Supplementary Material of encyclopedia-3858847

PRISMA Checklist

Figure S1: Completed PRISMA 2020 checklist (adapted from Page et al., 2021 [14]).



PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 4
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 5
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 5
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 5
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 6
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 6
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 6
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 6
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 7
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 7
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 7
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 7
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 7
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 8
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 8
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 8
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 8
Study characteristics	17	Cite each included study and present its characteristics.	Page 9
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 10
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 11
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 11
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Page 12
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Page 12
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 13
	23b	Discuss any limitations of the evidence included in the review.	Page 14
	23c	Discuss any limitations of the review processes used.	Page 14
	23d	Discuss implications of the results for practice, policy, and future research.	Page 15
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Title Page
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	N/A
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Page 16
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 16
Competing interests	26	Declare any competing interests of review authors.	Page 16
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Page 16

PRISMA Flow Diagram

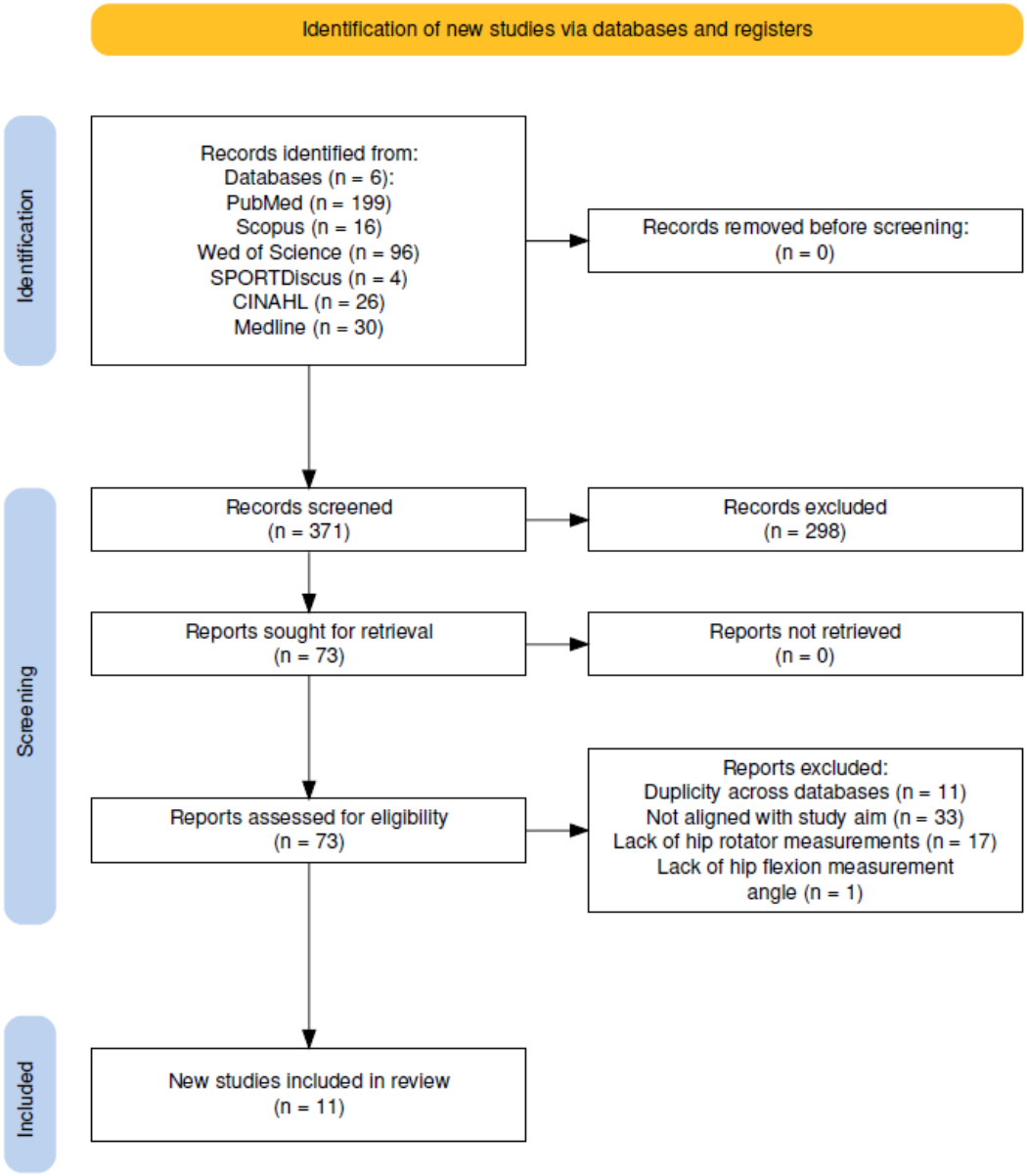


Figure S2. PRISMA flow diagram showing the study selection process (adapted from Haddaway et al., 2022 [17]).

Data conversion equation

To allow comparison between studies using different measurement units, data were converted to common clinical units where possible. When range of motion (ROM) was reported as degrees per kilogram of body weight (degrees/kg), it was converted to absolute degrees by multiplying the value by the average body mass reported in the study (Equation 1). Similarly, in cases where force was reported in newtons (N), the equivalent load in kilograms (kg-force) was estimated by dividing by 9.81 (acceleration due to gravity) (Equation 2). These conversions enabled consistent interpretation of strength and mobility measures across studies and were only performed when sufficient data (e.g., average body weight) were available.

Equation S1: Formula for conversion of degree/kg to degree. Degree (˚), kilogram (kg).

$$degree\ (^{\circ}) = \frac{^{\circ}}{kg}\ x\ (body\ mass\ in\ kg)$$

Equation S2: Formula for conversion of N to Kg.

$$kg - force\ = \frac{force\ (N)}{9.81}$$

PEDro Scale Outcomes for Study Risk of Bias Assessment

Table S1: PEDro scale outcome scores for the 11 articles included in review.

Study	PEDro Score
Manning 2009	6
Nevin 2014	7
Hoglund 2014	8
Ferber 2015	6
López-Valenciano 2017	7
Tak 2017	7
Espí-López 2018	8
Ocarino 2021	7
Siwecka 2022	7
Tanabe 2023	6
Girdwood 2023	7

Factors evaluating reporting bias across studies

Table S2: Tabular representation of factors used to evaluate reporting bias across studies.

Study	Unit of measurement	Hip flexion angle during IR measurement	Hip flexion angle during ER measurement	Stabilization used during IR measurement	Stabilization used during ER measurement	Bilateral measurements	Control group	Athletic population	Injured population	Non-Active Population
					ROM					
Manning 2009	degrees	90˚	90˚	Yes	Yes	No*	Yes	Yes	No	Yes
Nevin 2014	degrees	0˚	0˚	Yes	-	Yes	Yes	NoΔ	Yes	Yes
López-Valenciano 2017	degrees	0˚	0˚	Yes	Yes	Yes	No	Yes	No	No
Tak 2017	degrees	0˚	0˚	Yes	Yes	Yes	No	Yes	Yes	No
Espí-López 2018	degrees	90˚	90˚	-	-	No	No**	Yes	No	No
Ocarino 2021	degrees/kg	0˚	N/A	Yes	N/A	Yes	No	Yes	No	No
Siweka 2022	degrees	90˚	90˚	Yes	Yes	Yes	Yes	Yes	No	Yes
Girdwood 2023	degrees	90˚	90˚	Yes	Yes	Yes	No	Yes	No	No
Tanabe 2023	degrees	0˚	0˚	Yes	Yes	Yes	No	Yes	Yes	No
					STRENGTH					
Hoglund 2014	Kg	0˚ and 90˚	0˚ and 90˚	Yes	Yes	Yes	Yes	No	No	Yes
Ferber 2015	N	90˚	90˚	Yes	Yes	No	No	No	Yes	No
Girdwood 2023	N	0˚	0˚	Yes	Yes	Yes	No	Yes	No	No

Abbreviations: IR: internal rotation, ER: external rotation, kg: kilogram, Nm: newton meter, N: newton.

* Article states no significant difference was noticed between limbs, but the data was not available; average values were shown.

** The PNF group was considered the control group, but intervention was performed.

Δ The athletes were considered the injured population.

- Information was not available in article

Individual Outcomes for ROM and Strength Values across Study

Table S3: Table display of outcomes of each study analyzing ROM.

			ROM							
			Dominant				Non-Dominant			
	Study	Sub-Group	Mean (degrees)	SD	CI (95%)	n	Mean (degrees)	SD	CI (95%)	n
IR 0°	Nevin 2014	Injured	30.58	4.88		18	28.59	6.06		18
		Non-Active	34.50	5.61		18	34.15	5.89		18
	Tak 2017 [Δ]	Athletes	30.00	12.00		103	31.00	12.00		103
		Control	30.00	11.00		83	31.00	12.00		83
	López-Valenciano 2017	Injured	21.00	12.00		57	34.00	11.00		57
		Athletes	47.1	8.0		68	45.3	7.9		68
	Ocarino 2021	Athletes	26.73	7.42	(24.35-28.66)	134	23.01	8.17	(20.79-25.24)	134
	Tanabe 2023	Injured	47.3	7.9		35	35.8	10.1		35
		Athletes	44.9	9.3		78	44.6	9.2		78
IR 90°	Manning 2009 [A]	Athletes	25.00		(17.75-30)	20				20
		Non-Active	43.00		(39-42.25)	20				20
	Espí-López 2018 [B]	Athletes	34.5	7.54	(-4.8-1.57)	22				
		Non-Active	35.45	5.35	(-5.89-0.79)	20				
	Siweka 2022	Athletes	4.30	4.80		25	3.30	4.70		25
		Non-Active	27.00	6.25		25	27.00	6.25		25
	Girdwood 2023	Athletes	17.8	6.5		58	20.4	6.4		58
ER 0°	Nevin 2014	Injured	29.85	4.52		18	30.33	4.67		18
		Non-Active	27.24	5.32		18	26.50	5.73		18
	Tak 2017 [Δ]	Athletes	65	11.0		103	66	9.00		103
		Control	66	17.0		83	66	17.0		83
	López-Valenciano 2017	Injured	55	22.0		57	64	20.0		57
		Athletes	49.9	9.8		68	50.7	9.8		68
	Tanabe 2023	Injured	48.7	9.2		35	47.9	9.3		35
		Athletes	47.0	7.6		78	47.1	6.6		78
ER 90°	Manning 2009 [A]	Athletes	44	-	(41-46)	20				20
		Non-Active	43	-	(39.75-45)	20				20
	Espí-López 2018 [B]	Athletes	35.14	6.58	(-2.67-4.35)	22				
		Non-Active	34.23	5.72	(-5.18-2.18)	20				
	Siweka 2022	Football	12.4	9.4		25	12.4	9.4		25
		Non-Active	35	4.89		25	35	5		25
	Girdwood 2023	Athletes	48.5	8.1		58	48.0	6.9		58

Missing data was not available or specified in the articles. Abbreviations: SD: standard deviation, CI (95%): confidence intervals, n: sample size.

[A] Data shows average of both limbs

[B] Study only measured dominant limb

[Δ] Values presented for dominant are the injured limb, values presented for non-dominant are the non-injured limb

Table S4: Table display of outcomes of each study analyzing strength.

			STRENGTH					
			Dominant			Non-Dominant		
	Study	Sub-Group	Mean (kg)	SD	n	Mean (kg)	SD	n
1. IR 0°	Hoglund 2014	Non-Active (Male)	12.5	5.2	40	11.6	4.4	40
		Non-Active (Female)	8.8	3.4	39	8.9	3.5	39
	Girdwood 2023**	Athletes	13.1	4.0	58	13.1	4.3	58
2. ER 0°	Hoglund 2014	Non-Active (Male)	15.5	4.4	40	15.4	4.4	40
		Non-Active (Female)	9.6	2.6	39	9.4	2.7	39
	Girdwood 2023 **	Athletes	15.1	3.7	58	15.8	3.6	58
3. IR 90°	Hoglund 2014	Non-Active (Male)	15.8	5.8	40	14.6	6.3	40
		Non-Active (Female)	11.3	4.8	39	10.5	4.4	39
	Ferber 2015**[A]	Hip Protocol Baseline	34.0	12.6	111			
		Knee Protocol Baseline	33.0	14.7	88			
4. ER 90°	Hoglund 2014	Non-Active (Male)	17.4	4.9	40	16.9	4	40
		Non-Active (Female)	10.6	3.4	39	9.9	3.2	39
	Ferber 2015**[A]	Hip Protocol Baseline	27.3	9.6	111			
		Knee Protocol Baseline	27.1	10.3	88			

Abbreviations: SD: standard deviation, n: sample size.

** Values converted from N to Kg

[A] Study included values obtained from injured limb