

Table 1. Risk of bias assessment and GRADE of clinical tests for diagnosing hamstring injuries.

Diagnosis Hamstring injuries				QUADAS 2 Items*											GRADE (outcome level)								
Index test	Reference standard	Study	Likelihood ratio	1	2	3	4	5	6	7	8	9	10	11	Study design	Risk of bias	Indirectness	Inconsistency	Imprecise evidence	Publication bias	Downgrade**		
Aktiv slump	MRI	Wangenstein et al. (1)	LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	?	✓	?	↓	
			LR-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	↓
Pain during SLR	MRI		LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	?	✓	?	↓	
			LR-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	↓
Pai during 90deg R KF	MRI		LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	?	✓	?	↓
			LR-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	↓
Pai during 30deg R KF	MRI		LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	?	✓	?	↓
			LR-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	↓
Pain during active KF	MRI		LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	?	↔
			LR-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	↔
Pain during active KE	MRI		LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	?	✓	?	↓
			LR-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	↓
Pain during trunk F	MRI	LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	?	✓	?	↓	
		LR-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	↓	
Taking off shoe	US	Zeren et al. (2)	LR+: N/A	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	N/A	?	N/A	
			LR-	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	?	?	?	↓↓↓
Resisted range of motion test	US		LR+: N/A	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	N/A	?	N/A	
			LR-	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	✓	?	?	↓↓↓
Passive range of motion test	US		LR+: N/A	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	N/A	?	N/A	
			LR-	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	✓	?	?	↓↓↓
Active range of motion test	US		LR+: N/A	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	N/A	?	N/A	
			LR-	×	✓	?	×	✓	✓	×	×	✓	?	?	✓	×	×	×	?	✓	?	?	↓↓↓
Composit	MRI		Schneider-Kolsky et al. (3)	LR+	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	✓	?	?	↓
				LR-: N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	N/A	?	?

Abbreviations: MRI (magnetic resonance imaging); US (ultrasound); LR+ (Positive likelihood ratio); LR- (negative likelihood ratio); N/A (not applicable)

\*Item 1: Was a consecutive or random sample of patients enrolled? Item 2: Was a case-control design avoided? Item 3: Did the study avoid inappropriate exclusions? Item 4: Were the index test results interpreted without knowledge of the results of the reference standard? Item 5: If a threshold was used, was it pre-specified? Item 6: Is the reference standard likely to correctly classify the target condition? Item 7: Were the reference standard results interpreted without knowledge of the results of the index test? Item 8: Was there an appropriate interval between index test(s) and reference standard? Item 9: Did all patients receive a reference standard? Item 10: Did patients receive the same reference standard? Item 11: Were all patients included in the analysis?

Quadas 2 risk of bias assessment: ✗ item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled

GRADE assessments: ✗ = item cause for possible downgrade once; ✗✗ = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

\*\* ↓ = downgrade quality by one level; ↓↓ = downgrade quality by two levels; ↓↓↓ = downgrade quality by three levels; ↔ = no downgrade

Table 2. Risk of bias assessment and GRADE of clinical tests for diagnosing adductor injuries.

Diagnosis				QUADAS Items											GRADE (outcome level)							
Adductor injuries																						
Index test	Reference standard	Study	Likelihood ratio	1	2	3	4	5	6	7	8	9	10	11	Study design	Risk of bias	Indirectness	Inconsistency	Imprecise evidence	Publication bias	Downgrade**	
Palpation	MRI	Serner et al. (4)	LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓	
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✗	?	↓↓
Squeeze 0°	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✗	?	↓↓	
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓
Squeeze 45°	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓
Isometric adduction (outer range)	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✗	?	↓↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓
Adductor stretching	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✗	?	↓↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓
Flexion Abduction External Rotation (FABER)	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✗	?	✓	?	↓

Abbreviations: MRI (magnetic resonance imaging); LR+ (Positive likelihood ratio); LR- (negative likelihood ratio).

\*Item 1: Was a consecutive or random sample of patients enrolled? Item 2: Was a case-control design avoided? Item 3: Did the study avoid inappropriate exclusions? Item 4: Were the index test results interpreted without knowledge of the results of the reference standard? Item 5: If a threshold was used, was it pre-specified? Item 6: Is the reference standard likely to correctly classify the target condition? Item 7: Were the reference standard results interpreted without knowledge of the results of the index test? Item 8: Was there an appropriate interval between index test(s) and reference standard? Item 9: Did all patients receive a reference standard? Item 10: Did patients receive the same reference standard? Item 11: Were all patients included in the analysis?

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GRADE assessments: ✗ = item cause for possible downgrade once; ✗✗ = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

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Table 3. Risk of bias assessment and GRADE of clinical tests for diagnosing rectus femoris injuries.																						
Diagnosis				QUADAS Items											GRADE (outcome level)							
Rectus femoris injuries																						
Index test	Reference standard	Study	Likelihood ratio	1	2	3	4	5	6	7	8	9	10	11	Study design	Risk of bias	Indirectness	Inconsistency	Imprecise evidence	Publication bias	Downgrade **	
Palpation	MRI	Serner et al. (4)	LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	×	?	↓↓	
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	?	?	↓
Isometric hip flexion 0°	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	✓	?	↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	×	?	↓↓
Isometric hip flexion 90°	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	✓	?	↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	×	?	↓↓
Isometric hip flexion (modified Thomas Test)	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	✓	?	↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	×	?	↓↓
Isometric knee extension (modified Thomas Test)	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	✓	?	↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	?	?	↓
Hip extension (stretching; modified Thomas Test)	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	✓	?	↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	×	?	↓↓
Knee flexion (stretching; modified Thomas Test)	MRI		LR +	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	×	?	↓↓
			LR -	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	×	?	×	?	↓↓

Abbreviations: MRI (magnetic resonance imaging); LR+ (Positive likelihood ratio); LR- (negative likelihood ratio).

\*Item 1: Was a consecutive or random sample of patients enrolled? Item 2: Was a case-control design avoided? Item 3: Did the study avoid inappropriate exclusions? Item 4: Were the index test results interpreted without knowledge of the results of the reference standard? Item 5: If a threshold was used, was it pre-specified? Item 6: Is the reference standard likely to correctly classify the target condition? Item 7: Were the reference standard results interpreted without knowledge of the results of the index test? Item 8: Was there an appropriate interval between index test(s) and reference standard? Item 9: Did all patients receive a reference standard? Item 10: Did patients receive the same reference standard? Item 11: Were all patients included in the analysis?

Quadas 2 risk of bias assessment: × item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled

GRADE assessments: × = item cause for possible downgrade once; ×× = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

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Table 4. Risk of bias assessment and GRADE for treatment of hamstring injuries.

Treatment Hamstring		Risk of Bias assessment Item*							Outcome	GRADE (outcome level)						
Interventions	Study	1	2	3	4	5	6	7		Study design	Risk of bias	Inconsistency	Indirectness	Imprecise evidence	Publication bias	Downgrade**
Multifactorial criteria-based algorithm vs. lengthening hamstring exercises	Mendiguchia et al. (5)	?	x	x	?	✓	?	✓	Return to play	RCT ✓	?	?	✓	xx	?	↓↓
									Reinjuries	RCT ✓	?	?	✓	xx	?	↓↓
Lengthening hamstring exercises versus to conventional hamstring exercises (6)	Askling et al. (7,8)	x	x	x	x	✓	?	?	Return to play	RCT ✓	xx	✓	✓	✓	?	↓↓
		x	x	x	x	✓	?	?	Reinjuries		xx	✓	✓	xx	?	↓↓↓
Running and eccentric hamstring strengthening versus agility and trunk stabilization	Silder et al. (9)	?	?	x	?	✓	?	?	Return to play	RCT ✓	x	?	x	xx	?	↓↓↓
Agility and trunk stabilization vs. hamstring stretching and strengthening	Sherry et al. (10)	?	?	x	x	?	?	x	Return to play	RCT ✓	xx	?	x	x	?	↓↓↓
									Reinjuries	RCT ✓	xx	?	x	x	?	↓↓↓
Hamstring stretching four times/day versus hamstring stretching once daily	Malliaropoulos et al. (11)	?	?	x	?	?	?	x	Return to play	RCT ✓	xx	?	x	✓	?	↓↓↓
Platelet-rich plasma versus placebo or rehabilitation (6)	Reurink et al. (12)	✓	✓	✓	✓	✓	?	✓	Return to play	RCT ✓	✓	x	✓	✓	?	↓
	Hamilton et al. (13)	?	?	✓	✓	✓	x	✓								
	Hamid et al. (14)	✓	✓	x	✓	✓	x	✓	Reinjuries	RCT ✓	✓	✓	✓	x	?	↓
Pain-threshold (≤4 on the 0-10 NRS) versus Pain-free (0 on the 0-10 NRS) rehabilitation	Hickey et al. (15)	x	✓	✓	✓	?	?	✓	Return to play	RCT ✓	✓	?	x	x	?	↓↓
									Reinjuries		✓	?	✓	xx	?	↓↓

Abbreviations: RCT (randomized controlled trial)

\*Item 1: Random sequence generation; Item 2: Allocation concealment; Item 3: Blinding of participants and personal; Item 4: Blinding of outcome assessor; Item 5: Incomplete outcome data; Item 6: Selective reporting; Item 7: Other sources of bias.

Risk of bias assessment: x = item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled

GRADE assessments: x = item cause for possible downgrade once; xx = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

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Treatment Rectus femoris/quadriceps		SIGN Checklist 3*														Outcome	GRADE (outcome level)						
Interventions	Study	1	2	3	4	5	6	7	8	9	10	11	12	13	14		Study design	Risk of bias	Inconsistency	Indirectness	Imprecise evidence	Publication bias	Downgrade**
A two-phase criteria-based intervention	Cross et al. (16)	✓	N/A	✗	N/A	?	N/A	✗	✗	✗	?	✗	N/A	?	✗	Return to play	Cohort ✗✗	✗	?	✗	✗	?	↓↓↓
																Reinjuries	Cohort ✗✗	✗	?	✓	✓	?	↓↓↓

Abbreviations: N/A (not applicable).

\*Item 1: The study addresses an appropriate and clearly focused question?; Item 2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation?; Item 3: The study indicates how many of the people asked to take part did so, in each of the groups being studied?; Item 4: The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis?; Item 5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed?; Item 6: Comparison is made between full participants and those lost to follow up, by exposure status?; Item 7: The outcomes are clearly defined?; Item 8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable?; Item 9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome?; Item 10: The method of assessment of exposure is reliable?; Item 11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable?; Item 12: Exposure level or prognostic factor is assessed more than once?; Item 13: The main potential confounders are identified and taken into account in the design and analysis?; Item 14: Have confidence intervals been provided?

Risk of bias assessment: ✗ = item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled

GRADE assessments: ✗ = item cause for possible downgrade once; ✗✗ = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

\*\*↓↓↓=downgrade quality by three levels

Table 6. Risk of bias assessment and GRADE for treatment of calf injuries.																							
Treatment Calf		SIGN Checklist 3 and 4*														Outcome	GRADE (outcome level)						
Interventions	Study	1	2	3	4	5	6	7	8	9	10	11	12	13	14		Study design	Risk of bias	Inconsistency	Indirectness	Imprecise evidence	Publication bias	Downgrade***
Multimodal treatment program	Millar (17)	✗	N/A	✗	N/A	?	?	?	✗	N/A	?	N/A	✗	✗	✗	Return to play	Cohort ✗✗	✗✗	?	✓	?	?	↓↓↓
																Reinjuries	Cohort ✗✗	✗✗	?	✓	?	?	↓↓↓
Multimodal treatment program	Pedret et al. (18)	✓	N/A	✗	N/A	✓	N/A	✗	✗	?	?	✗	?	?	✗	Reinjuries	Cohort ✗✗	✗	?	✓	?	?	↓↓↓
Platelet-rich plasma**	Borrione et al. (19)	✗	✓	✓	?	✓	✓	✓	✗	?	✗	✗	-	-	-	Return to play	Case-control ✗✗	✗✗	?	✓	✓	?	↓↓↓

Abbreviations: N/A (not applicable).

\*SIGN 3: Item 1: The study addresses an appropriate and clearly focused question?; Item 2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation?; Item 3: The study indicates how many of the people asked to take part did so, in each of the groups being studied?; Item 4: The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis?; Item 5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed?; Item 6: Comparison is made between full participants and those lost to follow up, by exposure status?; Item 7: The outcomes are clearly defined?; Item 8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable?; Item 9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome?; Item 10: The method of assessment of exposure is reliable?; Item 11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable?; Item 12: Exposure level or prognostic factor is assessed more than once?; Item 13: The main potential confounders are identified and taken into account in the design and analysis?; Item 14: Have confidence intervals been provided?

SIGN 4: Item 1: The study addresses an appropriate and clearly focused question?; Item 2: The cases and controls are taken from comparable populations?; Item 3: The same exclusion criteria are used for both cases and controls?; Item 4: What percentage of each group (cases and controls) participated in the study?; Item 5: Comparison is made between participants and non-participants to establish their similarities or differences?; Item 6: Cases are clearly defined and differentiated from controls?; Item 7: It is clearly established that controls are non-cases?; Item 8: Measures will have been taken to prevent knowledge of primary exposure influencing case ascertainment?; Item 9: Exposure status is measured in a standard, valid and reliable way?; Item 10: The main potential confounders are identified and taken into account in the design and analysis?; Item 11: Confidence intervals are provided.

\*\* Risk of bias using SIGN 4

Risk of bias assessment: ✗ = item not fulfilled; ✓ = item fulfilled; ? = unclear or unknown if item is fulfilled

GRADE assessments: ✗ = item cause for possible downgrade once; ✗✗ = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

\*\*\* ↓↓↓ = downgrade quality by three levels

Table 7. Risk of bias assessment and GRADE for prevention of hamstring injuries.

Prevention Hamstring		Risk of Bias assessment Item*							Outcome	GRADE (outcome level)						
Interventions	Study	1	2	3	4	5	6	7		Study design	Risk of bias	Inconsistency	Indirectness	Imprecise evidence	Publication bias	Downgrade**
Interventions including the Nordic Hamstring exercise (20)	Gabbe et al. (21)	✓	✓	✗	✗	✓	✓	✓	Injuries	RCT ✓	?/✓	✗	✓	✓	✓	↓
	Soligard et al. (22)	?	?	✗	✗	✗	✓	✓								
	Engebretsen et al. (23)	?	?	✗	✗	?	?	✗								
	Petersen et al. (24)	✓	✓	✗	✗	✓	✓	✓								
	Del Ama Espinosa et al. (25)	✓	✓	✗	✗	✓	✓	✓								
	Silvers-Granelli et al. (26)	✓	?	✗	✗	✗	?	✗								
	Van der Horst et al. (27)	✓	✓	✗	✗	✓	✓	✓								
Mixed eccentric hamstring training (28)	Aksling et al. (29)	?	?	✗	?	?	?	✗	Injuries	RCT ✓	✓	✗	✓	✗	?	↓↓
	Gabbe et al. (21)	✓	✓	✗	✗	✓	✓	✓								
	Engebretsen et al. (23)	?	?	✗	✗	?	?	✗								
	Petersen et al. (24)	✓	✓	✗	✗	✓	✓	✓								
FIFA 11+ (30)	Soligard et al. (22)	?	?	✗	✗	✗	✓	✓	Injuries	RCT ✓	✗	✓	✓	✓	?	↓
	Silvers-Granelli et al. (26)	✓	?	✗	✗	✗	?	✗								
Nordic Hamstring Exercise Protocol (meta-analysis performed as part of this statement)	Petersen et al. (24)	✓	✓	✗	✗	✓	✓	✓	Injuries	RCT ✓	✓	✓	✓	✓	?	↔
	Van der Horst et al. (27)	✓	✓	✗	✗	✓	✓	✓								
Bounding exercise program	Van de Hoef et al. (31)	✓	?	✗	✗	✓	✓	✓	Injuries	RCT ✓	✓	?	✓	✗	?	↓
FIFA 11+ program pre- and post-football	Al Attar et al. (32)	✓	?	✗	✗	✓	✓	✗	Injuries	RCT ✓	✗	?	✓	✗✗	?	↓↓↓
Modified FIFA 11+ with rescheduling of Part 2 versus standard FIFA 11+	Whalan et al. (33)	?	?	✗	✗	✓	?	✓	Injuries	RCT ✓	?	?	✓	✗	?	↓
Balance board training	Soderman et al. (34)	?	?	✗	✗	✓	?	✗	Injuries	RCT ✓	✗	?	✓	✗✗	?	↓↓↓

Abbreviations: RCT (randomized controlled trial)

\*Item 1: Random sequence generation; Item 2: Allocation concealment; Item 3: Blinding of participants and personal; Item 4: Blinding of outcome assessor; Item 5: Incomplete outcome data; Item 6: Selective reporting; Item 7: Other sources of bias.

Risk of bias assessment: ✗ item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled

GRADE assessments: × = item cause for possible downgrade once; ×× = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

\*\* ↓ = downgrade quality by one level; ↓↓ = downgrade quality by two levels; ↓↓↓ = downgrade quality by three levels; ↔ = no downgrade



Table 8. Risk of bias assessment and GRADE for prevention of groin injuries.

Prevention Adductor (Groin)		Risk of Bias assessment Item*							Outcome	GRADE (outcome level)						
Interventions	Study	1	2	3	4	5	6	7		Study design	Risk of bias	Inconsistency	Indirectness	Imprecise evidence	Publication bias	Downgrade **
Mixed groin prevention programs (35)	Arnason et al. (36)	?	?	x	x	?	?	x	Injuries	RCT ✓	x	✓	x	x	?	↓↓
	Beijsterveldt et al. (37)	?	?	x	x	✓	x	?								
	Engebretsen et al. (23)	?	?	x	x	?	?	x								
	Holmich et al. (38)	✓	✓	x	x	✓	?	x								
	Soderman et al. (34)	?	?	x	x	✓	?	x								
	Steffen et al. (39)	?	?	x	x	✓	?	x								
Specific adductor strength training (35)	Holmich et al. (38)	✓	✓	x	x	✓	?	x	Injuries	RCT ✓	x	✓	x	x	?	↓↓
	Engebretsen et al. (23)	?	?	x	x	?	?	x								
FIFA 11 (35)	Steffen et al. (39)	?	?	x	x	✓	?	x	Injuries	RCT ✓	x	x	x	x	?	↓↓↓
	Beijsterveldt et al. (37)	?	?	x	x	✓	x	?								
FIFA 11+ programme in football (30)	Silvers-Graneli et al. (26)	✓	?	x	x	x	?	x	Injuries	RCT ✓	x	✓	x	✓	?	↓↓
	Soligard et al. (22)	?	?	x	x	x	✓	✓								
FIFA 11+ programme in mixed sports	Longo et al. (40)	✓	?	x	x	✓	✓	✓	Injuries	RCT ✓	✓	x	x	xx	?	↓↓↓
	Slauterbeck et al. (41)	✓	?	x	x	✓	?	✓								
Adductor strengthening program	Haroy et al. (42)	✓	?	x	x	✓	✓	✓	Injuries	RCT ✓	✓	?	x	✓	?	↓
FIFA 11+ program pre- and post-football	Al Attar et al. (32)	✓	?	x	x	✓	✓	x	Injuries	RCT ✓	x	?	x	xx	?	↓↓↓
Modified FIFA 11+ with rescheduling of Part 2 versus standard FIFA 11+	Whalan et al. (33)	?	?	x	x	✓	?	✓	Injuries	RCT ✓	?	?	x	✓	?	↓

Abbreviations: RCT (randomized controlled trial)

\*Item 1: Random sequence generation; Item 2: Allocation concealment; Item 3: Blinding of participants and personal; Item 4: Blinding of outcome assessor; Item 5: Incomplete outcome data; Item 6: Selective reporting; Item 7: Other sources of bias.

Risk of bias assessment: x = item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled

GRADE assessments: x = item cause for possible downgrade once; xx = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

\*\*↓ = downgrade quality by one level; ↓↓ = downgrade quality by two levels; ↓↓↓ = downgrade quality by three levels; ↔ = no downgrade

Table 9. Risk of bias assessment and GRADE for prevention of anterior thigh/quadriceps injuries.

Prevention anterior thigh/quadriceps		Risk of Bias assessment Item							Outcome	GRADE (outcome level)						
Interventions	Study	1	2	3	4	5	6	7		Study design	Risk of bias	Inconsistency	Indirectness	Imprecise evidence	Publication bias	Downgrade
FIFA 11+ (meta-analysis performed as part of this statement)	Silvers-Granelli et al. (26)	✓	?	×	×	×	?	×	Injuries	RCT ✓	×	✓	✓	×	?	↓
	Soligard et al. (22)	?	?	×	×	×	✓	✓								
FIFA 11+ program pre- and post-football	Al Attar et al. (32)	✓	?	×	×	✓	✓	×	Injuries	RCT ✓	×	?	✓	×	?	↓↓↓
Modified FIFA 11+ with rescheduling of Part 2 versus standard FIFA 11+	Whalan et al. (33)	?	?	×	×	✓	?	✓	Injuries	RCT ✓	?	?	✓	✓	?	↔
Balance board training	Soderman et al. (34)	?	?	×	×	✓	?	×	Injuries	RCT ✓	×	?	✓	×	?	↓↓↓

Abbreviations: RCT (randomized controlled trial)

\*Item 1: Random sequence generation; Item 2: Allocation concealment; Item 3: Blinding of participants and personal; Item 4: Blinding of outcome assessor; Item 5: Incomplete outcome data; Item 6: Selective reporting; Item 7: Other sources of bias.

Risk of bias assessment: × item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled

GRADE assessments: × = item cause for possible downgrade once; ×× = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.

\*\*↓ = downgrade quality by one level; ↓↓ = downgrade quality by two levels; ↓↓↓ = downgrade quality by three levels; ↔ = no downgrade

Table 10. Risk of bias assessment and GRADE for prevention of calf injuries.																							
Prevention Calf		SIGN Checklist 3*														Outcome	GRADE (outcome level)						
Interventions	Study	1	2	3	4	5	6	7	8	9	10	11	12	13	14		Study design	Risk of bias	Inconsistency	Indirectness	Imprecise evidence	Publication bias	Downgrade**
soccer-specific balance program	Kraemer et al. (43)	✓	N/A	N/A	?	✗	?	✓	✗	✗	✓	✓	?	?	✗	Injuries	Cohort ✗✗	✗	?	✓	?	?	↓↓↓
Abbreviations: N/A (not applicable).																							
*SIGN 3: Item 1: The study addresses an appropriate and clearly focused question?; Item 2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation?; Item 3: The study indicates how many of the people asked to take part did so, in each of the groups being studied?; Item 4: The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis?; Item 5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed?; Item 6: Comparison is made between full participants and those lost to follow up, by exposure status?; Item 7: The outcomes are clearly defined?; Item 8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable?; Item 9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome?; Item 10: The method of assessment of exposure is reliable?; Item 11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable?; Item 12: Exposure level or prognostic factor is assessed more than once?; Item 13: The main potential confounders are identified and taken into account in the design and analysis?; Item 14: Have confidence intervals been provided?																							
Risk of bias assessment: ✗ = item not fulfilled; ✓ = item fulfilled; ? unclear or unknown if item is fulfilled																							
GRADE assessments: ✗ = item cause for possible downgrade once; ✗✗ = item cause for possible downgrade twice; ✓ = item fulfilled, no downgrading; ? = item unclear or not available, no upgrading or downgrading.																							
**↓↓↓=downgrade quality by three levels																							

## ROBIS: Tool to assess risk of bias in systematic reviews

Table 11. Suggested Tabular Presentation for ROBIS Results

Review	Phase 2				Phase 3
	1. STUDY ELIGIBILITY CRITERIA	2. IDENTIFICATION AND SELECTION OF STUDIES	3. DATA COLLECTION AND STUDY APPRAISAL	4. SYNTHESIS AND FINDINGS	RISK OF BIAS IN THE REVIEW
Van Dyk 2019 (20)	😊	😞	😊	?	?
Thorborg 2017 (30)	😊	😊	😊	?	?
Esteve 2015 (35)	?	?	😊	?	?
Goode 2015 (28)	?	😊	?	?	?
Pas 2015 (6)	?	😊	😊	?	?
Rieman 2013 (44)	?	?	😊	?	?

😊 = low risk; 😞 = high risk; ? = unclear risk

## REFERENCES

1. Wangensteen A, Almusa E, Boukarroum S, Farooq A, Hamilton B, Whiteley R, m.fl. MRI does not add value over and above patient history and clinical examination in predicting time to return to sport after acute hamstring injuries: a prospective cohort of 180 male athletes. *Br J Sports Med.* december 2015;49(24):1579–87.
2. Zeren B, Oztekin HH. A new self-diagnostic test for biceps femoris muscle strains. *Clin J Sport Med.* marts 2006;16(2):166–9.
3. Schneider-Kolsky ME, Hoving JL, Warren P, Connell DA. A comparison between clinical assessment and magnetic resonance imaging of acute hamstring injuries. *Am J Sports Med.* juni 2006;34(6):1008–15.
4. Serner A, Weir A, Tol JL, Thorborg K, Roemer F, Guermazi A, m.fl. Can standardised clinical examination of athletes with acute groin injuries predict the presence and location of MRI findings? *Br J Sports Med.* december 2016;50(24):1541–7.
5. Mendiguchia J, Martinez-Ruiz E, Edouard P, Morin JB, Martinez-Martinez F, Idoate F, m.fl. A Multifactorial, Criteria-based Progressive Algorithm for Hamstring Injury Treatment. *Med Sci Sports Exerc.* juli 2017;49(7):1482–92.
6. Pas HI, Reurink G, Tol JL, Weir A, Winters M, Moen MH. Efficacy of rehabilitation (lengthening) exercises, platelet-rich plasma injections, and other conservative interventions in acute hamstring injuries: an updated systematic review and meta-analysis. *Br J Sports Med.* september 2015;49(18):1197–205.
7. Askling C, Tengvar M, Tarassova O, Thorstensson A. Acute hamstring injuries in Swedish elite sprinters and jumpers: a prospective randomised controlled clinical trial comparing two rehabilitation protocols. *Br J Sports Med.* april 2014;48(7):532–9.
8. Askling C, Tengvar M, Thorstensson A. Acute hamstring injuries in Swedish elite football: a prospective randomised controlled clinical trial comparing two rehabilitation protocols. *Br J Sports Med.* oktober 2013;47(15):953–9.
9. Silder A, Sherry MA, Sanfilippo J, Tuite MJ, Hetzel SJ, Heiderscheit BC. Clinical and morphological changes following 2 rehabilitation programs for acute hamstring strain injuries: a randomized clinical trial. *J Orthop Sports Phys Ther.* maj 2013;43(5):284–99.
10. Sherry MA, Best TM. A comparison of 2 rehabilitation programs in the treatment of acute hamstring strains. *J Orthop Sports Phys Ther.* marts 2004;34(3):116–25.
11. Malliaropoulos N, Papalexandris S, Papalada A, Papacostas E. The role of stretching in rehabilitation of hamstring injuries: 80 athletes follow-up. *Med Sci Sports Exerc.* maj 2004;36(5):756–9.
12. Reurink G, Goudswaard GJ, Moen MH, Weir A, Verhaar JAN, Bierma-Zeinstra SMA, m.fl. Platelet-rich plasma injections in acute muscle injury. *N Engl J Med.* 26. juni 2014;370(26):2546–7.
13. Hamilton B, Tol JL, Almusa E, Boukarroum S, Eirale C, Farooq A, m.fl. Platelet-rich plasma does not enhance return to play in hamstring injuries: a randomised controlled trial. *Br J Sports Med.* juli 2015;49(14):943–50.
14. MS AH, Mohamed Ali MR, Yusof A, George J, Lee LP. Platelet-rich plasma injections for the treatment of hamstring injuries: a randomized controlled trial. *Am J Sports Med.* oktober 2014;42(10):2410–8.
15. Hickey JT, Timmins RG, Maniar N, Rio E, Hickey PF, Pitcher CA, m.fl. Pain-Free Versus Pain-Threshold Rehabilitation Following Acute Hamstring Strain Injury: A Randomized Controlled Trial. *J Orthop Sports Phys Ther.* 28. juni 2019;1–35.
16. Cross TM, Gibbs N, Houang MT, Cameron M. Acute quadriceps muscle strains: magnetic resonance imaging features and prognosis. *Am J Sports Med.* april 2004;32(3):710–9.
17. Millar AP. Strains of the posterior calf musculature (“tennis leg”). *Am J Sports Med.* maj 1979;7(3):172–4.
18. Pedret C, Rodas G, Balius R, Capdevila L, Bossy M, Vernooij RWM, m.fl. Return to Play After Soleus Muscle Injuries. *Orthop J Sports Med.* juli 2015;3(7):2325967115595802.
19. Borrione P, Fossati C, Pereira MT, Giannini S, Davico M, Minganti C, m.fl. The use of platelet-rich plasma (PRP) in the treatment of gastrocnemius strains: a retrospective observational study. *Platelets.* september 2018;29(6):596–601.

20. Dyk N van, Behan FP, Whiteley R. Including the Nordic hamstring exercise in injury prevention programmes halves the rate of hamstring injuries: a systematic review and meta-analysis of 8459 athletes. *Br J Sports Med*. 26. februar 2019;bjsports-2018-100045.
21. Gabbe BJ, Branson R, Bennell KL. A pilot randomised controlled trial of eccentric exercise to prevent hamstring injuries in community-level Australian Football. *J Sci Med Sport*. maj 2006;9(1–2):103–9.
22. Soligard T, Myklebust G, Steffen K, Holme I, Silvers H, Bizzini M, m.fl. Comprehensive warm-up programme to prevent injuries in young female footballers: cluster randomised controlled trial. *BMJ*. 10. december 2008;337:a2469.
23. Engebretsen AH, Myklebust G, Holme I, Engebretsen L, Bahr R. Prevention of injuries among male soccer players: a prospective, randomized intervention study targeting players with previous injuries or reduced function. *Am J Sports Med*. juni 2008;36(6):1052–60.
24. Petersen J, Thorborg K, Nielsen MB, Budtz-Jorgensen E, Holmich P. Preventive effect of eccentric training on acute hamstring injuries in men’s soccer: a cluster-randomized controlled trial. *Am J Sports Med*. november 2011;39(11):2296–303.
25. Espinosa G del A, Pöyhönen T, Aramendi JF, Samaniego JC, Knörr JIE, Kyröläinen H. Effects of an eccentric training programme on hamstring strain injuries in women football players. *Biomed Hum Kinet [Internet]*. 25. september 2015 [henvist 2. maj 2019];7(1). Tilgængelig hos: <https://content.sciendo.com/view/journals/bhk/7/1/article-bhk-2015-0019.xml.xml>
26. Silvers-Granelli H, Mandelbaum B, Adeniji O, Insler S, Bizzini M, Pohlig R, m.fl. Efficacy of the FIFA 11+ Injury Prevention Program in the Collegiate Male Soccer Player. *Am J Sports Med*. november 2015;43(11):2628–37.
27. van der Horst N, Smits DW, Petersen J, Goedhart EA, Backx FJ. The preventive effect of the nordic hamstring exercise on hamstring injuries in amateur soccer players: a randomized controlled trial. *Am J Sports Med*. juni 2015;43(6):1316–23.
28. Goode AP, Reiman MP, Harris L, DeLisa L, Kauffman A, Beltramo D, m.fl. Eccentric training for prevention of hamstring injuries may depend on intervention compliance: a systematic review and meta-analysis. *Br J Sports Med*. marts 2015;49(6):349–56.
29. Askling C, Karlsson J, Thorstensson A. Hamstring injury occurrence in elite soccer players after preseason strength training with eccentric overload. *Scand J Med Sci Sports*. august 2003;13(4):244–50.
30. Thorborg K, Krommes KK, Esteve E, Clausen MB, Bartels EM, Rathleff MS. Effect of specific exercise-based football injury prevention programmes on the overall injury rate in football: a systematic review and meta-analysis of the FIFA 11 and 11+ programmes. *Br J Sports Med*. april 2017;51(7):562–71.
31. van de Hoef PA, Brink MS, Huisstede BMA, van Smeden M, de Vries N, Goedhart EA, m.fl. Does a bounding exercise program prevent hamstring injuries in adult male soccer players? - A cluster-RCT. *Scand J Med Sci Sports*. april 2019;29(4):515–23.
32. Al Attar WSA, Soomro N, Pappas E, Sinclair PJ, Sanders RH. Adding a post-training FIFA 11+ exercise program to the pre-training FIFA 11+ injury prevention program reduces injury rates among male amateur soccer players: a cluster-randomised trial. *J Physiother*. oktober 2017;63(4):235–42.
33. Whalan M, Lovell R, Steele JR, Sampson JA. Rescheduling Part 2 of the 11+ reduces injury burden and increases compliance in semi-professional football. *Scand J Med Sci Sports*. 3. august 2019;
34. Soderman K, Werner S, Pietila T, Engstrom B, Alfredson H. Balance board training: prevention of traumatic injuries of the lower extremities in female soccer players? A prospective randomized intervention study. *Knee Surg Sports Traumatol Arthrosc*. 2000;8(6):356–63.
35. Esteve E, Rathleff MS, Bagur-Calafat C, Urrutia G, Thorborg K. Prevention of groin injuries in sports: a systematic review with meta-analysis of randomised controlled trials. *Br J Sports Med*. juni 2015;49(12):785–91.
36. Arnason A, Engebretsen L, Bahr R. No effect of a video-based awareness program on the rate of soccer injuries. *Am J Sports Med*. januar 2005;33(1):77–84.

37. van Beijsterveldt AM, van de Port IG, Krist MR, Schmikli SL, Stubbe JH, Frederiks JE, m.fl. Effectiveness of an injury prevention programme for adult male amateur soccer players: a cluster-randomised controlled trial. *Br J Sports Med*. december 2012;46(16):1114–8.
38. Holmich P, Larsen K, Krogsgaard K, Gluud C. Exercise program for prevention of groin pain in football players: a cluster-randomized trial. *Scand J Med Sci Sports*. december 2010;20(6):814–21.
39. Steffen K, Myklebust G, Olsen OE, Holme I, Bahr R. Preventing injuries in female youth football--a cluster-randomized controlled trial. *Scand J Med Sci Sports*. oktober 2008;18(5):605–14.
40. Longo UG, Loppini M, Berton A, Marinozzi A, Maffulli N, Denaro V. The FIFA 11+ program is effective in preventing injuries in elite male basketball players: a cluster randomized controlled trial. *Am J Sports Med*. maj 2012;40(5):996–1005.
41. Slauterbeck JR, Choquette R, Tourville TW, Krug M, Mandelbaum BR, Vacek P, m.fl. Implementation of the FIFA 11+ Injury Prevention Program by High School Athletic Teams Did Not Reduce Lower Extremity Injuries: A Cluster Randomized Controlled Trial. *Am J Sports Med*. 17. september 2019;0363546519873270.
42. Haroy J, Clarsen B, Wiger EG, Oyen MG, Serner A, Thorborg K, m.fl. The Adductor Strengthening Programme prevents groin problems among male football players: a cluster-randomised controlled trial. *Br J Sports Med [Internet]*. 10. juni 2018; Tilgængelig hos: <https://www.ncbi.nlm.nih.gov/pubmed/29891614>
43. Kraemer R, Knobloch K. A soccer-specific balance training program for hamstring muscle and patellar and achilles tendon injuries: an intervention study in premier league female soccer. *Am J Sports Med*. juli 2009;37(7):1384–93.
44. Reiman MP, Loudon JK, Goode AP. Diagnostic accuracy of clinical tests for assessment of hamstring injury: a systematic review. *J Orthop Sports Phys Ther*. april 2013;43(4):223–31.