

Appendix III. Tables with references

Time as a return to sport criterion

	Studies Reporting (%)
Time used as a RTS criterion	178 (85% of 209)
<6 months from ACLR	43 (24% of 178)
≥6 months to <9 months	129 (72%)
≥9 months to <12 months	18 (10%)
≥12 months	6 (3%)
<i>Time as a single criterion</i>	<i>88 (49% of 178)</i>
<i>Time as part of a RTS test battery</i>	<i>90 (51% of 178)</i>
<i>Studies not using time in RTS test battery</i>	<i>31 (15% of 209)</i>

Note. ACLR, anterior cruciate ligament reconstruction RTS, return to sport.

Strength as a return to sport criterion

	Studies Reporting n (%)
STRENGTH TESTING MODE USED FOR RTS CRITERIA	86 (41% of 209)
Isokinetic testing	50 (58% of 86)
LSI ≥ 90%	11 (22% of 50)
Quadriceps and hamstring strength at 60°/s	1 (2% of 50) ¹
Quadriceps and hamstring strength at 180°/s	1 (2%) ²
Quadriceps and hamstring strength at 60°/s and 180°/s	2 (4%) ^{3 4}
Quadriceps and hamstring strength at 90°/s and 180°/s	1 (2%) ⁵
Quadriceps and hamstring strength at 180°/s and 300°/s	1 (2%) ⁶
Quadriceps and hamstring strength at 60°/s, 180°/s and 240°/s	1 (2%) ⁷
Quadriceps and hamstring strength at 60°/s, 180°/s and 300°/s	2 (4%) ^{8 9}
Strength (parameters not stated)	2 (4%) ^{10 11}
LSI ≥ 85%	9 (18% of 50)
Quadriceps and hamstring strength at 60°/s	1 (2% of 50) ¹²
Quadriceps and hamstring strength at 120°/s	1 (2%) ¹³
Quadriceps and hamstring strength at 60°/s and 180°/s	2 (4%) ^{14 15}
Quadriceps and hamstring strength at 90°/s and 240°/s	1 (2%) ¹⁶
Quadriceps and hamstring strength (parameters not stated)	4 (8%) ¹⁷⁻²⁰
LSI ≥ 80%	11 (22% of 50)
Quadriceps and hamstring strength at 60°/s	3 (6% of 50) ²¹⁻²³
Quadriceps and hamstring strength at 90°/s	2 (4%) ^{24 25}
Quadriceps and hamstring strength at 60°/s and 180°/s	1 (2%) ²⁶
Quadriceps and hamstring strength at 80°/s and 160°/s	1 (2%) ²⁷
Quadriceps strength at 60°/s, 180°/s and 240°/s	2 (4%) ^{28 29}
Quadriceps and hamstring strength (parameters not stated)	2 (4%) ^{30 31}
LSI ≥ 65%	1 (2% of 50)
Quadriceps strength	1 (2% of 50) ³²
Multiple LSI criteria	6 (12% of 50)
Quadriceps LSI ≥85%; hamstring LSI ≥90%; H/Q ratio ≥70% at 60°/s, 180°/s, and 300°/s	1 (2% of 50) ³³
Quadriceps and hamstring LSI ≥90% at 60°/s, 180°/s, and 300°/s; normalized isokinetic	1 (2%) ³⁴

quadriceps strength ≥ 3 Nm/kg at 60°/s; H/Q ratio $\geq 55\%$ for females and $\geq 62.5\%$ for males at 300°/s	
Quadriceps and hamstring LSI $\geq 90\%$ at 60°/s, 180°/s, and 300°/s; H/Q ratio $\geq 55\%$ for females and $\geq 62.5\%$ for males at 300°/s	1 (2%) ³⁵
Quadriceps strength of LSI $\geq 90\%$ and hamstring strength of LSI =100% at 60°/s and 300°/s	1 (2%) ³⁶
“good muscular...recovery” of quadriceps and hamstring strength; H/Q ratio between 40-80% (parameters not stated)	1 (2%) ³⁷
Eccentric or concentric hamstring strength LSI $\geq 80\%$ and quadriceps strength of LSI =100%	1 (2%) ³⁸
Criteria not clearly stated	12 (24% of 50)
Quadriceps and hamstring strength at 60°/s	3 (2% of 50) ³⁹⁻⁴¹
Quadriceps and hamstring strength at 180°/s	1 (2%) ⁴²
Quadriceps and hamstring strength at 60°/s and 180°/s	1 (2%) ⁴³
Quadriceps and hamstring strength at 60°/s and 240°/s	2 (4%) ^{44 45}
Quadriceps and hamstring strength at 90°/s and 230°/s	2 (4%) ^{46 47}
Quadriceps and hamstring strength at 180°/s and 230°/s	1 (2%) ⁴⁸
Quadriceps and hamstring strength at 60°/s, 120°/s and 180°/s	1 (2%) ⁴⁹
Quadriceps and hamstring strength at 60°/s, 180°/s, 300°/s; internal rotation and external rotation strength at 60°/s, 120°/s and 180°/s	1 (2%) ⁵⁰
Isometric testing	8 (9% of 86)
LSI $\geq 90\%$	5 (63% of 8)
Quadriceps strength at 60° of knee flexion	1 (13% of 8) ⁵¹
Quadriceps strength at 90° of knee flexion	1 (13%) ⁵²
Quadriceps burst superimposition strength	2 (25%) ^{53 54}
Isometric leg press testing	1 (13%) ⁵⁵
LSI $\geq 85\%$	1 (13% of 8)
Quadriceps and hamstring strength at 30° of knee flexion	1 (13% of 8) ¹³
LSI $\geq 80\%$	2 (25% of 8)
Quadriceps strength at 90° of knee flexion	1 (13% of 8) ⁵⁶
Hamstring strength at 70° and 90° of knee flexion in both prone and supine positions	1 (13%) ²⁶
Method of testing not clearly stated	25 (29% of 86)
Full strength	1 (1% of 86) ⁵⁷
Close to full strength	2 (2%) ^{58 59}
Quadriceps strength of LSI $\geq 90\%$	2 (2%) ^{60 61}
Muscle strength of LSI $\geq 90\%$	2 (2%) ^{62 63}
Quadriceps and hamstring strength of LSI $\geq 90\%$	2 (2%) ^{64 65}
Quadriceps and hamstring strength of LSI $\geq 85\%$	1 (1%) ⁶⁶
Quadriceps strength of LSI $\geq 85\%$	2 (2%) ^{67 68}
Thigh strength of LSI $\geq 85\%$	1 (1%) ⁶⁹
Quadriceps strength of LSI $\geq 80\%$	1 (1%) ⁷⁰
Quadriceps strength of LSI $\geq 80\%$ and normal hamstring strength	1 (1%) ⁷¹
Adequate quadriceps and hamstring strength	1 (1%) ⁷²
Good quadriceps function	1 (1%) ⁷³
Adequate strength	2 (2%) ^{74 75}
Functional strength	1 (1%) ⁷⁶
Proper muscular conditioning	1 (1%) ⁷⁷
Complete muscular recovery	1 (1%) ⁷⁸
Full functional stability in terms of strength	1 (1%) ⁷⁹
Regained strength	1 (1%) ⁸⁰

Leg press test demonstrating comparable strength to uninvolved lower extremity

1 (1%)⁸¹

Criteria to Pre-Set Standard	5 (6% of 86)
Leg Press for >15 reps at 100% BW of affected limb	5 (6% of 86) ⁸²⁻⁸⁶

Note. LSI, limb symmetry index; BW, body weight; H/Q ratio, hamstring/quadriceps ratio; RTS, return to sport; %, percent, °/s, degrees per second

Hop performance as a return to sport criterion

		Studies reporting n (%)
HOP TESTS USED AS CRITERIA FOR CLEARANCE TO RTS [n (%)]		30 (14% of 209)
Single leg hop		28 (93% of 30)
LSI ≥ 90%		17 (60% of 28) ¹ 2 6 9 11 15 34 35 51-53 60 61 64 67 87 88
LSI ≥ 85%		5 (18%) ^{12 16 54 66} 89
LSI ≥ 80%		2 (7%) ^{31 56}
LSI not stated		4 (14%) ^{42 75 90 91}
Triple hop		18 (60% of 30)
LSI ≥ 90%		14 (78% of 18) ¹ 2 6 9 15 34 35 51-53 60 61 64 67
LSI ≥ 85%		2 (11%) ^{54 66}
LSI not stated		2 (11%) ^{75 90}
Crossover hop		11 (37% of 30)
LSI ≥ 90%		9 (82% of 11) ^{1 2 9} 51 53 60 61 64 67
LSI ≥ 85%		2 (18%) ^{54 66}
Timed 6-meter hop		11 (37% of 30)
LSI ≥ 90%		8 (72% of 11) 1 2 51 53 60 61 64 67
LSI ≥ 85%		2 (18%) ^{54 66}
LSI ≥ 80%		1 (9%) ³¹
Other hop testing		11 (37% of 30)
Side hop test		2 (18% of 11) ^{34 35}
Single leg vertical jump		4 (36%) ^{6 15 31 90}
Timed lateral hop		1 (9%) ⁶
Single leg 10m speed jump test		1 (9%) ¹⁶
Square hop		1 (9%) ⁷⁵
Side hop from 30 cm box		1 (9%) ⁸⁷
Forward hop from 30 cm box		1 (9%) ⁸⁷
Two- and one-legged stability tests, two- and one-legged countermovement jump, speedy jumps, plyometric jumps, quick feet test		2 (18%) ^{92 93}

Note. LSI, limb symmetry index; RTS, return to sport; cm, centimeter; m, meter. Two studies^{92 93} used seven different tests, eleven studies^{1 2 6 51 53 54 60 64 66 67 94} used four hop

tests, seven studies^{9 15 31 34 35 87 90} used three tests, three studies^{16 52 75} used two hop tests, and seven studies^{11 12 42 56 88 89 91} used one hop test.

Additional measures used as criteria for clearance to return to sport

	Studies Reporting n (%)
Patient report	26 (12% of 209)
Patient Reported Outcome Measures	8 (31% of 26)
IKDC	5 (63% of 8)
Within 15% of gender aged matched controls	3 (38%) ^{34 35 95}
Composite score of 90%	1 (13%) ²
Question #10: ≥ 9 points	1 (13%) ⁵¹
KOS-ADL: score ≥ 90%	3 (38%) ^{53 68 94}
ACL-RSI: score ≥ 56%	1 (13%) ⁹⁵
Global rating of knee function: score ≥ 90%	1 (13%) ⁵³
Subjective statements	9 (35% of 26)
“Full subjective functional stability”	4 (44% of 9) ⁹⁶⁻⁹⁹
When athlete felt comfortable	2 (22%) ^{68 100}
Full subjective confidence in knee	2 (22%) ^{43 101}
“Desire to return to previous activity”	1 (11%) ¹⁰²
Pain	11 (42% of 26)
“No pain”	7 (64% of 11) ^{18 29} 33 48 66 101 103
“No problematic symptoms”	3 (27%) ²¹⁻²³
“<3/10 pain”	1 (9%) ²⁵
Clinical examination	54 (26% of 209)
Ligamentous stability	35 (65% of 54)
KT-1000	8 (23% of 35) ^{18 31} 33 42 45 49 104 105
Lachman test	6 (17%) ^{11 25 49 102} 103 105
Pivot shift	3 (9%) ^{49 103 106}
Anterior drawer	1 (3%) ²⁵
Stability testing method not stated	22 (63%) ^{27-29 44 71-} 73 76 79 101 107-118
Range of motion	30 (56% of 54)
Full/complete ROM	25 (83% of 30) ^{6 7} 13 25 28 29 33 44 45 48 57 62 67 71 73 78 81 86 103 107-109 114 115 119
Less than full ROM	2 (7%) ^{58 59}
ROM equal to contralateral leg	2 (7%) ^{16 53}
Adequate ROM	1 (3%) ¹¹⁴
Effusion	20 (37% of 54)
No effusion	18 (90% of 20) ⁷ 12 28 29 33 44 45 66 71 73 81 101 102 107-109

Minimal effusion	2 (10%) ^{25 53}
Thigh circumference	3 (6% of 54)
Atrophy ≤ 1 cm	2 (67% of 3) ^{11 88}
≥ 2 cm difference in thigh circumference	1 (33%) ³³
“Satisfactory clinical exam”	2 (4% of 54)^{31 91}
Performance-based criteria	41 (20% of 209)
General agility	4 (10% of 41)
T-test	2 (50% of 4) ^{9 87}
“Good agility”	2 (50%) ^{8 66}
Proprioception	6 (15% of 41)
Equal to contralateral	2 (33% of 6) ^{8 33}
Y-balance test within 80% uninjured	1 (17%) ⁵⁶
Star excursion balance test symmetry	1 (17%) ⁸⁷
Demonstrated balance/coordination	1 (17%) ⁴⁶
Prek Kinesthetic Action Training System 100%	1 (17%) ³¹
Aerobic endurance	2 (5% of 41)
Lactate aerobic-anaerobic threshold test	1 (50% of 2) ³⁰
Treadmill run for 10 minutes at 8 km/hr	1 (50%) ²⁵
Quality of motion	3 (7% of 41)
Landing error scoring system < 5	2 (67% of 3) ^{35 95}
Limb alignment control following fatiguing task: single-leg land (QASLS score 0-1)	1 (33%) ⁸⁷
Reported completion of a specific program	27 (66% of 41)
Running program	6 (22% of 27) ^{19 20} 28 29 114 115
On-field/sport-specific/functional program	9 (33%) ^{9 13 18 25 41 72} 119-121
Rehabilitation program	7 (26%) ^{48 107-109 122-124}
Agility program	4 (15%) ^{81 82 84 86}
Proprioceptive program	1 (4%) ⁸¹
Non-specific performance-based criteria	6 (15% of 41)
Rehabilitation goals met	2 (33% of 6) ^{125 126}
Regained agility, strength, coordination	1 (17%) ⁸⁰
Full functional stability in terms of strength, coordination, balance	1 (17%) ⁷⁹
Able to perform sport-related movements safely per physical therapist and surgeon	1 (17%) ¹²⁷
No functional complaints, confidence when running cutting, jumping at full speed	1 (17%) ⁵¹

Note. IKDC, International Knee Documentation Committee; KOS-ADL, Knee Outcome Survey-Activities of Daily Living; ACL-RSI, Anterior Cruciate Ligament-Return to Sport After Injury; ROM, range of motion; km/h, kilometers per hour; cm, centimeter; %, percent; QASLS, single-leg loading qualitative assessment tool;

ICF global categories and subcategories

Studies Reporting (%)	
Impairments	104 (50% of 209)
Strength	86 (83% of 104)
Range of motion	30 (29%)
Effusion	20 (19%)
Ligament stability	35 (34%)
Proprioception	6 (6%)
Quality of motion	3 (3%)
Thigh circumference	3 (3%)
Satisfactory clinical exam	2 (2%)
Activities	55 (26% of 209)
Hop testing	30 (55% of 55)
Agility	4 (7%)
Aerobic endurance	2 (4%)
Running/rehab/agility program completion	17 (31%)
Non-specific performance-based criteria	6 (11%)
Participation	9 (4% of 209)
Completion of specific on-field program	9
Contextual factors	26 (12% of 209)
Patient-reported outcome measures	8 (31% of 26)
Subjective reports	9 (35%)
Pain	11 (43%)
Time	178 (85% of 209)

ICF criteria in combination

Studies Reporting (%)	
Impairments Only	4 (2% of 209)
Activities Only	2 (1%)
Contextual Factors Only	1 (1%)
Participation Only	0 (0%)
Time Only	88 (42%)
Impairments + Activities	12 (6%)
Impairments + Contextual Factors	4 (2%)
Impairments + Activities + Contextual Factors	7 (3%)
Impairments + Activities + Participation	1 (1%)
Time + Impairments	40 (19%)
Time + Activities	6 (3%)
Time + Participation	1 (1%)
Time + Contextual Factors	5 (2%)
Time + Impairments + Activities	24 (12%)

Time + Impairments + Contextual Factors	5 (2%)
Time + Impairments + Participation	4 (2%)
Time + Impairments + Activities + Contextual Factors	4 (2%)
Time + Impairments + Contextual Factors + Participation	1 (1%)

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