

Supplementary Appendix 1. Complete search strategy, exemplified for MEDLINE Ovid.

The full search strategy is available on the Open Science Framework <https://osf.io/bkhr5/>.

Field labels

- / After an index term indicates a subject heading were selected.
 .tw. Indicates a search for a term in title or abstract
 .kw. = keyword heading
 .kf. = keyword heading word
 * At the end of a term indicates that this term has been truncated.
 Adj3 Indicates a search for two terms next to each other, in any order, up to 3 words in between.

MEDLINE (Ovid) ALL 1949 to May 05, 2022

Advanced search

Dates of search: 2020-06-16, 2021-07-07, and 2022-05-05

No search restrictions by publication or language.

#	Searches
1	Athletic Injuries/ or Rupture/ or "Sprains and Strains"/
2	Anterior Cruciate Ligament/ or Menisci, Tibial/
3	1 and 2
4	Anterior Cruciate Ligament Injuries/ or Tibial Meniscus Injuries/
5	3 or 4
6	(menisc* adj3 (resect* or injur* or tear* or rupture* or repair* or reconstruct* or shav* or surg*).tw,kf.
7	((ACL* or anterior cruciate ligament*) adj4 (injur* or tear* or sprain* or rupture* or reconstruct* or surg* or repair* or rupture*).tw,kf.
8	Meniscectomy/
9	exp Anterior Cruciate Ligament Reconstruction/
10	meniscectom*.tw,kf.
11	or/6-10
12	Arthroscopy/
13	arthroscop*.tw,kf.
14	or/12-13
15	(ACL* or anterior cruciate ligament* or menisc*).tw,kf.
16	2 or 15
17	14 and 16
18	5 or 11 or 17
19	Muscle strength/
20	((muscle* or lower extremity or quadriceps or knee or knees or lower limb or leg) adj3 (strength or force or weakness or power or performance or function or deficit or development)).tw,kw,kf.
21	or/19-20
22	(instrumentation or methods).fs.
23	(Validation Studies or Comparative Study).pt.
24	exp Psychometrics/
25	psychometr*.ti,ab.
26	(clinimetr* or clinometr*).tw.
27	exp Outcome Assessment, Health Care/
28	outcome assessment.ti,ab.
29	outcome measure*.tw.
30	exp Observer Variation/
31	observer variation.ti,ab.
32	exp Health Status Indicators/
33	exp Reproducibility of Results/
34	reproducib*.ti,ab.
35	exp Discriminant Analysis/
36	(reliab* or unreliab* or valid* or coefficient or homogeneity or homogeneous or internal consistency).ti,ab.
37	(cronbach* adj3 (alpha or alphas)).ti,ab.
38	(item adj3 (correlation* or selection* or reduction*)).ti,ab.

- 39 (agreement or precision or imprecision or precise values or test-retest).ti,ab.
40 (test adj3 retest).ti,ab.
41 (reliab* adj3 (test or retest)).ti,ab.
42 (stability or interrater or inter-rater or intrarater or intra-rater or intertester or inter-tester or intratester or intra-tester or interobserver or inter-observer or intraobserver or intraobserver or intertechnician or inter-technician or intratechnician or intra-technician or interexaminer or inter-examiner or intraexaminer or intra-examiner or interassay or interassay or intraassay or intra-assay or interindividual or inter-individual or intraindividual or intra-individual or interparticipant or inter-participant or intraparticipant or intra-participant or kappa or kappas or repeatab*).ti,ab.
43 ((replicab* or repeated) adj3 (measure or measures or findings or result or results or test or tests)).ti,ab.
44 (generaliza* or generalisa* or concordance).ti,ab.
45 (intraclass adj3 correlation*).ti,ab.
46 (discriminative or known group or factor analysis or factor analyses or dimension* or subscale*).ti,ab.
47 (multitrait scaling adj3 (analysis or analyses)).ti,ab.
48 (item discriminant or interscale correlation* or error or errors or individual variability).ti,ab.
49 (variability adj3 (analysis or values)).ti,ab.
50 (uncertainty adj3 (measurement or measuring)).ti,ab.
51 (standard error of measurement or sensitiv* or responsive*).ti,ab.
52 (((minimal or minimally or clinical or clinically) adj3 (important or significant or detectable)) and (change or difference)).ti,ab.
53 (small* adj3 (real or detectable) adj3 (change or difference)).ti,ab.
54 (meaningful change or ceiling effect or floor effect or Item response model or IRT or Rasch or Differential item functioning or DIF or computer adaptive testing or item bank or cross-cultural equivalence).ti,ab.
55 or/22-54
56 (addresses or biography or case reports or comment or directory or editorial or festschrift or interview or lectures or legal cases or legislation or letter or news or newspaper article or patient education handout or popular works or congresses or consensus development conference or consensus development conference, nih or practice guideline or randomized controlled trial or randomized controlled trial, veterinary or "systematic review").pt.
57 ((veterinar* or animal or animals or rabbit or rabbits or rodent or rodents or rat or rats or mouse or mice or hamster or hamsters or pig or pigs or piglet or piglets or porcine or pigeon* or horse* or equine or cow or cows or bovine or goat or goats or sheep or lamb or lambs or monkey or monkeys or murine or ovine or dog or dogs or canine or cat or cats or feline or dolphin*) not (patient or patients or human or humans)).ti.
58 (Animal Experimentation/ or exp Animals/ or exp Models, Animal/) not Humans/
59 systematic review/ or exp randomized controlled trial/ or (systematic review or randomi?ed controlled trial).ti.
60 or/56-59
61 18 and 21 and 55
62 61 not 60
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Supplementary Appendix 2. A priori hypotheses used in data synthesis for construct validity

Strength tests	Data management	Hypotheses	Interpretation
Isokinetic concentric and isometric extensor strength	Qualitative synthesis: Weighted mean correlation coefficients (95% CI) between the strength test and comparator instruments.	Correlation ≥ 0.50 with neural activity and hopping. Correlation 0.30-0.50 with running, dynamic balance, and patient-reported outcomes (related, but dissimilar constructs).	Considered sufficient if correlation with hopping ≥ 0.50 OR correlation with running, dynamic balance and patient-related outcomes 0.30-0.50 AND at least 75% of the results are in accordance with hypotheses
Isokinetic concentric and isometric flexor strength	Qualitative synthesis: Weighted mean correlation coefficients (95% CI) between the strength test and comparator instruments.	Correlation ≥ 0.40 with hopping. Correlation 0.30-0.50 with running, dynamic balance, and patient-reported outcomes (related, but dissimilar constructs).	Considered sufficient if correlation with hopping ≥ 0.40 OR correlation with running, dynamic balance and patient-related outcomes 0.30-0.50 AND at least 75% of the results are in accordance with hypotheses
Isokinetic eccentric and isotonic extensor strength	Qualitative synthesis: Individual study results of correlation between the strength test and comparator instruments	Correlation ≥ 0.50 with hopping. Correlation 0.30-0.50 with running, dynamic balance, and patient-reported outcomes (related, but dissimilar constructs).	Considered sufficient if at least 75% of the results are in accordance with hypotheses
Isokinetic eccentric flexor strength	Qualitative synthesis: Individual study results of correlation between the strength test and comparator instruments.	Correlation ≥ 0.40 with hopping. Correlation 0.30-0.50 with running, dynamic balance, and patient-reported outcomes (related, but dissimilar constructs).	Considered sufficient if at least 75% of the results are in accordance with hypotheses

Supplementary Appendix 3. Excluded references and reason of exclusion based on full-text screening

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Supplementary Appendix 4. Detailed description of the included strength tests

Instrument	References	Equipment	Muscle group	Position	Contraction mode	Range of motion (°)	Speed (°/s)	Duration (s)	Repetitions	Variables reported
Computerised dynamometry	1-26	Biodex, Contrex, Cybex, IsoMed, Isosport, KinCom	Extensors, flexors	Seated	Isokinetic concentric slow-speed	90 to 0	60, 90, 120	-	3, 4, 5, or 8	PT, PT/BW, LSI
	3, 4, 11, 15, 17, 20, 22, 27-29	Biodex, Cybex, IsoMed, Isosport, KinCom	Extensors, flexors	Seated	Isokinetic concentric high-speed	90 to 0	180, 300	-	3, 5, 8, 10, or 15	PT, PT/BW, LSI
	10, 11, 15	Biodex, IsoMed2000	Extensors, flexors	Seated	Isokinetic eccentric slow-speed	90 to 0	60, 90, 120	-	3, 5	PT/BW, LSI
	11, 15	Biodex	Extensors, flexors	Seated	Isokinetic eccentric high-speed	90 to 0	180	-	5	PT/BW
	11, 14, 20, 30-32	Biodex, Cybex	Extensors	Seated	Isometric	At 30, 60, 90	-	3, or ns	2, 3	PT/BW, LSI
Handheld dynamometry	17	KinCom	Extensors, flexors	Seated	Isometric (alternating)	At 45	-	ns (to max)	5	PT
	33-35	Hoggan Health, Lafayette	Extensors, flexors	Seated	Isometric	At 60, 90	-	5, or ns (to	2, 3	PT, PT/BW, LSI
	34	Hoggan Health	Extensors	Prone	Isometric	At 90	-	5	3	LSI
Leg extension	35	Hoggan Health	Flexors	Prone	Isometric	At 3	-	ns (to max)	3	PT
	36	Cybex knee extension	Extensors	Seated	Isotonic	90 to 40	-	-	1RM	PT
Leg curl	36	Cybex prone leg curl	Flexors	Prone	Isotonic	90 to 0	-	-	1RM	PT
Leg press	22	Keiser Air 300 Leg Press	Extensors	Seated	Isotonic	100 to 0	Max	-	5 at 70% of 1RM	Watt/BW

(BW) bodyweight; (LSI) limb symmetry index; (max) maximum; (ns) not specified; (PT) peak torque; (s) second; (1RM) one-repetition maximum; (°) degrees

Supplementary Appendix 5. Elements included in studies on reliability and measurement error.

Almeida 2019

Elements	Study 1 Isometric extensor strength test
1. Instrument	Handheld dynamometer (HHD)
2. Equipment, test protocol and variables reported	Equipment: Lafayette Instrument Company HHD
	Test personnel: Two raters. Five years of work experience. Blinded to the result.
	Test procedures: Two practice trials and 30-sec rest period before the test. Two test trials consisted of maximal isometric contractions for 5s. 1-min rest between legs. Verbal encouragement was given. The test was repeated if difference between the contractions >10%
	Positioning procedures: Seated position with 90° hip and knee flexion, and thigh and malleoli straps. Hands crossed over the trunk. HHD was positioned 2 cm proximal to the lateral malleolus midpoint.
	Variables reported: Variables of both test trials were calculated as normalised peak torque multiplied by the lever arm.
3. Construct	Isometric extensor strength.
4. Measurement property	Reliability (rater n=2, intra-rater) and measurement error.
5. Components that will be repeated	The measurement was repeated.
6. Source of variation	The measurement of two test trials.
7. Patient population	ACL reconstruction (25 ± 3 mo. postop.), n=70 (9% females), without knee pain.
Comprehensive research question: What is the intra-rater reliability (normalised peak torque) of isometric extensor strength test at 90° knee flexion based on two trials in ACL reconstructed individuals.	

Knezevic 2012

Elements	Study 1 Isokinetic concentric slow-speed extensor and flexor strength test	Study 2 Isokinetic concentric high-speed extensor and flexor strength test	Study 3 Alternating isometric extensor and flexor strength test
1. Instrument	Computerised dynamometer		
2. Equipment, test protocol and variables reported	Equipment: Kinetic Communication isokinetic dynamometer (KinCom)		
	Test personnel: One rater. No information on work experience.		
	Test procedures: Warm-up consisted of 5 min of stationary cycling and passive stretching. Five submaximal practice trials. Test trials consisted of two series of five maximal repetitions at 60°/s and at 180°/s. 1-min rest between trails, 2-min rest between speeds. Verbal encouragement and real-time feedback were given. The uninvolved leg was first.	Test procedures: Warm-up and two isokinetic concentric strength tests preceded (<i>cf.</i> Study 1 and 2). Five submaximal practice trials, followed by test trials, consisting of two series of five maximal alternating isometric contractions. Instructions given were “ <i>to consecutively exert the alternating maximum contractions of quadriceps and hamstrings as strong and as quickly as possible</i> ”. Verbal encouragement and real-time feedback were given. The uninvolved leg was first.	
	Positioning procedures: Seated position. Pelvis, thigh, and malleoli straps. Tightly holding the sides of the dynamometer chair. The axis of rotation of the dynamometer was aligned with the axis of the knee. Range of motion was limited from 90° to 10° of knee flexion.	Positioning procedures: Seated position. Pelvis, thigh, and malleoli straps. Tightly holding the sides of the dynamometer chair. The axis of rotation of the dynamometer was aligned with the axis of the knee. Knee flexion angle was fixed at 45°.	
Variables reported: The trial with the highest peak torque was used for data analysis, and calculated as mean peak torque multiplied by the lever arm.			
3. Construct	Isokinetic concentric slow-speed extensor and flexor strength.	Isokinetic concentric high-speed extensor and flexor strength.	Isometric extensor and flexor strength.
4. Measurement property	Intra-rater reliability (rater n=1) and measurement error.		
5. Components that will be repeated	The entire test procedure was repeated.		
6. Source of variation	Occasion (time interval of 48 hours).		
7. Patient population	ACL reconstruction (4 mo. postop.), n=15 (0% females). No knee pain was reported prior or during the tests.		
Comprehensive research question: What is the intra-rater reliability (peak torque) of isokinetic concentric extensor and flexor strength test at 60°/s and 180°/s based on the mean of five trials in ACL reconstructed individuals.			

Ross 2002

Elements	Study 1 Isokinetic concentric slow-speed extensor strength test
1. Instrument	Computerised dynamometer
2. Equipment, test protocol and variables reported	Equipment: Kinetic Communication isokinetic dynamometer (KinCom)
	Test personnel: One rater. No information on the rater's work experience.
	Test procedures: Warm-up consisted of 5 min of self-paced stationary cycling, followed by quadriceps, hamstring, and calf muscle stretching three times 30-s. Three submaximal practice trials and 1-min rest period before five test trials at 60°/s. The uninjured leg was first.
	Positioning procedures: Seated position, with waist and thigh straps. The tibial pad was placed 2.5 cm proximal to the lateral malleolus. The axis of rotation of the dynamometer was aligned with the lateral femoral epicondyle. Range of motion was limited from 90° to 0° of knee flexion.
	Variables reported: Limb symmetry index was calculated using the mean peak torque.
3. Construct	Isokinetic concentric slow-speed extensor strength.
4. Measurement property	Reliability (rater n=1, intra-rater) and measurement error.
5. Components that will be repeated	The entire test procedure was repeated.
6. Source of variation	Occasion (time interval of 5 days).
7. Patient population	ACL reconstruction (27 ± 13 mo. postop.), n=10 (30% females). The knee condition had reached a plateau and remained unchanged between tests.
Comprehensive research question: What is the intra-rater reliability (leg symmetry index) of isokinetic concentric extensor strength test at 60°/s based on the mean of five trials in ACL reconstructed individuals.	

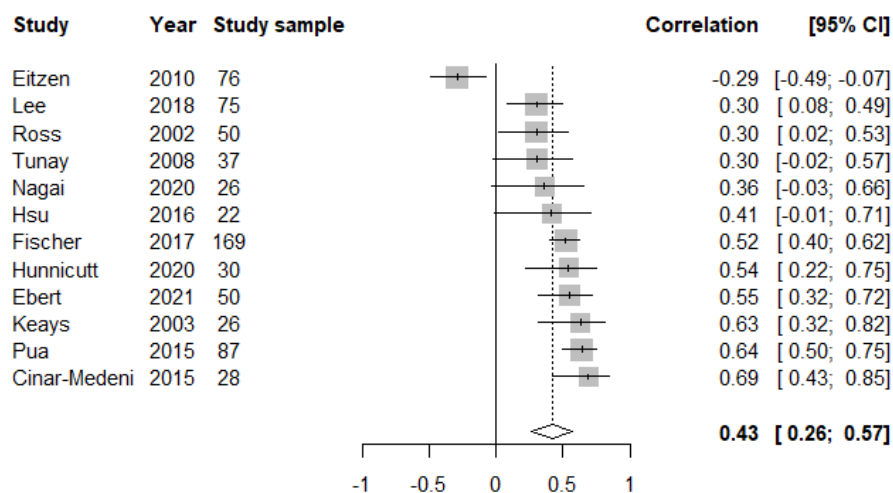
Wongcharoenwatana 2019

Elements	Study 1 Isometric extensor strength test (seated)	Study 2 Isometric extensor strength test prone
1. Instrument	Handheld dynamometer (HHD)	
2. Equipment, test protocol and variables reported	Equipment: Hoggan Health Industries HHD	
	Test personnel: Two raters. One female and male athletic trainers with HHD training. Blinded to the result.	
	Test procedures: A maximal isokinetic strength test was performed first, followed by 10-min rest. Three submaximal practice trials and three maximal test trials consisting of isometric contractions for 5s. 10-min rest between legs.	
	Positioning procedures: Seated position. Trunk, waist, and thigh straps. 90° hip and knee flexion. HHD device on the anterior aspect of the tibia 3 cm above the lateral malleolus.	Positioning procedures: Prone position, fixed with thigh straps. No hip flexion, 90° knee flexion. HHD device on the anterior aspect of the tibia 3 cm above the lateral malleolus.
	Variables reported: Mean limb symmetry index.	
3. Construct	Isometric extensor strength.	Isometric extensor strength, prone.
4. Measurement property	Intra-rater and inter-rater reliability (rater n=2).	
5. Components that will be repeated	Intra-rater reliability: The measurement was repeated.	
	Intra-rater reliability: The entire test was repeated.	
6. Source of variation	Intra-rater reliability: The measurement of three test trials.	
	Inter-rater reliability: The entire test was repeated.	
7. Patient population	ACL reconstruction (10 [3-70] mo. postop.), n=60 (12% females), without knee pain.	
Comprehensive research question: What is the intra-rater reliability and inter-rater reliability (leg symmetry index) of isometric extensor test at 90° based on the mean of three trials in ACL reconstructed individuals.		

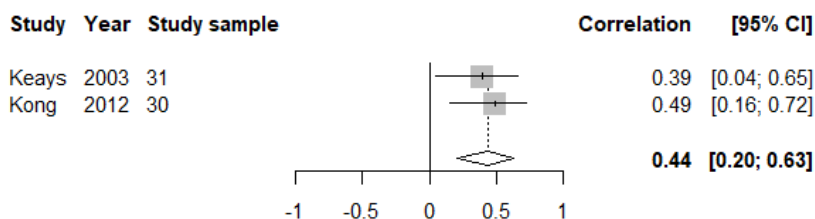
Supplementary Appendix 6. Forest plots for meta-analyses on qualitatively pooled correlation coefficients between strength tests and categorised comparator instruments

Isokinetic concentric slow-speed extensor strength test

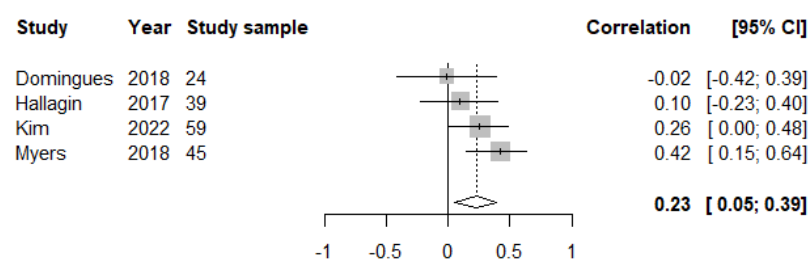
Comparator instrument: Hop tests



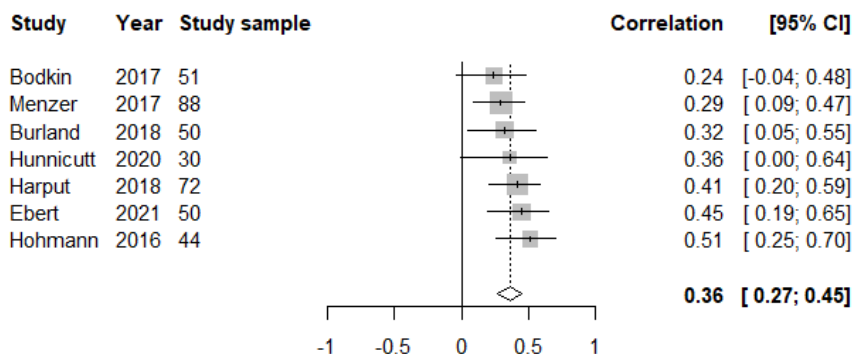
Comparator instrument: Running tests



Comparator instrument: Balance tests

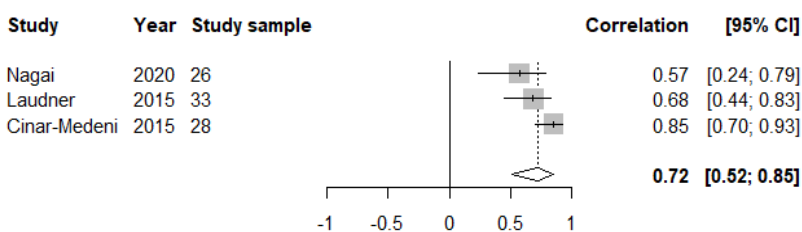


Comparator instrument: PROMS

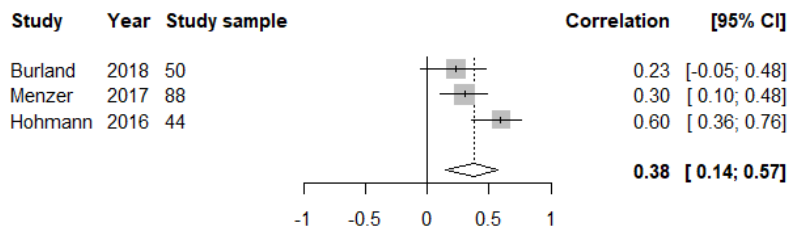


Isokinetic concentric high-speed extensor strength test

Comparator instrument: Hop tests

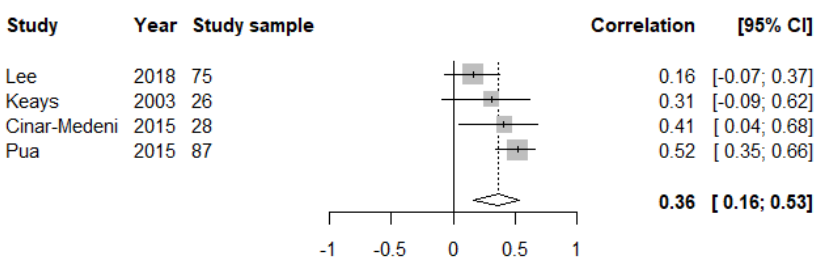


Comparator instrument: PROMS

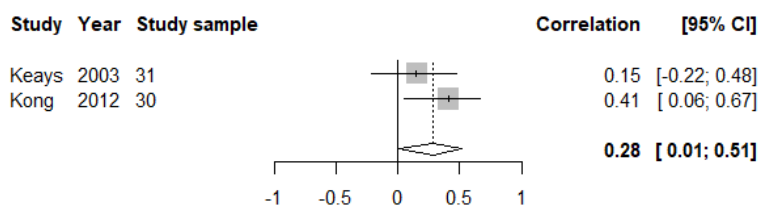


Isokinetic concentric slow-speed flexor strength test

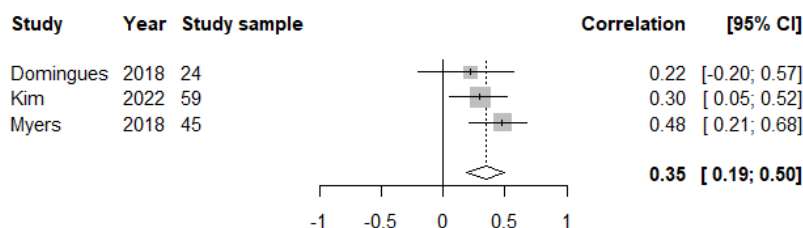
Comparator instrument: Hop tests



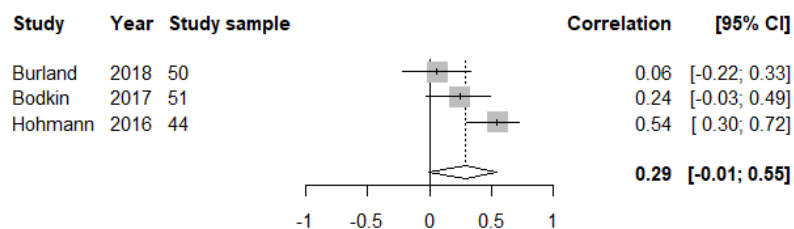
Comparator instrument: Running tests



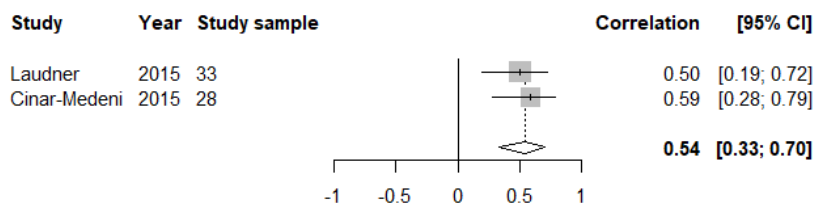
Comparator instrument: Balance tests



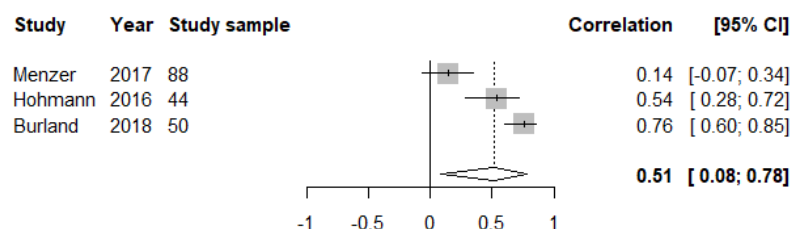
Comparator instrument: PROMS

Isokinetic concentric high-speed flexor strength test

Comparator instrument: Hop tests

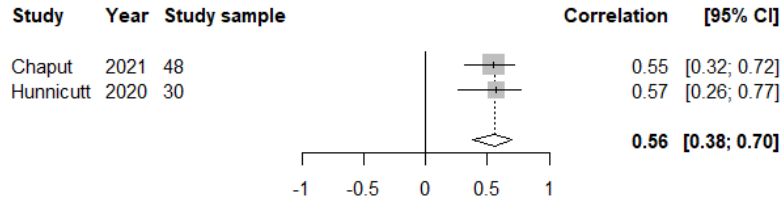


Comparator instrument: PROMS

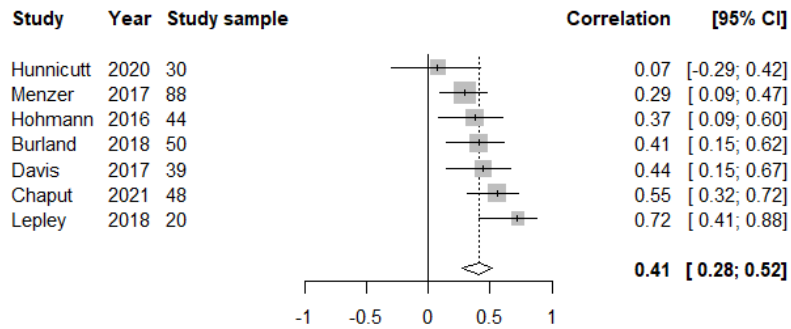


Isometric extensor strength test

Comparator instrument: Hop tests

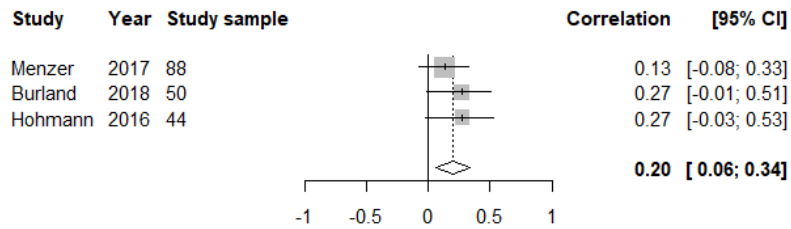


Comparator instrument: PROMS



Isometric flexor strength test

Comparator instrument: PROMS



Supplementary Appendix 7. COSMIN methodological quality ratings and correlation coefficients for studies included in the meta-analyses on construct validity

Strength tests	Study	n	COSMIN score	Neural activity	Hop tests	Running tests	Balance tests	PROMS*
Isokinetic concentric slow-speed extensor strength	Bodkin 2017	51	Very good	-	-	-	-	0.24
	Bodkin 2019	29	Inadequate	-0.50	-	-	-	-
	Burland 2018	50	Very good	-	-	-	-	0.32
	Cinar-Medeni 2015	28	Very good	-	0.69	-	-	-
	Domingues 2018	24	Adequate	-	-	-	-0.02	-
	Ebert 2021	50	Very good	-	0.57	0.34	-	0.51
	Eitzen 2010	76	Very good	-	-0.29	-	-	-
	Fischer 2017	169	Very good	-	0.52	-	-	-
	Hallagin 2017	39	Very good	-	-	-	0.10	-
	Harput 2018	72	Doubtful	-	-	-	-	0.41
	Hohmann 2016	44	Very good	-	-	-	-	0.51
	Hsieh 2015	28	Very good	-	-	-	-	ns
	Hsu 2016	22	Very good	-	0.41	-	-	-
	Hunnicutt 2020	30	Very good	-	0.54	-	-	0.36
	Jamshidi 2005	11	Doubtful	-	ns	-	-	-
	Keays 2003	26	Very good	-	0.63	-	-	-
		31	Very good	-	-	0.39	-	-
	Kim 2022	59	Adequate	-	-	-	0.03	-
	Kong 2012	30	Adequate	-	-	0.49	-	-
	Lee 2018	75	Adequate	-	0.30	-	-	-
Menzer 2017	88	Very good	-	-	-	-	0.29	
Myers 2018	45	Adequate	-	-	-	0.42	-	
Nagai 2020	26	Very good	-	0.36	-	-	-	
Pua 2015	87	Very good	-	0.64	-	-	-	
Ross 2002	50	Very good	-	0.30	-	-	-	
Tunay 2008	37	Very good	-	0.30	-	-	-	
Isokinetic concentric high-speed extensor strength	Burland 2018	50	Very good	-	-	-	-	0.23
	Cinar-Medeni 2015	28	Very good	-	0.85	-	-	-
	Clagg 2015	66	Doubtful	-	-	-	ns	-
	Hohmann 2016	44	Very good	-	-	-	-	0.60
	Jamshidi 2005	11	Doubtful	-	ns	-	-	-
	Laudner 2015	33	Very good	-	0.68	-	-	-
	Menzer 2017	88	Very good	-	-	-	-	0.30
	Nagai 2020	26	Very good	-	0.57	-	-	-
	Sueyoshi 2017	29	Very good	-	ns	-	-	-
	Bodkin 2017	51	Very good	-	-	-	-	0.25
Isokinetic concentric slow-speed flexor strength	Burland 2018	50	Very good	-	-	-	-	0.06
	Cinar-Medeni 2015	28	Very good	-	0.41	-	-	-
	Domingues 2018	24	Adequate	-	-	-	0.22	-
	Hohmann 2016	44	Very good	-	-	-	-	0.55
	Jamshidi 2005	11	Doubtful	-	ns	-	-	-
	Keays 2003	26	Very good	-	0.31	-	-	-
		31	Very good	-	-	0.15	-	-
	Kong 2012	30	Adequate	-	-	0.41	-	-
	Lee 2018	75	Adequate	-	0.16	-	-	-
	Myers 2018	45	Adequate	-	-	-	0.48	-
Pua 2015	87	Very good	-	0.52	-	-	-	
Isokinetic concentric high-speed flexor strength	Burland 2018	50	Very good	-	-	-	-	0.08
	Cinar-Medeni 2015	28	Very good	-	0.59	-	-	-
	Clagg 2015	66	Doubtful	-	-	-	ns	-
	Hohmann 2016	44	Very good	-	-	-	-	0.54
	Jamshidi 2005	11	Doubtful	-	ns	-	-	-
	Laudner 2015	33	Very good	-	0.50	-	-	-
	Menzer 2017	88	Very good	-	-	-	-	0.14
	Sueyoshi 2017	29	Very good	-	ns	-	-	-
Burland 2018	50	Very good	-	-	-	-	0.41	

Isometric extensor strength	Chaput 2021	48	Very good	-	0.55	-	-	0.55
	Davis 2017	39	Very good	-	-	-	-	0.44
	Hohmann 2016	44	Very good	-	-	-	-	0.37
	Hunnicut 2020	30	Very good	-	0.57	-	-	0.08
	Lepley 2018	20	Very good	-	-	-	-	0.72
Isometric flexor strength	Menzer 2017	88	Very good	-	-	-	-	0.29
	Burland 2018	50	Very good	-	-	-	-	0.27
	Hohmann 2016	44	Very good	-	-	-	-	0.27
	Menzer 2017	88	Very good	-	-	-	-	0.13

(n) sample size; (ns) not specified; (slow-speed) 60 to 120 degrees/second; (high-speed) 180 to 300 degrees/second;
 Negative associations due to time-based variables (running tests) were removed for consistent presentation of the results.
 *Included PROMS (patient-related outcome measures) were Knee Documentation Committee Subjective Knee Form, Knee injury and Osteoarthritis Outcome Score sport and recreation and knee-related quality of life subscales, and Cincinnati Knee Rating System

Supplementary Appendix 8. COSMIN methodological quality ratings and correlation coefficients for studies included in the qualitative syntheses on construct validity

Strength test	Instrument	Study	n	COSMIN score	Hop tests	PROMS*	Results (rating)
Isokinetic eccentric slow-speed extensor strength	Com. dyn.	Harput 2018	72	Doubtful	-	ns	1+
	Com. dyn.	Hohmann 2016	44	Very good	-	0.43	
	Com. dyn.	Jamshidi 2005	11	Doubtful	ns	-	
Isokinetic eccentric high-speed extensor strength	Com. dyn.	Hohmann 2016	44	Very good	-	0.43	1+
	Com. dyn.	Jamshidi 2005	11	Doubtful	ns	-	
Isokinetic eccentric slow-speed flexor strength	Com. dyn.	Harput 2018	72	Doubtful	-	0.46	2+
	Com. dyn.	Hohmann 2016	44	Very good	-	0.32	
	Com. dyn.	Jamshidi 2005	11	Doubtful	ns	-	
Isokinetic eccentric high-speed flexor strength	Com. dyn.	Hohmann 2016	44	Very good	-	0.40	1+
	Com. dyn.	Jamshidi 2005	11	Doubtful	ns	-	
Isotonic extensor strength	Leg press	Nagai 2020	26	Very good	0.34	-	1-
Isometric extensor strength	HHD	Manchado 2021	194	Very good	-	0.20	1-
Isometric flexor strength, prone	HHD	Manchado 2021	194	Very good	-	0.18	1-

(com. dyn.) computerised dynamometry; (HHD) handheld dynamometry; (n) sample size; (ns) not specified; (slow-speed) 60 to 120 degrees/second; (high-speed) 180 to 300 degrees/second

*Included PROMS (patient-related outcome measures) were Knee Documentation Committee Subjective Knee Form, Knee injury and Osteoarthritis Outcome Score sport and recreation and knee-related quality of life subscales, and Cincinnati Knee Rating System

Supplementary Appendix 9. COSMIN methodological quality ratings and correlation coefficient for studies on criterion validity

Strength tests	Instruments	Variables reported	Study	n	COSMIN score	Summary result (rating)
Isokinetic concentric high-speed extensor strength	Computerized dynamometry	PT/BW	Nagai 2020	26	Very good	$r=0.82-0.83$ (+)
Isometric extensor strength	HHD	PT/BW	Almeida 2019	70	Very good	$r=0.62$ (-)
	HHD	LSI	Wongcharoenwatana 2019	60	Very good	$r=0.36-0.52$ (-)
Isometric extensor strength, prone	HHD	LSI	Wongcharoenwatana 2019	60	Very good	$r=0.17-0.36$ (-)
Isotonic extensor strength	Leg extension	PT	Pua 2017	106	Very good	$r=0.91$ (+)
	Leg press	PT/BW	Nagai 2020	26	Very good	$r=0.57$ (-)
Isotonic flexor strength, prone	Leg curl	PT	Pua 2017	106	Very good	$r=0.80$ (+)

(BW) body weight; (HHD) handheld dynamometry; (LSI) limb symmetry index; (n) sample size; (PT) peak torque; (r) correlation coefficient; (high-speed) 180 to 300 degrees/second

Appendix 10. Modified GRADE table

Strength tests	Studies, number	Individuals, number	Graded factor (level of downgrading)	Quality of evidence
Reliability				
<i>Intra-rater</i>				
Isokinetic concentric 60°/s extensor strength	2	25	Inconsistency (one); imprecision (two)	Very low
Isokinetic concentric 180°/s extensor strength	1	15	Risk of bias (one); imprecision (two)	Very low
Isokinetic concentric 60°/s flexor strength	1	15	Risk of bias (one); imprecision (two)	Very low
Isokinetic concentric 180°/s flexor strength	1	15	Risk of bias (one); imprecision (two)	Very low
Isometric extensor strength	2	130	Inconsistency (one)	Moderate
Isometric extensor strength, prone	1	60	Risk of bias (two); imprecision (one)	Very low
Alternating isometric extensor strength	1	15	Risk of bias (two); imprecision (one)	Very low
Alternating isometric flexor strength	1	15	Risk of bias (two); imprecision (one)	Very low
<i>Inter-rater</i>				
Isometric extensor strength	1	60	Risk of bias (two); imprecision (one)	Very low
Isometric extensor strength, prone	1	60	Risk of bias (two) imprecision (one)	Very low
Measurement error				
Isokinetic concentric 60°/s extensor strength	2	25	-	-
Isokinetic concentric 180°/s extensor strength	1	15	-	-
Isokinetic concentric 60°/s flexor strength	1	15	-	-
Isokinetic concentric 180°/s flexor strength	1	15	-	-
Isometric extensor strength	1	130	-	-
Alternating isometric extensor strength	1	15	-	-
Alternating isometric extensor strength	1	15	-	-
Construct validity				
Isokinetic concentric slow-speed extensor strength	26	1277	Inconsistency (one)	Moderate
Isokinetic concentric high-speed extensor strength	9	375	Inconsistency (one)	Moderate
Isokinetic concentric slow-speed flexor strength	12	502	Inconsistency (one)	Moderate
Isokinetic concentric high-speed flexor strength	8	349	Inconsistency (one)	Moderate
Isokinetic eccentric slow-speed extensor strength	1	44	Imprecision (two)	Low
Isokinetic eccentric high-speed extensor strength	1	44	Imprecision (two)	Low
Isokinetic eccentric slow-speed flexor strength	2	116	-	High
Isokinetic eccentric high-speed flexor strength	1	44	Imprecision (two)	Low
Isometric extensor strength	7	319	Inconsistency (one)	Moderate
Isometric flexor strength	3	182	Inconsistency (one)	Moderate
Isometric extensor strength (HHD)	1	194	-	High
Isometric flexor strength, prone (HHD)	1	194	-	High
Isotonic extensor strength (leg press)	1	26	Imprecision (two)	Low
Criterion validity				
Isokinetic concentric high-speed extensor strength	1	26	Imprecision (two)	Low
Isometric extensor strength (HHD)	2	130	-	High
Isometric extensor strength, prone (HHD)	1	60	Imprecision (one)	Moderate
Isotonic extensor strength (leg extension)	1	106	-	High
Isotonic extensor strength (leg press)	1	26	Imprecision (two)	Low
Isotonic flexor strength, prone (leg curl)	1	106	-	High

(HHD) handheld dynamometry; (slow-speed) 60 to 120 degrees/second; (high-speed) 180 to 300 degrees/second

Unless otherwise stated, strength tests were performed using computerised dynamometry

Four factors (risk of bias, inconsistency, imprecision, and indirectness) were evaluated for grading quality of evidence: starting point at high quality; downgraded for risk of bias by one level if there is one study of adequate quality available, two levels if there is one study of doubtful quality available; downgraded for inconsistency by one level if serious; downgraded for imprecision by one level if total sample size = 50-100, two levels if total sample size <50

Appendix 11. Summary of Findings

Strength tests (variable)	Instrument	Summary or pooled result	Overall rating	Quality of evidence
Reliability				
<i>Intra-rater</i>				
Isokinetic concentric 60°/s extensor strength (LSI, PT)	Com. dyn.	ICC: 0.95; n: 25	Sufficient	Very low
Isokinetic concentric 180°/s extensor strength (PT)	Com. dyn.	ICC: 0.99; n: 15	Sufficient	Very low
Isokinetic concentric 60°/s flexor strength (PT)	Com. dyn.	ICC: 0.99; n: 15	Sufficient	Very low
Isokinetic concentric 180°/s flexor strength (PT)	Com. dyn.	ICC: 0.99; n: 15	Sufficient	Very low
Isometric extensor strength (PT/BW, LSI)	Com. dyn.	ICC: 0.91-98; n: 130	Sufficient	Moderate
Isometric extensor strength prone (LSI)	Com. dyn.	ICC: 0.90; n: 60	Sufficient	Very low
Alternating isometric extensor strength (LSI)	Com. dyn.	ICC: 0.95; n: 60	Sufficient	Very low
Alternating isometric flexor strength (LSI)	Com. dyn.	ICC: 0.89; n: 60	Sufficient	Very low
<i>Inter-rater</i>				
Isometric extensor strength (LSI)	Com. dyn.	ICC: 0.60; n: 60	Insufficient	Very low
Isometric extensor prone strength (LSI)	Com. dyn.	ICC: 0.43; n: 60	Insufficient	Very low
Measurement error				
Isokinetic concentric 60°/s extensor strength (PT, LSI)	Com. dyn.	SEM: 3.8; CV 8.3%; n: 25	Indeterminate	-
Isokinetic concentric 180°/s extensor strength (PT)	Com. dyn.	CV: 2.9%; n: 15	Indeterminate	-
Isokinetic concentric 60°/s flexor strength (PT)	Com. dyn.	CV: 3.4%; n: 15	Indeterminate	-
Isokinetic concentric 180°/s flexor strength (PT)	Com. dyn.	CV: 3.3%; n: 15	Indeterminate	-
Isometric extensor strength (PT/BW)	Com. dyn.	SEM: 0.6%; SDC 95%: 1.7%; LOA: -18.7,17.9; n: 70	Indeterminate	-
Alternating isometric extensor strength (PT)	Com. dyn.	CV: 9.2%; n: 60	Indeterminate	-
Alternating isometric extensor strength (PT)	Com. dyn.	CV: 10.3%; n: 60	Indeterminate	-
Construct validity				
Isokinetic concentric slow-speed extensor strength	Com. dyn.	3 of 5 hypotheses confirmed	Sufficient	Moderate
Isokinetic concentric high-speed extensor strength	Com. dyn.	2 of 2 hypotheses confirmed	Sufficient	Moderate
Isokinetic concentric slow-speed flexor strength	Com. dyn.	1 of 4 hypotheses confirmed	Insufficient	Moderate
Isokinetic concentric high-speed flexor strength	Com. dyn.	2 of 2 hypotheses confirmed	Sufficient	Moderate
Isokinetic eccentric slow-speed extensor strength	Com. dyn.	1 of 1 hypotheses confirmed	Sufficient	Low
Isokinetic eccentric high-speed extensor strength	Com. dyn.	1 of 1 hypotheses confirmed	Sufficient	Low
Isokinetic eccentric slow-speed flexor strength	Com. dyn.	2 of 2 hypotheses confirmed	Sufficient	High
Isokinetic eccentric high-speed flexor strength	Com. dyn.	1 of 1 hypotheses confirmed	Sufficient	Low
Isometric extensor strength	Com. dyn.	2 of 2 hypotheses confirmed	Sufficient	Moderate
Isometric flexor strength	Com. dyn.	0 of 1 hypotheses confirmed	Insufficient	Moderate
Isometric extensor strength	HHD	0 of 1 hypotheses confirmed	Insufficient	High
Isometric flexor strength, prone	HHD	0 of 1 hypotheses confirmed	Insufficient	High
Isotonic extensor strength	Leg press	0 of 1 hypotheses confirmed	Insufficient	Low
Criterion validity				
Isokinetic concentric high-speed extensor strength	Com. dyn.	2 of 2 hypotheses confirmed	Sufficient	Low
Isometric extensor strength	HHD	0 of 1 hypotheses confirmed	Insufficient	High
Isometric extensor strength, prone	HHD	0 of 2 hypotheses confirmed	Insufficient	Moderate
Isotonic extensor strength	Leg extension	1 of 1 hypotheses confirmed	Sufficient	High
Isotonic extensor strength	Leg press	0 of 1 hypotheses confirmed	Insufficient	Low
Isotonic flexor strength, prone	Leg curl	1 of 1 hypotheses confirmed	Sufficient	High

(BW) body weight; (com. dyn.) computerised dynamometry; (CV) coefficient of variation; (HHD) handheld dynamometry; (ICC) intraclass correlation coefficient; (LOA) limits of agreement; (LSI) limb symmetry index; (n) sample size; (PT) peak torque; (SDC) smallest detectable change; (SEM) standard error of measurement; (°/s) degrees/second; (slow-speed) 60 to 120 degrees/second; (high-speed) 180 to 300 degrees/second

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