-0.924] **M:** 0.914 ± 0.007 [0.9-0.928] **F:** 0.914± 0.008 [0.898-0.930]	NR	0.869 **M:** 0.677 **F:** 0.711
Medial condyle/lateral condyle	Vrooijink	2011	**M:** 27 **F:** 18	**M:** 0.9 **F:** 0.9	**M:** 22 **F:** 22	**M:** 1.0 **F:** 2.0	NR	**M:** n.s.[α2] **F:** n.s.[α2]
Medial condyle:Lateral condyle	Park	2012	**M:** 76 **F:** 44	**M:** 0.91±0.08 **F:** 0.94±0.06	**M:** 71 **F:** 35	**M:** 0.88±0.04 **F:** 0.89±0.05	NR	**M:** 0.012 (n.s.)[α2] **F:** 0.001

Alpha Angle and the Angle between Blumensaat's line and anterior tibial slope

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range) [95CI]**	**OR (95%CI)**	**p value**
Alpha angle (degrees)	Bouras	2017	58	44 ± 3	61	43 ± 4	**U:** 1.0 (0.9-1.2) **A:** 1.0 (0.9-1.1)	**U:** n.s. **A:** n.s.
Intercondylar shelf-Shaft Angle	Anderson	1987	**Bil:** 14 **Uni:** 17	**Bil:** 36.9 **Uni:** 37.2	17	38.1	NR	**Bil**: 0.0551[Sig] **Uni:** 0.0556[Sig]
Alpha angle (degrees)	Fernandez Jaen	2015	308	57.5±5.5	222	56.2±4.5	NR	0.009
Alpha Angle (degrees)	Kizilgoz	2018	86 **M:** 54 **F:** 32	39.90±0.35 [39.20-40.6] **M:** 39.90 ± 0.50 [38.90-40]	109 **M:** 63 **F:** 46	38.73±0.20 [38.33-39.13] **M:** 39.19 ± 0.23 [38.73-39.65]	NR	0.003 **M:** 0.186 **F:** 0.001

http://dx.doi.org/10.2106/JBJS.19.00535

				F: 39.89± 0.41 [39.07-40.71]		**F:** 38.09± 0.33 [37.76-38.75]		
Angle between Blumensaat line and anterior tibial slope (degrees)	Alentorn-Geli	2015	46	35.9 [16.5-55.3]	53	31.7 [16.4-93.8]	NR	0.02

Femoral AP length (mm)

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range) [95CI]**	**OR (95%CI)**	**p value**
Femoral anteroposterior length, FAP (mm)	Wahl	2012	69[U], 86 (43pts)[B] **M:**43[U], 44 (22pts)[B] **F:** 26[U], 42 (21pts)[B]	68.33±4.83 [67.43-69.23] **M:** 71.11±3.66 [70.21-72.02] **F:** 64.48±3.38 [63.48-65.47]	61 **M:**36 **F:** 25	69.14±5.44 [67.75-70.53] **M:** 72.12±4.55 [70.58-73.65] **F:** 64.86±3.37 [63.47-66.25]	NR	0.31 **M:** 0.23 **F:** 0.65
Parameter "B" (Lateral Condylar AP Length)	Vasta	2018	**M:** 100 **F:** 100	68.7 ± 6.9 **M:**73.1 ± 4.5 **F:** 64.3 ± 6.0	M: 100 F: 100	70.0± 6.0 **M:**74.6 ± 4.1 **F:** 65.3 ± 3.6	NR	NS M: 0.02 F: NS

Femoral Radius of Curvature and Condylar Offset Ratios

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range) [95CI]**	**OR (95%CI)**	**p value**
Femoral Fibonacci radius of curvature, Fr (mm)	Wahl	2012	69[U], 86 (43pts)[B] **M:**43[U], 44 (22 pts)[B] **F:** 26[U], 42 (21pts)[B]	24.32±2.23 [23.90-24.74] **M:** 25.50±1.81 [25.05-25.95] **F:** 22.69±1.64 [22.20-23.1]	61 **M:** 36 **F:** 25	25.10±2.51 [24.45-25.74] **M**:26.71±1.58 [26.17-27.25] **F**: 22.77±1.59 [22.12-23.43]	NR	0.04 **M:** 0.001 **F:** 0.83
Medial Condyle Radius	Siebold	2010	37	NR	37	**S:** 21.6±1.7 **C:** 22.4±3.2 **A:** 21.3±3.3	NR	ns
Lateral Condyle Radius	Siebold	2010	37	NR	37	**S:** 21.3±1.8 **C:** 27.8±4.4 **A:** 18.3±2.6	NR	ns
Condylar offset ratio	Hoshino	2012	26 **M:** 14 **F:** 12	1.05±0.15 **M:** 0.95±0.09 **F:** 1.16±0.12	12 **M:** 6 **F:** 6	0.99±0.11 **M:** 0.97±0.05 **F:** 1.02±0.15	NR	0.28 **M:** 0.6 **F:** <0.05

Lateral Femoral Condyle Ratio (%)	Pfeiffer	2018	**Prim:**50 **M:** 31 **F:** 19 **Cltl:** 35 **M:** 16 **F:** 19	Primary: 64.2 ± 3.8 Cltl: 66.9 ± 4.3	66 **M:** 44 **F:** 22	61.2 ± 2.4	8.0 [4.1-15.7] (for ratio > 63%)	<0.05 (all groups) p<0.008 (primary vs. contralateral) p<0.008 (primary, contralateral, failed ACLR vs. control) n.s. (primary vs. failed ACLR)

Lateral Condylar Height (mm)

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
Parameter "C" (Lateral Condylar Height)	Vasta	2018	**M:** 100 **F:** 100	41.2± 6.8 **M:**43.2 ± 8.3 **F:** 39.1 ± 3.9	**M:** 100 **F:** 100	44.6± 7.1 **M:**47.1 ± 8.6 **F:** 42.1 ± 3.9	NR	<0.001 **M:** <0.001 **F:** <0.001

Femur AP Diaphysis (mm)

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
Parameter "A" (Diaphysis AP length)	Vasta	2018	**M:** 100 **F:** 100	36.0 ± 2.99 **M:**36.9 ± 2.9 **F:** 35.1 ± 2.8	**M:** 100 **F:** 100	36.3± 2.5 **M:**37.1 ± 2.5 **F:** 35.5 ± 2.3	NR	NS **M:** NS **F:** NS

Femur AP Flattened Lateral Condyle Distance (mm)

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
Distance "XY" (Lateral Condyle Flat AP distance)	Vasta	2018	**M:** 100 **F:** 100	41.9 ± 3.6 **M:**42.1 ± 3.5 **F:** 41.6 ± 3.7	**M:** 100 **F:** 100	43.8± 4.5 **M:** 45.6 ± 4.4 **F:** 42.0 ± 3.9	NR	<0.001 **M:** <0.001 **F:** NS

Anterior Flattening to Anterior Cortical Edge (mm)

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
Distance "YZ" (Anterior Flattening to Anterior Cortical Edge)	Vasta	2018	**M:** 100 **F:** 100	5.4± 3.5 **M:**5.9 ± 4.1 **F:** 5.0± 2.7	**M:** 100 **F:** 100	10.5± 4.2 **M:**11.1± 4.9 **F:** 9.9± 3.4	NR	<0.001 **M:** <0.001 **F:** <0.001

Posterior Flattening to Posterior Cortical Edge (mm)

Study Information	Torn ACL	Intact ACL	Significance

http://dx.doi.org/10.2106/JBJS.19.00535

Variable Name	Authors	Year	N	mean±SD (range) [95CI]	N	mean±SD (range), [95%CI]	OR [95%CI]	p value
Distance "XW" (Posterior Flattening to Posterior Cortical Edge)	Vasta	2018	**M:** 100 **F:** 100	11.0± 3.5 **M:**10.9 ± 4.2 **F:** 11.0 ± 2.7	**M:** 100 **F:** 100	13.2± 3.2 **M:**13.4± 3.9 **F:** 13.1 ± 2.4	NR	<0.001 **M:** <0.001 **F:** <0.001
Ratio of Condylar AP distance to the Flattening of Condyle								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95CI]**	**N**	**mean±SD (range), [95%CI]**	**OR [95%CI]**	**p value**
Ratio of Condylar AP distance to the Flattening of Condyle ("B/XY")	Vasta	2018	200 **M:** 100 **F:** 100	1.64±0.11 **M:** 1.74±0.05 **F:** 1.54±0.05	200 **M:** 100 **F:** 100	1.60±0.0.9 **M:** 1.64±0.10 **F:** 1.56±0.07	NR	<0.001 **M:** <0.001 **F:** NS

M: Male; **F:** Female; **Prim:** Primary; **Cltl:** Contralateral**; NR:** Not Reported; **n.s.**: Not significant
$^{\alpha 1}$p<0.005 was considered significant; $^{\alpha 2}$p<0.01 was considered significant

Table 6. Tibiofemoral Congruity, Frontal Plane Alignment, and Patellofemoral Geometry

Tibiofemoral Congruity								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Author**	**Year**	**N**	**mean±SD (range) [95% CI]**	**N**	**mean±SD (range) [95% CI]**	**OR [95%CI]**	**p value**
FAP:TPAP	Wahl	2012	69^{U}, 86 (43pts)^{B} **M:**43^{U}, 44 (22pts)^{B} **F:** 26^{U}, 42 (21pts)^{B}	2.21±0.20 [2.17-2.24] **M:** 2.20±0.20 [2.15 to 2.24] **F:** 2.22±0.20 [2.16-2.28]	61 **M:**36 **F:** 25	2.12±0.18 [2.07-2.16] **M:** 2.05±0.18 [1.99-2.11] **F:** 2.21±0.15 [2.15-2.27]	NR	0.003 **M:** 0.0005 **F:** 0.75
Lateral condyle AP distance/tibial plateau AP distance ("B/AB")	Vasta	2018	200 **M:** 100 **F:** 100	1.43±0.19 **M:** 1.51±0.22 **F:** 1.35±0.11	200 **M:**100 **F:** 100	1.32±0.15 **M:** 1.41±0.17 **F:** 1.23±0.05	NR	<0.001 **M:**<0.001 **F:** 0.005

http://dx.doi.org/10.2106/JBJS.19.00535

Flattening of the lateral condyle/tibial plateau AP distance ("XY/AB")	Vasta	2018	200 **M:** 100 **F:** 100	0.87±0.09 **M:** 0.87±0.11 **F:** 0.88±0.06	200 **M:**100 **F:** 100	0.82±0.06 **M:** 0.86±0.06 **F:** 0.79±0.02	NR	<0.001 **M:** NS **F:** <0.001
Fibonacci radius of curvature/Lateral Tibial plateau radius of curvature ("Fr/TPr")	Wahl	2012	69[U], 86 (43pts)[B] **M:**43[U],44 (22pts)[B] **F:** 26[U], 42 (21pts)[B]	0.744±0.132 [0.719-0.768] **M:** 0.748±0.134 [0.715-0.782] **F:** 0.737±0.131 [0.698-0.775]	61 **M:**36 **F:** 25	0.698±0.120 [0.667-0.728] **M:**0.676±0.177 [0.636-0.715] **F:** 0.729±0.121 [0.679-0.779]	NR	0.03 **M:** 0.008 **F:** 0.80

Frontal Plane Tibiofemoral Alignment

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Author**	**Year**	**N**	**mean±SD (range) [95% CI]**	**N**	**mean±SD (range) [95% CI]**	**OR [95%CI]**	**p value**
Tibio femoral angle	Chung	2011	28	4	20	6	NR	0.16
Coronal alignment	Lopes	2016	**Con:**35 **NC:** 45	**Con:** 2.7±1.8 **NC:** 2.6±2.0	0	NA	NR	n.s.
19 Q kut	Miljko	2012	24	15±2	27	16±2	NR	0.420
Q-Angle	Hertel	2004	24	11.16	24	11.84	NR	n.s.
Q Angle	Kizilgoz	2018	86 **M:** 54 **F:** 32	10.4 (7.8-15.4) **M:** 9.4 (7.8-13) **F:** 13.51±0.21 [13.08-13.94]	109 **M:** 63 **F:** 46	9.8 (8.4-14.8) **M:** 9.4 (8.4-10.3) **F:** 12.56 ± 0.17 [12.21-12.90]	NR	0.320 **M:** 0.318 **F:** 0.001
Q Angle	Loudon	1996	**F:** 20	**Normal (18°)**: 2 **Low Abnormal (<18°)**: 18 **High Abnormal (>18°):** 0	**F:** 20	**Normal (18°)**: 2 **Low Abnormal (<18°)**: 18 **High Abnormal (>18°):** 0	NR	0.317

Patellofemoral

Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**Year**	**N**	**mean±SD (range) [95% CI]**	**N**	**mean±SD (range) [95% CI]**	**OR [95%CI]**	**p value**

Patella tendon length	Lin	2005	115	4.45±0.55	102	4.61±0.61	NR	0.0561
Patella length	Lin	2005	115	4.52±0.49	102	4.40±0.59	NR	0.0979
Patella tendon length/patella length (Insall-Salvati)	Lin	2005	115	0.99±0.11	102	1.05±0.12	NR	0.001

M: Male**; F:** Female**; Con:** Contact**; NC:** Non-contact**; Bil:** Bilateral
FAP:TPAP—Femoral anteroposterior length: tibial plateau anteroposterior length
[H]Historical Data

Table 7. Soft Tissue Geometry

Meniscus								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable	**Authors**	**Year**	**N**	**mean ± SD**	**N**	**mean ± SD**	**OR [95%CI]**	**p value**
Lateral meniscus cartilage angle	Sturnick	2014	**M:**27 **F:** 61	**M:** 38.5±5.6 **F:** 40.3±5.3	**M:** 27 **F:** 61	**M:** 40.3±5.5 **F:** 40.5±6.3	**M:** 0.939 [0.844–1.044] **F:** 0.993 [0.93–1.061]	**M:** 0.25 **F:** 0.84
Meniscus Bone Angle[L]	Bojicic	2017	76	28.6±4.1	42	29.6±4.6	0.949 [0.868-1.037]	0.246[Reg]
Lateral meniscus bone angle	Sturnick	2014	**M:**27 **F:** 61	**M:** 26.8±3.9 **F:** 27.9±4.2	**M:** 27 **F:** 61	**M:** 28.5±4.0 **F:** 30.6±4.7	**M:**0.900[0.782–1.036] **F:** 0.863 [0.781–0.953]	**M:** 0.14 **F:** 0.004
Posterior Meniscal Height (PMH)[L]	Bojicic	2017	76	6.3±0.9	42	6.5±1.0	0.692 [0.463-1.033]	0.072[Reg]
Lateral meniscus cartilage height	Sturnick	2014	**M:**27 **F:** 61	**M:** 6.8±0.9 **F:** 6.3±0.7	**M:** 27 **F:** 61	**M:** 7.1±0.7 **F:** 6.6±0.8	**M:** 0.546 [0.23–1.298] **F:** 0.438 [0.235–0.818]	**M:** 0.17 **F:** 0.01
Lateral Cartilage bone height	Sturnick	2014	**M:**27 **F:** 61	**M:** 2.8±0.4 **F:** 2.7±0.6	**M:** 27 **F:** 61	**M:** 3.1±0.6 **F:** 2.7±0.5	**M:**0.243[0.061–0.968] **F:** 1.015 [0.526–1.96]	**M:** 0.04 **F:** 0.96
Lateral Mensical Slope	Elmansori	2017	100	4.7±4.7 (-5.6-13.8)	100	0.9±4.8 (-12.5 to 12.6)	NR	NR[Sig]
Lateral Meniscal Slope	Hudek	2011	55 **M:**24 **F:** 31	1.8 [0.8-2.8] **M:** 2.0 [0.5-3.5] **F:** 1.7 [0.2-3.2]	55 **M:**24 **F:** 31	-1.7 [-2.7, -0.6] **M:** -2.7 [-4.2, -1.2] **F:** -0.9 [-2.4, 0.6]	NR	<0.001 **M:** <0.001 **F:** 0.0177
Medial meniscus cartilage angle	Sturnick	2014	**M:**27 **F:** 61	**M:** 22.4±3.5 **F:** 21.7±3.3	**M:** 27 **F:** 61	**M:** 21.7±4.1 **F:** 21.9±3.6	**M:**1.085 [0.905–1.302] **F:** 0.982 [0.88–1.096]	**M:** 0.38 **F:** 0.74

Medial meniscus bone angle	Sturnick	2014	**M:**27 **F:** 61	**M:** 24.3±2.8 **F:** 24.1±2.8	**M:** 27 **F:** 61	**M:** 21.7±4.1 **F:** 21.9±3.7	**M:**1.041 [0.853–1.27] **F:** 0.914 [0.788–1.059]	**M:** 0.69 **F:** 0.23
Medial meniscus cartilage height	Sturnick	2014	**M:**27 **F:** 61	**M:** 5.9±1.1 **F:** 5.2±0.8	**M:** 27 **F:** 61	**M:** 21.7±4.1 **F:** 21.9±3.8	**M:**0.929 [0.547–1.577] **F:** 0.629 [0.397–0.996]	**M:** 0.78 **F:** 0.048
Medial cartilage bone height	Sturnick	2014	**M:**27 **F:** 61	**M:** 1.7±0.6 **F:** 1.6±0.4	**M:** 27 **F:** 61	**M:** 21.7±4.1 **F:** 21.9±3.9	**M:**0.635 [0.233–1.725] **F:** 0.874 [0.362–2.112]	**M:** 0.37 **F:** 0.76
Medial Meniscal Slope	Hudek	2011	55 **M:**24 **F:** 31 1.3 [0.5-2.1] 0.7 [-0.4-1.9] 1.7 [0.8-2.7]		55 **M:**24 **F:** 31 0.1 [-0.7-0.9] -1.6 [-2.8, -0.5] 1.4 [0.5-2.4]		NR	n.s **M:** 0.0047 **F:** n.s.
Medial Meniscal Slope	Elmansori	2017	100	6.0±3.4 (-2.2-14.5)	100	3.7±3.6 (-4.2-11.5)	NR	NR[Sig]

ACL Volume

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean ± SD**	**N**	**mean ± SD**	**OR [95%CI]**	**p value**
ACL_Vol (mm3)	Whitney	2014	88 **M:**27 **F:** 61	1037.0±277.0 **M:**1140.0±344.0 **F:** 992.0±230.0	88 **M:** 27 **F:** 61	1169.0±321.0 **M:**1386.0±363.0 **F:** 1072.0±249.0	0.817 [0.717-0.931][Reg] **M:** 0.767 [0.610-0.964][Reg] **F:** 0.850 [0.719-1.005][Reg]	<0.01[Reg] **M:** <0.05[Reg] **F:** n.s.[Reg]
ACL Vol (mm3)	Chaudhari	2009	**M:**17 **F:** 10	**M:** 2107.5 **F:** 1694.5	**M:**17 **F:** 10	**M:** 2256.5 **F:** 1880.3	**M:** NR **F:** NR	**M:** 0.2149 **F:** 0.0116

Tibial Insertion

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean ± SD**	**N**	**mean ± SD**	**OR [95%CI]**	**p value**
TIS (mm)	van Diek	2014	45	17.3 **M:** 16.8 **F:** 17.9	43	16.9 **M:** 17.1 **F:** 16.8	NR **M:** NR **F:** NR	n.s. [α1] **M:** n.s. [α1] **F:** n.s. [α1]

Ligament angle

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean ± SD**	**N**	**mean ± SD**	**OR (95%CI)**	**p value**
Tibial Insertion Angle (deg)	van Diek	2014	45	48.0 **M:** 49.9 **F:** 45.8	43	48.9 **M:** 48.8 **F:** 49.1	NR	n.s.[α1]

Ligament length

Study Information			Torn ACL		Intact ACL		Significance	
Variable Name	**Authors**	**Year**	**N**	**mean ± SD**	**N**	**mean ± SD**	**OR (95%CI)**	**p value**

ACL length (mm)	van Diek	2014	45	35.1 **M:** 35.0 **F:** 35.1	43	33.4 **M:** 33.7 **F:** 32.5	NR **M:** NR **F:** NR	n.s. [α1] **M:** n.s. [α1] **F:** n.s. [α1]
Ligament Cross-Sectional Area (CSA)								
Study Information			**Torn ACL**		**Intact ACL**		**Significance**	
Variable Name	**Authors**	**Year**	**N**	**mean ± SD**	**N**	**mean ± SD**	**OR (95%CI)**	**p value**
ACL_CSA (cm^2)	Whitney	2014	88 **M:**27 **F:** 61	0.38±0.11 **M:** 0.40±0.12 **F:** 0.37±0.11	88 **M:** 27 **F:** 61	0.41±0.11 **M:** 0.47±0.11 **F:** 0.39±0.11	0.962 [0.932-0.993][Reg] **M:** 0.942 [0.890-0.998][Reg] **F:** 0.973 [0.936-1.011][Reg]	<0.05[Reg] **M:** <0.05[Reg] **F:** n.s.[Reg]

[L]Reported only as PMH but measured in the lateral tibia
[Reg]Univariate regression

Table 8. Shape Modeling Data

Shape Modeling						
Author	**Year**	**Mode,Dataset,Structure (Mode Description)**	**Patient Population (n)**	**Value**	**R^2**	**p-value(s)**
Pedoia	2015	1st, Euclidean aligned dataset, Femur (NR)	ACL injured (50)	292.85 (88.26)	NR	0.007 (inj v. ctrl) 0.021 (cltl v. ctrl)* 0.11 (inj v. cltl)
			Contralateral (50)	281.69 (82.96)	NR	
			Control (19)	231.72 (65.11)	NR	
		2nd, scale-preserved dataset, Femur (relative distance between condyles)	ACL injured (50)	365.55 (84.41)	NR	0.007 (inj v. ctrl) 0.03 (cltl v. ctrl)* 0.03 (inj v. ctrl)
			Contralateral (50)	351.65 (81.58)	NR	
			Control (19)	306.89 (60.89)	NR	
		2nd, Euclidian aligned dataset, Tibia (NR)	ACL injured (50)	79.52 (23.17)	NR	0.004 (inj v. ctrl 0.009 (cltl v. ctrl)* 0.34 (inj v. cltl)[E]
			Contralateral (50)	84.9 (35.38)	NR	
			Control (19)	61.00 (24.51)	NR	

http://dx.doi.org/10.2106/JBJS.19.00535

		3rd, scale-preserved dataset, Tibia (elevation of anteromedial tibial plateau)	ACL injured (50)	107.06 (40.06)	NR	0.002 (inj v. ctrl) 0.001 (cltl v. ctrl)* 0.32 (inj v. cltl)
			Contralateral (50)	111.59 (44.45)	NR	
			Control (19)	70.47 (47.21)	NR	
			Non-operatively treated (48)	NR	NR	NR
		15th, Rosenberg radiograph[R]	Operatively treated (134)	NR	NR	NR
			Non-operatively treated (48)	NR	0.357	0.003
		20th, Rosenberg radiograph[R]	Operatively treated (134)	NR	0.092	0.05 (n.s.)[α2]
			Non-operatively treated (48)	NR	NR	NR
		21st, Rosenberg radiograph[R]	Operatively treated (134)	NR	0.093	0.047 (n.s.)[α2]
			Non-operatively treated (48)	NR	NR	NR
		22nd, Rosenberg radiograph[R]	Operatively treated (134)	NR	0.118	0.014 (n.s.)[α2]
			Non-operatively treated (48)	NR	NR	NR
		4th, Lateral radiograph[L]	Operatively treated (134)	NR	0.108	0.020 (n.s.)[α2]
			Non-operatively treated (48)	NR	NR	NR
		6th, Lateral radiograph[L]	Operatively treated (134)	NR	0.116	0.013[α2]
			Non-operatively treated (48)	NR	NR	NR
		7th, Lateral radiograph[L]	Operatively treated (134)	NR	0.103	0.026[α2]

			Non-operatively treated (48)	NR	NR	NR
		8th, Lateral radiographL	Operatively treated (134)	NR	0.093	0.042α2
			Non-operatively treated (48)	NR	NR	NR
		10th, Lateral radiographL	Operatively treated (134)	NR	0.095	0.039α2
			Non-operatively treated (48)	NR	NR	NR
		17th, Lateral radiographL	Operatively treated (134)	NR	NR	NR
			Non-operatively treated (48)	NR	0.249	0.041α2

inj: ACL injured, cltl: contralateral, ctrl:control
*****The differences of the same modes between contralateral and control group were not statistically significant if the Bonferroni correction is applied
Ecomparison erroneously reported as ACL-injured v. control
α2$p<0.01$ was considered significant
RRosenberg radiograph: weight-bearing, AP radiograph at 45 degrees of flexion
LLateral radiograph: non-weight bearing, standard lateral radiograph

Table 9. Femoral Pooled and Gender Stratified Multivariate Analyses

Author	Year	Covariates	Variable	OR [95% CI]	Coefficient	p-value
Kizilgoz	2018	NW, MCW, LCW, MCW/LCW, BCW, NWI, alpha angle, NWA, Q angle, MTST, LTST, CTST, DMCT	NW	[0.001-1.405] **M:** [15.517-1.915] **F:** [0.000-4.6222]	-3.50 **M:** 7.452 **F:** 17.65	0.074 **M:** 0.002 **F:** 0.495
			MCW	[0.000-0.734] **M:** [0.008-2.167] **F:** [0.000-2.232]	-4.70 **M:** 3.758 **F:** 44.43	0.036 **M:** 0.008 **F:** 0.131
			LCW	[0.008-39.217] **M:** [0.006-8.368] **F:** [0.000-1.918]	-0.56 **M:** 3.09 **F:** 30.45	0.795 **M:** 0.463 **F:** 0.301
			MCW/LCW	[0.000-2.438] **M:** [0.000-3.197] **F:** [0.000-1.648]	60.04 **M:** -6.140 **F:** -196.31	0.319 **M:** 0.961 **F:** 0.238
			BCW	[2.954-104.65] **M:** [0.001-0.148] **F:** [0.000-9.836]	2.86 **M:** -4.453 **F:** -32	0.002 **M:** 0.001 **F:** 0.234

			NWI	[0.000-7.358] **M:** [0.000-0.000] **F:** [0.000-8.768]	53.50 **M:** -302.72 **F:** 1.44	0.666 **M:** 0.012 **F:** 0.249
			alpha angle	[1.161-1.800] **M:** [0.512-1.037] **F:** [0.336-1.014]	0.36 **M:** -0.317 **F:** -0.538	0.001 **M:** 0.079 **F:** 0.056
			NWA	[0.719-1.081] **M:** [0.818-1.419] **F:** [0.690-2.087]	-0.12 **M:** 0.075 **F:** 0.182	0.226 **M:** 0.594 **F:** 0.519
			Q angle	[1.142-2.318] **M:** [0.130-1.022] **F:** [0.270-1.656]	0.48 **M:** -1.008 **F:** -0.402	0.007 **M:** 0.055 **F:** 0.385
Whitney	2014	NW-anterior attachment (NW_AA), ACL volume (ACL_Vol), Ridge thickness, weight (kg)	NW_AA	0.694 [0.557-0.864] **M:** 0.722 [0.495-1.053] **F:** 0.629 [0.469-0.843]	NR	0.001 **M:** 0.091 **F:** 0.920
			ACL_Vol	0.772 [0.647-0.921] **M:** 0.715 [0.509-1.004] **F:** 0.793 [0.643-0.991]	NR	0.001 **M:** 0.053 **F:** 0.041
			Ridge	1.556 [1.093-2.216] **M:** 1.506 [0.825-2.746] **F:** 1.686 [1.025-2.776]	NR	0.014 **M:** 0.182 **F:** 0.040
			Weight	1.053 [1.005-1.103] **M:** 1.015 [0.946-1.088] **F:** 1.088 [1.020-1.161]	NR	0.029 **M:** 0.681 **F:** 0.011
Sturnick	2015	NW-anterior outlet (NW_AO), Lateral Meniscal Slope (LatMCS)^{T}, Lateral Meniscal Height (LatMCH)^{T}	NW_AO	0.688 [0.559-0.847] **M:** 0.727 [0.539-0.979] **F:** 0.649 [0.483-0.872]	NR	0.0004 **M:** 0.036 **F:** 0.004
Everhart	2010	Ridge Thickness, Posterior outlet width (NW_PO), Anterior outlet width (NW_AO)	Ridge	NR	NR	0.021
			NW_PO	NR	NR	0.032
			NW_AO	NR	NR	0.14
Fernandez -Jaen	2015	Sex (Male), Notch width (NW), alpha angle, Age	Sex (male)	2.217 [1.474-3.333]	0.796	<0.001
			NW	0.868 [0.819-0.920]	-0.142	<0.001
			alpha angle	1.049 [1.011-1.088]	0.048	0.011
			Age	0.999 [0.983-1.014]	-0.001	0.857
Vasta	2018	Femoral Diaphysis width (A), Tibial AP length (AB), XW, XY, XZ (refer to Figure 5B)	A	4.82 [2.20-10.54]	1.572	<0.001
			AB	1.20 [1.06-1.36]	0.180	0.005
			XW	0.60 [0.44-0.81]	-0.519	0.001
			XY	1.54 [1.13-2.10]	0.433	0.006
			XZ	0.19 [0.13-0.27]	-1.668	<0.001
Uhorchak	2003	Notch width (NW, 1 SD≤ mean), Generalized Laxity (GL, ≥ 5 regions), BMI (1 SD≥ mean), AP Laxity (KT-2000, 1 SD≥mean)	NW+BMI	8.5^{RR} **M:** 2.0^{RR} **F:** 26.3^{RR}	NR	NR
			NW+GL	3.3^{RR} **M:** 7.8^{RR} **F:** 8.2^{RR}	NR	NR
			NW+ KT-2000	6.4^{RR} **M:** 2.0^{RR} **F:** 16.8^{RR}	NR	NR

			NW+BMI +GL	7.6[RR] **M:** None injured **F:** All injured	NR	NR
			NW+BMI+ KT-2000	21.3[RR] **M:** None injured **F:** All injured	NR	NR

[RR]Relative Risk
NW = notch width, MCW = medial condylar width, LCW = lateral condylar width, BCW = bicondylar width, NWI = notch width index, NWA = notch width angle, MTS = medial tibial slope, LTS = lateral tibial slope, LPTS = lateral posterior tibial slope, CTS = coronal tibial slope, DMC = depth of medial tibial condyle, MCS = middle cartilage slope, MTD = medial tibial depth, cBMI = body mass index "centered around the mean," cWeight = weight "centered around the mean," NR = not reported, KT-2000 = anteroposterior laxity measured using the KT-2000 (MEDmetric) arthrometer

Table 10. Tibial Pooled and Gender Stratified Multivariate Analyses

Author	Year	Covariates	Variable	OR [95% CI]	Coefficient	p-value
Kizilgoz	2018	Q angle, MTS, LTS, CTS, DMC, NW[F], MCW[F], LCW[F], MCW/LCW[F], BCW[F], NWI[F], alpha angle[F], NWA[F]	Q angle	[1.142-2.318] **M:** [0.130-1.022] **F:** [0.270-1.656]	0.48 **M:** -1.008 **F:** -0.402	0.007 **M:** 0.055 **F:** 0.385
			MTS	[1.228-2.968] **M:** [0.219-0.762] **F:** [0.347-2.358]	0.64 **M:** -0.895 **F:** -0.101	0.004 **M:** 0.005 **F:** 0.837
			LTS	[0.459-1.103] **M:** [1.150-4.865] **F:** [0.152-1.295]	-0.34 **M:** 0.861 **F:** -0.812	0.128 **M:** 0.019 **F:** 0.137
			CTS	[0.465-1.265] **M:** [0.541-2.276] **F:** [0.675-9.960]	-0.26 **M:** 0.104 **F:** 0.952	0.299 **M:** 0.777 **F:** 0.166
			DMC	[0.575-2.234] **M:** [0.293-2.525] **F:** [0.246-4.723]	0.12 **M:** -0.151 **F:** 0.076	0.718 **M:** 0.784 **F:** 0.920
Hashemi	2010	LTS, MTD, MTS*Sex	LTS	1.17 [1.002-1.37]	NR	0.048
			MTD	3.03 [1.78-5.26]	NR	<0.001
			MTS*Sex	1.18 [1.01-1.39]	NR	0.036
Bojicic	2017	**Model 1:** LPTS, cBMI, LPTS*cBMI	PTS	1.12	NR	0.061
			cBMI	0.88	NR	0.140
			PTS*cBMI	1.03	NR	0.050
		Model 2: LPTS, cHeight, LPTS*cHeight	PTS	1.12	NR	0.049
			cHeight	3.07	NR	0.754
			PTS*cHeight	1.42	NR	0.497
		Model 3: LPTS, cWeight, LPTS*cWeight	PTS	1.13	NR	0.045
			cWeight	0.83	NR	0.348
			PTS*cWeight	1.06	NR	0.055

		Model 4: MCS, cBMI, MCS*cBMI	MCS	1.13	NR	0.037
			cBMI	0.98	NR	0.707
			MCS*cBMI	1.19	NR	0.395
		Model 5: MCS, cHeight, MCS*cHeight	MCS	1.15	NR	0.020
			cHeight	32.98	NR	0.288
			MCS*cHeight	1.08	NR	0.904
		Model 6: MCS, cWeight, MCS*cWeight	MCS	1.14	NR	0.029
			cWeight	1.04	NR	0.812
			MCS*cWeight	1.03	NR	0.345
Sturnick	2014	**Model 1:** Medial tibial spine height (M_{ed}Height), Medial tibial spine width (M_{ed}Width), Medial tibial spine (M_{ed}Length)	M_{ed}Height	0.94 [0.72–1.24] **M:** 0.66 [0.37–1.16] **F:** 1.15 [0.81–1.63]	NR	0.670 **M:** 0.148 **F:** 0.434
			M_{ed}Width	1.03 [0.85–1.24] **M:** 0.97 [0.71–1.31] **F:** 1.12 [0.86–1.47]	NR	0.80 **M:** 0.84 **F:** 0.41
			M_{ed}Length	0.99 [0.94–1.04] **M:** 0.99 [0.89–1.1] **F:** 0.99 [0.94–1.06]	NR	0.65 **M:** 0.84 **F:** 0.87
		Model 2: Medial tibial spine volume (M_{ed}Vol), anteroposterior location of medial tibial spine (M_{ed}Loc)	M_{ed}Vol	0.89 [0.71–1.13] **M:** 0.66 [0.44–0.99] **F:** 1.2 [0.84–1.72]	NR	0.34 **M:** 0.046 **F:** 0.31
			M_{ed}Loc	0.92 [0.79–1.07] **M:** 1.03 [0.75–1.41] **F:** 0.86 [0.72–1.04]	NR	0.27 **M:** 0.86 **F:** 0.13
Whitney	2014	ACL volume (ACL_Vol), weight (kg), NW-anterior attachment (NW_AA)**F**, Ridge thickness**F**	ACL_Vol	0.772 [0.647-0.921] **M:** 0.715 [0.509-1.004] **F:** 0.793 [0.643-0.991]	NR	0.001 **M:** 0.053 **F:** 0.041
			Weight	1.053 [1.005-1.103] **M:** 1.015 [0.946-1.088] **F:** 1.088 [1.020-1.161]	NR	0.029 **M:** 0.681 **F:** 0.011
Sturnick	2015	Lateral Meniscal Slope (LatMCS), Lateral Meniscal Height (LatMCH), NW-anterior outlet(NW_O)**F**	LatMCH	0.44 [0.221-0.874] **M:** 0.493 [0.181-1.337] **F:** 0.374 [0.136-1.03]	NR	0.019 **M:** 0.165 **F:** 0.057
			LatMCS	1.216 [1.088-1.359] **M:** 1.023 [0.842-1.244] **F:** 1.325 [1.123-1.564]	NR	0.001 **M:** 0.816 **F:** 0.001
Vasta	2018	Tibial AP length (AB), Femoral Diaphysis width (A)**F**, XW **F**, XY**F**, XZ**F** (refer to Figure 5B).	AB	1.20 [1.06-1.36]	0.180	0.005

[F]Femoral value-presented in Table 9, NW = notch width, MCW = medial condylar width, LCW = lateral condylar width, BCW = bicondylar width, NWI = notch width index, NWA = notch width angle, MTS = medial tibial slope, LTS = lateral tibial slope, LPTS = lateral posterior tibial slope, CTS = coronal tibial slope, DMC = depth of medial tibial condyle, MCS = middle cartilage slope, MTD = medial tibial depth, cBMI = body mass index "centered around the mean," cWeight = weight "centered around the mean," NR = not reported, KT-2000 = anteroposterior laxity measured using the KT-2000 (MEDmetric) arthrometer, and MTS×Sex = interaction term.

Appendix IV: Excluded Studies

Full Text Screen—Excluded by Third Reviewer: 9

1. Beynnon BD, Sturnick DR, Argentieri EC, et al. A Sex-Stratified Multivariate Risk Factor Model for Anterior Cruciate Ligament Injury. J Athl Train. 2015;50(10):1094-6.
2. Hernigou P, Garabedian JM. Intercondylar notch width and the risk for anterior cruciate ligament rupture in the osteoarthritic knee: evaluation by plain radiography and CT scan. Knee. 2002;9(4):313-6.
3. Grooms DR, Page SJ, Onate JA. Brain Activation for Knee Movement Measured Days Before Second Anterior Cruciate Ligament Injury: Neuroimaging in Musculoskeletal Medicine. J Athl Train. 2015;50(10):1005-10.
4. Matava MJ, Freehill AK, Grutzner S, et al. Limb dominance as a potential etiologic factor in noncontact anterior cruciate ligament tears. J Knee Surg. 2002;15(1):11-6.
5. Maletis GB, Inacio MC, Funahashi TT. Risk factors associated with revision and contralateral anterior cruciate ligament reconstructions in the Kaiser Permanente ACLR registry. Am J Sports Med. 2015;43(3):641-7.
6. McLean SG, Huang X, Van Den Bogert AJ, et al. Association between lower extremity posture at contact and peak knee valgus moment during sidestepping: Implications for ACL injury. Clin Biomech. 2005;20(8):863-70.
7. Nilstad A, Krosshaug T, Mok KM, et al. Association Between Anatomical Characteristics, Knee Laxity, Muscle Strength, and Peak Knee Valgus During Vertical Drop-Jump Landings. J Orthop Sports Phys Ther. 2015;45(12):998-1005.
8. Shimokochi Y, Ambegaonkar JP, Meyer EG, et al. Changing sagittal plane body position during single-leg landings influences the risk of non-contact anterior cruciate ligament injury. Knee Surg Sports Traumatol Arthrosc. 2013;21(4):888-97.
9. Thomas AC, Palmieri-Smith RM, McLean SG. Isolated hip and ankle fatigue are unlikely risk factors for anterior cruciate ligament injury. Scand J Med Sci Sports. 2011;21(3):359-68.

Full Text Screen—Excluded by Consensus: 45

1. Ali N, Rouhi G, Robertson G. Gender, Vertical Height and Horizontal Distance Effects on Single-Leg Landing Kinematics: Implications for Risk of non-contact ACL Injury. J Hum Kinet. 2013;37:27-38.

2. Chappell JD, Creighton RA, Giuliani C, et al. Kinematics and electromyography of landing preparation in vertical stop-jump: risks for noncontact anterior cruciate ligament injury. Am J Sports Med 2007;35(2):235-41.
3. Dickin DC, Johann E, Wang H, et al. Combined Effects of Drop Height and Fatigue on Landing Mechanics in Active Females. J Appl Biomech. 2015;31(4):237-43.
4. Ebstrup JF, Bojsen-Moller F. Anterior cruciate ligament injury in indoor ball games. Scand J Med Sci Sports. 2000;10(2):114-6.
5. Ellera Gomes JL, Palma HM, Ruthner R. Influence of hip restriction on noncontact ACL rerupture. Knee Surg Sports Traumatol Arthrosc. 2014;22(1):188-91.
6. Faude O, Junge A, Kindermann W, et al. Risk factors for injuries in elite female soccer players. Br J Sports Med. 2006;40(9):785-90.
7. Favre J, Clancy C, Dowling AV, et al. Modification of Knee Flexion Angle Has Patient-Specific Effects on Anterior Cruciate Ligament Injury Risk Factors During Jump Landing. Am J Sports Med. 2016;44(6):1540-6.
8. Fong CM, Blackburn JT, Norcross MF, et al. Ankle-dorsiflexion range of motion and landing biomechanics. J Athlet Train. 2011;46(1):5-10.
9. Ford KR, Myer GD, Smith RL, et al. A comparison of dynamic coronal plane excursion between matched male and female athletes when performing single leg landings. Clin Biomech. 2006;21(1):33-40.
10. Hill OT, Bulathsinhala L, Scofield DE, et al. Risk factors for soft tissue knee injuries in active duty U.S. Army soldiers, 2000-2005. Mil Med. 2013;178(6):676-82.
11. Kagaya Y, Fujii Y, Nishizono H, et al. Association between hip abductor function, rear-foot dynamic alignment, and dynamic knee valgus during single-leg squats and drop landings. J Sport Health Sci. 2015;4(2):182-87.
12. Kaneko M, Sakuraba K. Association between Femoral Anteversion and Lower Extremity Posture upon Single-leg Landing: Implications for Anterior Cruciate Ligament Injury. J Phys Ther Sci. 2013;25(10):1213-7.
13. Kim KW, Lim BO. Effects of menarcheal age on the anterior cruciate ligament injury risk factors during single-legged drop landing in female artistic elite gymnasts. Arch Orthop Trauma Surg. 2014;134(11):1565-71.
14. Kimura Y, Ishibashi Y, Tsuda E, et al. Increased knee valgus alignment and moment during single-leg landing after overhead stroke as a potential risk factor of anterior cruciate ligament injury in badminton. Br J Sports Med. 2012;46(3):207-13.
15. Kujala UM, Nelimarkka O, Koskinen SK. Relationship between the pivot shift and the configuration of the lateral tibial plateau. Arch Orthop Trauma Surg. 1992;111(4):228-9.
16. Lin CF, Liu H, Gros MT, et al. Biomechanical risk factors of non-contact ACL injuries: A stochastic biomechanical modeling study. J Sport Health Sci. 2012;1(1):36-42.
17. Malinzak RA, Colby SM, Kirkendall DT, et al. A comparison of knee joint motion patterns between men and women in selected athletic tasks. Clin Biomech. 2001;16(5):438-45.
18. McLean SG, Huang X, van den Bogert AJ, et al. Investigating isolated neuromuscular control contributions to non-contact anterior cruciate ligament injury risk via computer simulation methods. Clin Biomech. 2008;23(7):926-36.
19. McLean SG, Lucey SM, Rohrer S, et al. Knee joint anatomy predicts high-risk in vivo dynamic landing knee biomechanics. Clin Biomech. 2010;25(8):781-88.

20. McLean SG, Samorezov JE. Fatigue-induced ACL injury risk stems from a degradation in central control. Med Sci Sports Exerc. 2009;41(8):1661-72.
21. Medrano D, Smith D. A comparison of knee joint laxity among male and female collegiate soccer players and non-athletes. Sports Biomech. 2003;2(2):203-12.
22. Meinerz CM, Malloy P, Geiser CF, et al. Anticipatory Effects on Lower Extremity Neuromechanics During a Cutting Task. J Athlet Train. 2015;50(9):905-13.
23. Myer GD, Ford KR, Brent JL, et al. An integrated approach to change the outcome part II: targeted neuromuscular training techniques to reduce identified ACL injury risk factors. J Strength Cond Res. 2012;26(8):2272-92.
24. Myer GD, Ford KR, Khoury J, et al. Clinical correlates to laboratory measures for use in non-contact anterior cruciate ligament injury risk prediction algorithm. Clin Biomech. 2010;25(7):693-9.
25. Myer GD, Ford KR, Khoury J, et al. Biomechanics laboratory-based prediction algorithm to identify female athletes with high knee loads that increase risk of ACL injury. Br J Sports Med. 2011;45(4):245-52.
26. Negrete RJ, Schick EA, Cooper JP. Lower-limb dominance as a possible etiologic factor in noncontact anterior cruciate ligament tears. J Strength Cond Res. 2007;21(1):270-3.
27. Nguyen AD, Shultz SJ, Schmitz RJ, et al. A preliminary multifactorial approach describing the relationships among lower extremity alignment, hip muscle activation, and lower extremity joint excursion. J Athl Train. 2011;46(3):246-56.
28. Nilstad A, Andersen TE, Bahr R, et al. Risk factors for lower extremity injuries in elite female soccer players. Am J Sports Med. 2014;42(4):940-8.
29. Norcross MF, Blackburn JT, Goerger BM, et al. The association between lower extremity energy absorption and biomechanical factors related to anterior cruciate ligament injury. Clin Biomech. 2010;25(10):1031-6.
30. Norcross MF, Lewek MD, Padua DA, et al. Lower extremity energy absorption and biomechanics during landing, part II: frontal-plane energy analyses and interplanar relationships. J Athl Train. 2013;48(6):757-63.
31. Okoroha KR, Marfo K, Meta F, et al. Amount of Minutes Played Does Not Contribute to Anterior Cruciate Ligament Injury in National Basketball Association Athletes. Orthopedics. 2017;40(4):e658-e62.
32. Orchard J, Seward H, McGivern J, et al. Intrinsic and extrinsic risk factors for anterior cruciate ligament injury in Australian footballers. Am J Sports Med. 2001;29(2):196-200
33. Orishimo KF, Kremenic IJ, Pappas E, et al. Comparison of landing biomechanics between male and female professional dancers. Am J Sports Med. 2009;37(11):2187-93.
34. Paterno MV, Kiefer AW, Bonnette S, et al. Prospectively identified deficits in sagittal plane hip-ankle coordination in female athletes who sustain a second anterior cruciate ligament injury after anterior cruciate ligament reconstruction and return to sport. Clin Biomech. 2015;30(10):1094-101.
35. Paterno MV, Schmitt LC, Ford KR, et al. Biomechanical measures during landing and postural stability predict second anterior cruciate ligament injury after anterior cruciate ligament reconstruction and return to sport. Am J Sports Med. 2010;38(10):1968-78.
36. Rahnemai-Azar AA, Abebe ES, Johnson P, et al. Increased lateral tibial slope predicts high-grade rotatory knee laxity pre-operatively in ACL reconstruction. Knee Surg Sports Traumatol Arthrosc. 2017;25(4):1170-76.

37. Raschner C, Platzer HP, Patterson C, et al. The relationship between ACL injuries and physical fitness in young competitive ski racers: a 10-year longitudinal study. Br J Sports Med. 2012;46(15):1065-71.
38. Ristić V, Ristić S, Maljanović M, et al. Risk Factors for Bilateral Anterior Cruciate Ligament Injuries. Med Pregl. 2015;68(5 6):192-97.
39. Sigward SM, Pollard CD, Powers CM. The influence of sex and maturation on landing biomechanics: implications for anterior cruciate ligament injury. Scand J Med Sci Sports. 2012;22(4):502-9.
40. Sueyoshi T, Emoto G, Yuasa T. Generalized Joint Laxity and Ligament Injuries in High School-Aged Female Volleyball Players in Japan. Orthop J Sports Med. 2016;4(10):2325967116667690.
41. Teng PSP, Kong PW, Leong KF. Effects of foot rotation positions on knee valgus during single-leg drop landing: Implications for ACL injury risk reduction. Knee. 2017;24(3):547-54.
42. Tillman MD, Bauer JA, Cauraugh JH, et al. Differences in lower extremity alignment between males and females. Potential predisposing factors for knee injury. J Sports Med Phys Fitness. 2005;45(3):355-9.
43. Tran AA, Gatewood C, Harris AH, et al. The effect of foot landing position on biomechanical risk factors associated with anterior cruciate ligament injury. J Exp Orthop. 2016;3(1):13.
44. Verrall GM, Esterman A, Hewett TE. Analysis of the Three Most Prevalent Injuries in Australian Football Demonstrates a Season to Season Association Between Groin/Hip/Osteitis Pubis Injuries With ACL Knee Injuries. Asian J Sports Med. 2014;5(3):e23072.
45. Zahradnik D, Jandacka D, Uchytil J, et al. Lower extremity mechanics during landing after a volleyball block as a risk factor for anterior cruciate ligament injury. Phys Ther Sport. 2015;16(1):53-8.

Did Not Meet Inclusion Criteria for Age: 30

1. Barrett GR, Rose JM, Ried EM. Relationship of anterior cruciate ligament injury to notch width index (a roentgenographic study). J Miss State Med Assoc. 1992;33(8):279-83.
2. Beynnon BD, Hall JS, Sturnick DR, et al. Increased slope of the lateral tibial plateau subchondral bone is associated with greater risk of noncontact ACL injury in females but not in males: a prospective cohort study with a nested, matched case-control analysis. Am J Sports Med. 2014;42(5):1039-48.
3. Beynnon BD, Vacek PM, Sturnick DR, et al. Geometric profile of the tibial plateau cartilage surface is associated with the risk of non-contact anterior cruciate ligament injury. J Orthop Res. 2014;32(1):61-8.
4. Bisson LJ, Gurske-DePerio J. Axial and sagittal knee geometry as a risk factor for noncontact anterior cruciate ligament tear: a case-control study. Arthroscopy. 2010;26(7):901-6.
5. Botchu R, Obaid H, Rennie WJ. Correlation between trochlear dysplasia and the notch index. J Orthop Surg. 2013;21(3):290-3.

6. Botchu R, Obaid H, Rennie WJ. Correlation between trochlear dysplasia and anterior cruciate ligament injury. J Orthop Surg. 2013;21(2):185-8.
7. Carter JC, Sturnick DR, Vacek PM, et al. Relationship between geometry of the extensor mechanism of the knee and risk of anterior cruciate ligament injury. J Orthop Res. 2017;35(5):965-73.
8. Estes K, Cheruvu B, Lawless M, et al. Risk assessment for anterior cruciate ligament injury. Arch Orthop Trauma Surg. 2015;135(10):1437-43.
9. Fernandes MS, Pereira R, Andrade R, et al. Is the femoral lateral condyle's bone morphology the trochlea of the ACL? Knee Surg Sports Traumatol Arthrosc. 2017;25(1):207-14.
10. Ghandour TM, Abdelrahman AA, Talaat A, et al. Can Khan's new method using MRI integrable to detect tibial plateau slope and depth as risk factors for anterior cruciate tear? Eur J Orthop Surg Traumatol. 2015;6(4):439-44.
11. Goetschius J, Smith HC, Vacek PM, et al. Application of a clinic-based algorithm as a tool to identify female athletes at risk for anterior cruciate ligament injury: a prospective cohort study with a nested, matched case-control analysis. Am J Sports Med. 2012;40(9):1978-84.
12. Goshima K, Kitaoka K, Nakase J, et al. Familial predisposition to anterior cruciate ligament injury. Sports Med Arthrosc Rehabil Ther Technol. 2014;1(2):62-66.
13. Harner CD, Paulos LE, Greenwald AE, et al. Detailed analysis of patients with bilateral anterior cruciate ligament injuries. Am J Sports Med. 1994;22(1):37-43.
14. Hewett TE, Myer GD, Ford KR, et al. Biomechanical measures of neuromuscular control and valgus loading of the knee predict anterior cruciate ligament injury risk in female athletes: a prospective study. Am J Sports Med. 2005;33(4):492-501.
15. Hoteya K, Kato Y, Motojima S, et al. Association between intercondylar notch narrowing and bilateral anterior cruciate ligament injuries in athletes. Arch Orthop Trauma Surg. 2011;131(3):371-6.
16. Ireland ML, Ballantyne BT, Little K, et al. A radiographic analysis of the relationship between the size and shape of the intercondylar notch and anterior cruciate ligament injury. Knee Surg Sports Traumatol Arthrosc. 2001;9(4):200-5.
17. Khan MS, Seon JK, Song EK. Risk factors for anterior cruciate ligament injury: assessment of tibial plateau anatomic variables on conventional MRI using a new combined method. Int Orthop. 2011;35(8):1251-6.
18. Kostogiannis I, Sward P, Neuman P, et al. The influence of posterior-inferior tibial slope in ACL injury. Knee Surg Sports Traumatol Arthrosc. 2011;19(4):592-7.
19. Mohamed EE, Useh U, Mtshali BF. Q-angle, Pelvic width, and Intercondylar notch width as predictors of knee injuries in women soccer players in South Africa. Afr Health Sci. 2012;12(2):174-80.
20. Motohashi M. Profile of bilateral anterior cruciate ligament injuries: a retrospective follow-up study. J Orthop Surg. 2004;12(2):210-5.
21. Ristic V, Maljanovic MC, Pericin B, et al. The relationship between posterior tibial slope and anterior cruciate ligament injury. Med Pregl. 2014;67(7-8):216-21.

22. Shelbourne KD, Facibene WA, Hunt JJ. Radiographic and intraoperative intercondylar notch width measurements in men and women with unilateral and bilateral anterior cruciate ligament tears. Knee Surg Sports Traumatol Arthrosc. 1997;5(4):229-33.
23. Shelbourne KD, Gray T, Benner RW. Intercondylar notch width measurement differences between African American and white men and women with intact anterior cruciate ligament knees. Am J Sports Med. 2007;35(8):1304-7.
24. Sonnery-Cottet B, Archbold P, Cucurulo T, et al. The influence of the tibial slope and the size of the intercondylar notch on rupture of the anterior cruciate ligament. J Bone Joint Surg Br. 2011;93(11):1475-8.
25. Souryal TO, Moore HA, Evans JP. Bilaterality in anterior cruciate ligament injuries: associated intercondylar notch stenosis. Am J Sports Med. 1988;16(5):449-54.
26. Stijak L, Blagojevic Z, Santrac-Stijak G, et al. Predicting ACL rupture in the population actively engaged in sports activities based on anatomical risk factors. Orthopedics. 2011;34(6):431.
27. Stijak L, Bumbasirevic M, Kadija M, et al. Morphometric parameters as risk factors for anterior cruciate ligament injuries - a MRI case-control study. Vojnosanit Pregl. 2014;71(3):271-6.
28. Stijak L, Herzog RF, Schai P. Is there an influence of the tibial slope of the lateral condyle on the ACL lesion? A case-control study. Knee Surg Sports Traumatol Arthrosc. 2008;16(2):112-7.
29. Terauchi M, Hatayama K, Yanagisawa S, et al. Sagittal alignment of the knee and its relationship to noncontact anterior cruciate ligament injuries. Am J Sports Med. 2011;39(5):1090-4.
30. Vacek PM, Slauterbeck JR, Tourville TW, et al. Multivariate Analysis of the Risk Factors for First-Time Noncontact ACL Injury in High School and College Athletes: A Prospective Cohort Study With a Nested, Matched Case-Control Analysis. Am J Sports Med. 2016;44(6):1492-501.

Not Knee-Related to Knee Morphology: 42

1. Alentorn-Geli E, Alvarez-Diaz P, Ramon S, et al. Assessment of neuromuscular risk factors for anterior cruciate ligament injury through tensiomyography in male soccer players. Knee Surg Sports Traumatol Arthrosc. 2015;23(9):2508-13.
2. Alentorn-Geli E, Alvarez-Diaz P, Ramon S, et al. Assessment of gastrocnemius tensiomyographic neuromuscular characteristics as risk factors for anterior cruciate ligament injury in male soccer players. Knee Surg Sports Traumatol Arthrosc. 2015;23(9):2502-7.
3. Bagherifard A, Jabalameli M, Yahyazadeh H, et al. Diminished femoral head-neck offset and the restricted hip range of motion suggesting a possible role in ACL injuries. Knee Surg Sports Traumatol Arthrosc. 2018 Feb 26(2):368-373. Epub 2017 Jun 5.
4. Beckett ME, Massie DL, Bowers KD, et al. Incidence of Hyperpronation in the ACL Injured Knee: A Clinical Perspective. J Athl Train. 1992;27(1):58-62.
5. Boden BP, Torg JS, Knowles SB, et al. Video analysis of anterior cruciate ligament injury: abnormalities in hip and ankle kinematics. Am J Sports Med. 2009;37(2):252-9.

6. Branch TP, Browne JE, Campbell JD, et al. Rotational laxity greater in patients with contralateral anterior cruciate ligament injury than healthy volunteers. Knee Surg Sports Traumatol Arthrosc. 2010;18(10):1379-84.
7. Brophy R, Silvers HJ, Gonzales T, et al. Gender influences: the role of leg dominance in ACL injury among soccer players. Br J Sports Med. 2010;44(10):694-7.
8. Burkhart B, Ford KR, Myer GD, et al. Anterior cruciate ligament tear in an athlete: Does increased heel loading contribute to ACL rupture? N Am J Sports Phys Ther. 2008;3(3):141-44.
9. Dingenen B, Malfait B, Nijs S, et al. Postural Stability During Single-Leg Stance: A Preliminary Evaluation of Noncontact Lower Extremity Injury Risk. J Orthop Sports Phys Ther. 2016;46(8):650-7.
10. Dingenen B, Malfait B, Nijs S, et al. Can two-dimensional video analysis during single-leg drop vertical jumps help identify non-contact knee injury risk? A one-year prospective study. Clin Biomech. 2015;30(8):781-7.
11. Gomes JLE, de Castro JV, Becker R, et al. Decreased Hip Range of Motion and Noncontact Injuries of the Anterior Cruciate Ligament. Arthroscopy. 2008;24(9):1034-37.
12. Grassi A, Smiley SP, Roberti di Sarsina T, et al. Mechanisms and situations of anterior cruciate ligament injuries in professional male soccer players: a YouTube-based video analysis. Eur J Orthop Surg Traumatol. 2017;25:25.
13. Grindstaff TL, Jackson KR, Garrison JC, et al. Decreased quadriceps activation measured hours prior to a noncontact anterior cruciate ligament tear. J Orthop Sports Phys Ther. 2008;38(8):508-16.
14. Jenkins WL, Killian CB, Williams DS, 3rd, et al. Anterior cruciate ligament injury in female and male athletes: the relationship between foot structure and injury. J Am Podiatr Med Assoc. 2007;97(5):371-6.
15. Khayambashi K, Ghoddosi N, Straub RK, et al. Hip Muscle Strength Predicts Noncontact Anterior Cruciate Ligament Injury in Male and Female Athletes: A Prospective Study. Am J Sports Med. 2016;44(2):355-61.
16. Kim SY, Spritzer CE, Utturkar GM, et al. Knee Kinematics During Noncontact Anterior Cruciate Ligament Injury as Determined From Bone Bruise Location. Am J Sports Med. 2015;43(10):2515-21.
17. Kobayashi H, Kanamura T, Koshida S, et al. Mechanisms of the anterior cruciate ligament injury in sports activities: a twenty-year clinical research of 1,700 athletes. J Sports Sci Med. 2010;9(4):669-75.
18. Koga H, Nakamae A, Shima Y, et al. Mechanisms for noncontact anterior cruciate ligament injuries: knee joint kinematics in 10 injury situations from female team handball and basketball. Am J Sports Med. 2010;38(11):2218-25.
19. Krosshaug T, Nakamae A, Boden BP, et al. Mechanisms of anterior cruciate ligament injury in basketball: Video analysis of 39 cases. Am J Sports Med. 2007;35(3):359-67.
20. Leppanen M, Pasanen K, Kujala UM, et al. Stiff Landings Are Associated With Increased ACL Injury Risk in Young Female Basketball and Floorball Players. Am J Sports Med. 2017;45(2):386-93.

21. Lopes OV, Jr., Tragnago G, Gatelli C, et al. Assessment of the alpha angle and mobility of the hip in patients with noncontact anterior cruciate ligament injury. Int Orthop. 2017;41(8):1601-05.
22. Montgomery C, Blackburn J, Withers D, et al. Mechanisms of ACL injury in professional rugby union: a systematic video analysis of 36 cases. Br J Sports Med. 2016;30:30.
23. Mouton C, Theisen D, Meyer T, et al. Noninjured Knees of Patients With Noncontact ACL Injuries Display Higher Average Anterior and Internal Rotational Knee Laxity Compared With Healthy Knees of a Noninjured Population. Am J Sports Med. 2015;43(8):1918-23.
24. Myer GD, Ford KR, Paterno MV, et al. The effects of generalized joint laxity on risk of anterior cruciate ligament injury in young female athletes. Am J Sports Med. 2008;36(6):1073-80.
25. Numata H, Nakase J, Kitaoka K, et al. Two-dimensional motion analysis of dynamic knee valgus identifies female high school athletes at risk of non-contact anterior cruciate ligament injury. Knee Surg Sports Traumatol Arthrosc. 2017;24:24.
26. Philippon M, Dewing C, Briggs K, et al. Decreased femoral head-neck offset: a possible risk factor for ACL injury. Knee Surg Sports Traumatol Arthrosc. 2012;20(12):2585-9.
27. Ramesh R, Von Arx O, Azzopardi T, et al. The risk of anterior cruciate ligament rupture with generalised joint laxity. J Bone Joint Surg Br. 2005;87(6):800-03.
28. Ruedl G, Webhofer M, Helle K, et al. Leg dominance is a risk factor for noncontact anterior cruciate ligament injuries in female recreational skiers. Am J Sports Med. 2012;40(6):1269-73.
29. Saunders N, McLean SG, Fox AS, et al. Neuromuscular dysfunction that may predict ACL injury risk: A case report. Knee. 2014;21(3):789-92.
30. Sheehan FT, Sipprell WH, 3rd, Boden BP. Dynamic sagittal plane trunk control during anterior cruciate ligament injury. Am J Sports Med. 2012;40(5):1068-74.
31. Smith J, Szczerba JE, Arnold BL, et al. Role of hyperpronation as a possible risk factor for anterior cruciate ligament injuries. J Athl Train. 1997;32(1):25-8.
32. Soderman K, Alfredson H, Pietila T, et al. Risk factors for leg injuries in female soccer players: a prospective investigation during one out-door season. Knee Surg Sports Traumatol Arthrosc 2001;9(5):313-21.
33. Steffen K, Nilstad A, Krosshaug T, et al. No association between static and dynamic postural control and ACL injury risk among female elite handball and football players: a prospective study of 838 players. Br J Sports Med. 2017;51(4):253-59.
34. Tainaka K, Takizawa T, Kobayashi H, et al. Limited hip rotation and non-contact anterior cruciate ligament injury: a case-control study. Knee. 2014;21(1):86-90.
35. VandenBerg C, Crawford EA, Sibilsky Enselman E, et al. Restricted Hip Rotation Is Correlated With an Increased Risk for Anterior Cruciate Ligament Injury. Arthroscopy. 2017;33(2):317-25.
36. Wahlstedt C, Rasmussen-Barr E. Anterior cruciate ligament injury and ankle dorsiflexion. Knee Surg Sports Traumatol Arthrosc. 2015;23(11):3202-7.
37. Wallace BJ, Kernozek TW, Mikat RP, et al. A comparison between back squat exercise and vertical jump kinematics: implications for determining anterior cruciate ligament injury risk. J Strength Cond Res. 2008;22(4):1249-58.

38. Wieschhoff GG, Mandell JC, Czuczman GJ, et al. Acute non-contact anterior cruciate ligament tears are associated with relatively increased vastus medialis to semimembranosus cross-sectional area ratio: a case-control retrospective MR study. Skeletal Radiol. 2017;15:15. doi:
39. Woodford-Rogers B, Cyphert L, Denegar CR. Risk factors for anterior cruciate ligament injury in high school and college athletes. J Athl Train. 1994;29(4):343-6.
40. Yamazaki J, Muneta T, Ju YJ, et al. Hip acetabular dysplasia and joint laxity of female anterior cruciate ligament-injured patients. Am J Sports Med. 2011;39(2):410-4.
41. Zazulak BT, Hewett TE, Reeves NP, et al. Deficits in neuromuscular control of the trunk predict knee injury risk: A prospective biomechanical-epidemiologic study. Am J Sports Med. 2007;35(7):1123-30.
42. Zebis MK, Andersen LL, Bencke J, et al. Identification of athletes at future risk of anterior cruciate ligament ruptures by neuromuscular screening. Am J Sports Med. 2009;37(10):1967-73.

Level IV or V Evidence: 5

1. Amraee D, Alizadeh MH, Minoonejhad H, et al. Predictor factors for lower extremity malalignment and non-contact anterior cruciate ligament injuries in male athletes. Knee Surg Sports Traumatol Arthrosc. 2017;25(5):1625-31.
2. Ntagiopoulos PG, Bonin N, Sonnery-Cottet B. The incidence of trochlear dysplasia in anterior cruciate ligament tears. Int Orthop. 2014;38(6):1269-75.
3. Sanchis-Alfonso V, Tinto-Pedrerol M. Simultaneous bilateral anterior cruciate ligament tears in a female beginner skier. Knee Surg Sports Traumatol Arthrosc. 2000;8(4):241-3.
4. Souryal TO, Freeman TR, Daniel DM, et al. Intercondylar notch size and anterior cruciate ligament injuries in athletes. A prospective study. Am J Sports Med. 1993;21(4):535-39.
5. Tifford CD, Jackson DW. Simultaneous bilateral anterior cruciate ligament ruptures in a cheerleader. Arthroscopy. 2001;17(4):E17.

Appendix V: Studies Included by Reference Screen and Search Update

Reference Screen: 6

1. Al Moosawi N, Mahajan P, S. Al Nahedh Y. MRI Evaluation of Femoral Intercondylar Notch Width Index in Cases with and without Anterior Cruciate Ligament Injuries. A Retrospective Study. Kuwait Med J. 2010;42:286.

2. Chaudhari AM, Zelman EA, Flanigan DC, Kaeding CC, Nagaraja HN. Anterior cruciate ligament-injured subjects have smaller anterior cruciate ligaments than matched controls: a magnetic resonance imaging study. Am J Sports Med. 2009;37(7):1282-7.

3. Good L, Odensten M, Gillquist J. Intercondylar notch measurements with special reference to anterior cruciate ligament surgery. Clin Orthop Relat Res. 1991;(263):185-9.

4. Park JS, Nam DC, Kim DH, Kim HK, Hwang SC. Measurement of Knee Morphometrics Using MRI: A Comparative Study between ACL-Injured and Non-Injured Knees. Knee Surg Relat Res. 2012;24(3):180-5.

5. Pedoia V, Lansdown DA, Zaid M, McCulloch CE, Souza R, Ma CB, et al. Three-dimensional MRI-based statistical shape model and application to a cohort of knees with acute ACL injury. Osteoarthritis Cartilage. 2015;23(10):1695-703.

6. van Eck CF, Martins CA, Vyas SM, Celentano U, van Dijk CN, Fu FH. Femoral intercondylar notch shape and dimensions in ACL-injured patients. Knee Surg Sports Traumatol Arthrosc. 2010;18(9):1257-62.

Search Update: 3

1. Vasta S, Andrade R, Pereira R, Bastos R, Battaglia AG, Papalia R, et al. Bone morphology and morphometry of the lateral femoral condyle is a risk factor for ACL injury. Knee Surg Sports Traumatol Arthrosc. 2018;26(9):2817-2825.

2. Kızılgöz V, Sivrioğlu AK, Ulusoy GR, Aydın H, Karayol SS, Menderes U. Analysis of the risk factors for anterior cruciate ligament injury: an investigation of structural tendencies. Clin Imaging. 2018;50:20-30.

3. Pfeiffer TR, Burnham JM, Hughes JD, Kanakamedala AC, Herbst E, Popchak A, et al. An Increased Lateral Femoral Condyle Ratio Is a Risk Factor for Anterior Cruciate Ligament Injury. J Bone Joint Surg Am. 2018;100(10):857-64.