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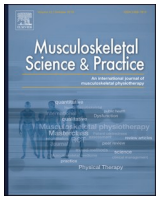

Review article

Evaluation of methodological and reporting quality of systematic reviews on conservative non-pharmacological musculoskeletal pain management in children and adolescents: A methodological analysis

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ABSTRACT

Background: There are no studies investigating the methodological and report quality of systematic reviews of non-pharmacological interventions for musculoskeletal pain management among children and adolescents.
Objective: To evaluate the methodological and reporting quality of systematic reviews on conservative non-pharmacological pain management in children and adolescents with musculoskeletal pain.
Methods: Searches were conducted on the Cochrane Database of Systematic Reviews, Medline, Embase, and three other databases. Two pairs of reviewers independently assessed each article according to the predetermined selection criteria. We assessed the methodological quality of systematic reviews, using the AMSTAR 2 checklist and the quality of reporting, using PRISMA checklist. Descriptive analysis was used to summarise the characteristics of all included systematic reviews. The percentage of systematic reviews achieving each item from the AMSTAR 2, PRISMA checklist and the overall confidence in the results were described.
Results: We included 17 systematic reviews of conservative non-pharmacological pain management for musculoskeletal pain in children and adolescents. Of the 17 systematic reviews included, nine (53%) were rated as "critically low", seven (41%) were rated as "low", and one (6%) was rated as "high" methodological quality by AMSTAR-2. The reporting quality by items from PRISMA range from 17.6% (95% CI 6.2 to 41) to 100% (95% CI 81.6 to 100).
Conclusion: This systematic review of physical interventions in children and adolescents showed overall 'very low' to 'high' methodological quality and usually poor reporting quality.

1. Introduction

Musculoskeletal pain is very common and is responsible for an important impact on society (Henschke et al., 2015; de Oliveira et al., 2019). Among children and adolescents, the prevalence of musculoskeletal pain range between 4% and 40% (King et al., 2011; Santos et al., 2022). Musculoskeletal pain is the tenth cause of years lived with disability in children and adolescents from 5 to 14 years old (Institute for Health Metrics and, 2019). Pain in childhood and adolescence is also a risk factor for chronic pain, negative psychological symptoms, and work absenteeism in adulthood (Walker et al., 2012; Hestbaek et al., 2006). As pain negatively affects children and adolescents and increases during life, effective pain treatments are necessary.

Conservative non-pharmacological treatments are the first-line management for musculoskeletal pain in children and adolescents (Leite et al., 2022). These treatments include exercise therapy, manual therapy and education, and have shown to be effective in reducing pain and disability (Leite et al., 2022; World Health, 2020). Conservative non-pharmacological treatments are also safer than commonly used pharmacological options. (e.g., paracetamol, NSAIDs) (Pierce and Voss,

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2010). These treatment management strategies are usually based upon systematic reviews (Leite et al., 2022; World Health, 2020; Pierce and Voss, 2010; Nascimento Leite et al., 2023). However, the quality of systematic reviews that inform treatment management can vary considerably, which can lead to biased treatment estimates and unreliable clinical decisions (Almeida et al., 2020; Page and Moher, 2017).

Despite the increased efforts to improve the methodological and reporting quality of systematic reviews, recent studies have reported flaws in their overall quality. A recent study used *A MeaSurement Tool to Assess Systematic Reviews 2* (AMSTAR 2) to measure the methodological quality of systematic reviews in individuals with low back pain, and most systematic reviews included were rated as "low" and "critically low" methodological quality (Almeida et al., 2020). That means, clinicians are making decisions based on systematic reviews with poor confidence in their results (Almeida et al., 2020).

There are only overviews of systematic reviews in the literature that indirectly measured the methodological quality of pain management interventions in children and adolescents (i.e., inflammatory pain, chronic pain) (Yang et al., 2015; Eccleston et al., 2019). Also, there are no studies investigating the methodological and the reporting quality of systematic reviews on interventions for children and adolescents with musculoskeletal pain. Therefore, we aim to evaluate the methodological and the reporting quality of systematic reviews on conservative non-pharmacological pain management in children and adolescents with musculoskeletal pain.

2. Methods

2.1. Registration

This study was reported according to the *Guidelines for reporting meta-epidemiological methodology research* (Murad and Wang, 2017). This study protocol is available at the Open Science Framework (https://osf.io/yu247/).

2.2. Study design

This study is a methodological overview of systematic reviews of conservative non-pharmacological pain management in children and adolescents with musculoskeletal pain.

2.3. Inclusion and exclusion criteria

We only considered systematic reviews of randomised controlled trials (RCTs) or quasi-randomised controlled clinical trials (CCTs) that:

- Included studies with children and/or adolescents of any duration of symptoms, sex, ethnicity and age ranging between 6 and 19 years old (Organization, 1989). For studies that included children and adults or neonates and children, we only included the study if children's data were reported separately from adults or neonates, corresponding to more than 50% of the sample or the mean age of the sample ranged between 6 and 19 years of age.
- Investigated any conservative non-pharmacological pain management therapy for children and adolescents with musculoskeletal pain, including specific conditions such as juvenile arthritis and fibromyalgia. We considered conservative non-pharmacological pain management therapy any type of conservative intervention as exercise therapy, manual therapy, hydrotherapy, neuromuscular training, electrotherapy, orthoses prescription and use, pain education, laser therapy, ultrasounds, and shockwave therapy are examples of conservative treatments. We did not consider invasive procedures (e.g., surgery, administration of medications by injections or invasive procedures) or medication (including plants, herbs and herbal medicines). The comparator could be any other intervention as other conservative intervention, surgical or invasive procedures, medication, minimal interventions (e.g., advice, placebo), no treatment or other treatments.
- Included studies with primary or main outcomes that were patient-centered (i.e., relevant to patients), as for example pain, disability, global perceived effect.
- Were published in full-text format for peer-review scientific journals – systematic reviews in pre-prints format or published in predatory journals were not included. We consulted the list of predatory journals to make sure no publication from predatory journals was considered (Reports, 2023).

We did not consider studies related to abdominal pain, headache, pain from fractures, surgery, cancer, induced pain and life-threatening conditions related to pain (e.g., epilepsy/seizure disorders). We excluded overviews of systematic reviews and outdated versions of Cochrane reviews (once an updated version has been published).

2.4. Search methods and electronic search

The search strategy was adapted for each electronic database based on free terms, its synonymous and also on terms related to the study design, participants and intervention. We have combined the terms with OR and after with AND (e.g., systematic reviews AND child* AND conservative treatment). There was no restriction on dates of publication and language.

One author (VS) conducted the search in all databases to identify all potential relevant systematic reviews from inception until June 13th, 2022. The searches were conducted on the following electronic databases: Cochrane Database of Systematic Reviews (CDSR - The Cochrane Library, issue actual); Medline (via Ovid); Embase (via Ovid); Physiotherapy Evidence Database (PEDro); Cumulative Index to Nursing and Allied Health Literature (CINAHL) (via EBSCO); and PsycINFO (via Ovid). The search strategies are available in Appendix 1. We also checked the references lists from eligible systematic reviews.

2.5. Data collection and analysis

2.5.1. Selection of studies

We used the EndNote X9 version (Thomson Reuters, Philadelphia, PA, USA) for the selection process (Bramer et al., 2017). The total number of studies was equally divided between two pairs of reviewers (VS and FG; BA and JF). The pairs independently performed the screening and study selection. We discussed disagreements between reviewers in a consensus meeting and if there is no consensus, a third reviewer made a decision (TY or BS).

2.5.2. Data extraction and management

One pair of independent reviewers (VS and IF) performed the data extraction. We discussed disagreements between reviewers in a consensus meeting and if there was no consensus, a third reviewer made a decision (TY or BS). We have piloted the data extraction form with five studies before starting data extraction.

We extracted the following information from the systematic reviews:

- Bibliometric characteristics (country of the corresponding author, year of publication, number of authors in the review, and language);
- Methodological characteristics (main outcomes, Grading of Recommendations Assessment, Development and Evaluation (GRADE) use);
- Characteristics of participants (sex (female %), mean age, number of studies, and participants);
- Characteristics of the intervention: exercise or physical activity, education or behaviour change, electrophysical agents, manual therapies, and others;
- Characteristics of the comparator intervention: exercise or physical activity, education or behaviour change, electrophysical agents,

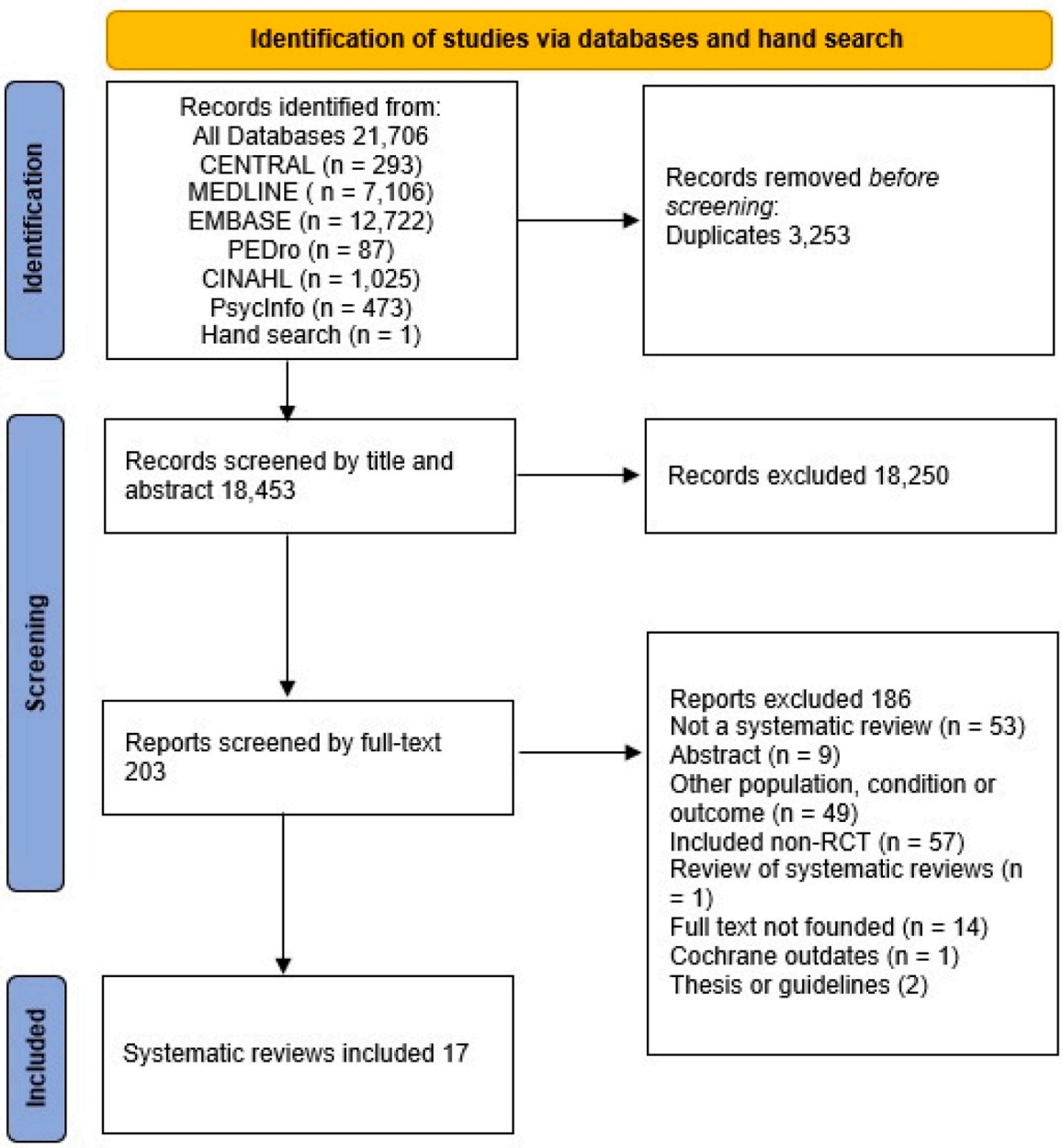

Fig. 1. Study flow diagram of the included systematic reviews.

manual therapies, medications, invasive or surgical treatments, no treatment, minimal treatment, and other treatments;
- Other information as (Cochrane review or not Cochrane review, protocol registration, protocol publication, conflict of interest, source of funding, and journal's impact factor).

There were no attempts to contact reviewer authors regarding missing information. Information not described in the manuscript was considered as "not reported".

2.5.3. Quality of included reviews

One pair of reviews (VS and IF) conducted the methodological and reporting quality assessment of the included reviews.

We assessed the methodological quality of the included systematic reviews with the AMSTAR 2 checklist (Appendix 2) (Pollock et al., 2017; Shea et al., 2007/02). The AMSTAR 2 checklist contains 16 items designed to assess the methodological quality of systematic reviews on health care interventions (Shea et al., 2017a). The assessment of general confidence of the results of the systematic reviews is classified in four levels, as:

- High: None or a non-critical weakness;
- Moderate: More than one non-critical weakness;
- Low: A critical failure with or without non-critical weaknesses;
- Critically low: More than one critical failure with or without non-critical weaknesses (Shea et al., 2017a).

We assessed the reporting quality of the included systematic reviews with the PRISMA checklist (Appendix 3) (Liberati et al., 2009a). We answered each of 27 items from PRISMA as "yes" (total compliance), "partial" (partial compliance), "no" (noncompliance) and "cannot answer" (limited information).

Table 1
Characteristics of the included systematic reviews (n = 14).

General information	Bibliometric characteristics			Methodological characteristics			Characteristics of participants			Characteristics of the intervention	Characteristics of the comparator	Other information					
Study	Country*	Number of authors	Main outcomes	GRADE use	Number of studies	Number of participants	Female n (%)	Age mean (SD)	Condition	Type of intervention	Type of intervention	Cochrane review	Registration	Protocol publication	Conflict of interest	Funding	Journals impact factor
Bernardy et al. (2018)	Germany	5	Pain intensity, negative mood, disability, acceptability, fatigue, sleep problems, HRQoL	Yes	23 (2[a])	2031 (142 [a])	NR (89–100)	15.3 (0.4)	Fibromyalgia	Education or behaviour change	Education or behaviour change, no treatment, exercise or physical activity	Yes	No	No	Yes	No	9.266
Burger et al. (2019)	South Africa	8	HRQoL, Cobb angle	No	4	119	110 (92.4)	13.8 (1.2)	Adolescent Idiopathic Scoliosis	Exercise or physical activity	Exercise or physical activity, no treatment, other treatments	No	No	No	No	No	0.66
Chan et al. (2012)	China	6	Tender point, disability, HRQoL, depression, activity estimation	No	4 (1[a])	251 (30 [a])	NR	8 to 18 (range)	Fibromyalgia	Exercise or physical activity	Exercise or physical activity	No	No	No	No	Unclear	2.579
Cohen et al. (2017)	United States	4	Pain intensity, HRQoL, disability	No	5	299	195 (85.1)	5 to 18 (range)	Rheumatic diseases	Education or behaviour change	Education or behaviour change, no treatment, manual therapies	No	No	No	Yes	No	2.77
Cordeiro et al. (2020)	Brazil	5	HRQoL, Cobb's angle, neck slope angle, angle of trunk rotation, endurance, image self-perceived, pulmonary function, hump height, waist asymmetry	No	6	357	NR	10 to 18 (range)	Adolescent Idiopathic Scoliosis	Exercise or physical activity	Minimal treatment, exercise or physical activity, no treatment	No	No	No	NR	NR	NF
Evans et al. (2022)	Australia	4	Pain intensity, disability, HRQoL, treatment success, adverse events	Yes	16	1058 (108[d])	NR	11 months to 19 years (range)	*Pes planus*	Other treatments, exercise or physical activity, electrophysical agents	Control not specified, other treatments, minimal treatment, no treatment	Yes	No	No	Yes	Yes	9.266
Fellas et al. (2017)	Australia	3	Pain intensity, HRQoL, disability, ambulation speed	No	2	100	75 (75)	11.8 (1.2)	Juvenile Idiopathic Arthritis	Other treatments	Minimal treatment, other treatments	No	Yes	Yes	Yes	No	0.675
Gámiz-Bermúdez et al. (2022)	Spain	4	Cobb's angle, HRQoL	Yes	8	279	241 (86.4)[c]	12.7 (1.2)	Adolescent Idiopathic Scoliosis	Exercise or physical activity	Exercise or physical activity, other treatments	No	Yes	No	No	No	3.477
Iversen et al. (2022)	United States	3	Physical activity level, physical function, exercise capacity, HRQoL, pain, fatigue, joint stiffness, range-of-motion, muscle integrity, mental health	No	13	672	409 (60.9)	8.7 to 14.9 (mean age range)	Juvenile Idiopathic Arthritis	Exercise or physical activity	Exercise or physical activity, minimal treatment	No	Yes	No	No	No	2.4
Klepper et al. (2019)	United States	6	Health-related physical fitness, disability, pain	Yes	9	457	315 (69)[b]	10.9 (1.6)	Juvenile Idiopathic Arthritis	Exercise or physical activity	Exercise or physical activity, no treatment	No	No	No	No	NR	3.049

(*continued on next page*)

Table 1 (*continued*)

General information	Bibliometric characteristics			Methodological characteristics			Characteristics of participants			Characteristics of the intervention	Characteristics of the comparator	Other information					
Study	Country*	Number of authors	Main outcomes	GRADE use	Number of studies	Number of participants	Female n (%)	Age mean (SD)	Condition	Type of intervention	Type of intervention	Cochrane review	Registration	Protocol publication	Conflict of interest	Funding	Journals impact factor
			intensity, HRQoL, bone density														
Ceballos Laita et al. (2018)	Spain	4	HRQoL, pain intensity, function, Cobb's angle, neck slope angle, angle of trunk rotation, endurance, perception of change, pulmonary function	No	9	459	NR	13.5 (1.3)	Adolescent Idiopathic Scoliosis	Exercise or physical activity	Exercise or physical activity, control not specified	No	No	No	No	No	0.635
Lonergan (2016)	Ireland	1	Pain intensity, pain duration, disability	No	9	771 (144[c])	621 (80.5)										
	15.1 (0.2)	Fibromyalgia, headaches/ migraines, abdominal pain	Education or behaviour change	No treatment, education or behaviour change	No	No	No	No	No	1.701							
Michaleff et al. (2014)	Australia	6	Pain intensity, HRQoL, disability, physical measures, back care beliefs, knowledge about posture, fear avoidance, self-efficacy, posture, manual handling, backpack wearing behaviour	Yes	17	3064	1448 (47.2)	11.7 (2.2)	Back pain	Exercise or physical activity, Education or behaviour change	No treatment, exercise or physical activity	No	No	No	No	NR	3.134
Peterson et al. (2018)	Australia	4	Pain intensity, patients' global impression of change, functional ability, HRQoL, disability, parents' global evaluation of the impact of their child's hypermobility	No	2	86	38 (44.2)	11.4 (0.8)	Hypermobility Spectrum Disorder and Hypermobile Ehlers-Danlos Syndrome	Exercise or physical activity	Exercise or physical activity	No	No	Yes	No	No	2.303
Reychler et al. (2021)	Belgium	5	Pain intensity, proprioception, physical function, functional exercise capacity, strength, HRQoL, endurance (muscle), postural stability, inspiratory muscle strength, lung function, anxiety and depression	No	6 (2[a])	203 (82[a])	NR (65–100/ 65 to 66[a] (range))	(10.9–49.4/ 10.9 to 12[a]) (range of mean age)	Hypermobile Ehlers-Danlos Syndrome	Exercise or physical activity	Exercise or physical activity, minimal treatment	No	No	No	No	NR	2.578
Takken et al. (2008)	Netherlands	6	HRQoL, aerobic capacity, disability, joint status, pain intensity, number of	No	3	212	124 (58.5)	4 to 19 (range)	Juvenile Idiopathic Arthritis	Exercise or physical activity	Exercise or physical activity, control not specified	Yes	Yes	Yes	No	NR	9.266

(*continued on next page*)

Table 1 (*continued*)

General information	Bibliometric characteristics			Methodological characteristics			Characteristics of participants			Characteristics of the intervention	Characteristics of the comparator	Other information					
Study	Country*	Number of authors	Main outcomes	GRADE use	Number of studies	Number of participants	Female n (%)	Age mean (SD)	Condition	Type of intervention	Type of intervention	Cochrane review	Registration	Protocol publication	Conflict of interest	Funding	Journals impact factor
			joints with pain adverse outcomes, number of joints with swelling, muscle strenght, compliance														
Thompson et al. (2019)	United Kingdom	5	Cobb angle, angle of trunk rotation, pain intensity, adverse events, function, HRQoL, financial costs, self-image	Yes	9	380	342 (75)	13.3 (1.5)	Adolescent Idiopathic Scoliosis	Exercise or physical activity	Exercise or physical activity, no treatment, other treatments	No	No	No	No	Yes	3.358

HRQoL: Health-related quality of life.

2.5.4. Data analysis and summary

Descriptive analysis through absolute numbers and percentages was used to summarise the characteristics of all included systematic reviews. The dichotomous and categorical variables were reported by frequency and percentage, and the continuous variables were reported by mean and standard deviation, median and interquartile range, or only range (when no further information was available). The percentage of systematic reviews achieving each item of the AMSTAR 2 and the PRISMA, and the overall confidence in the results were described in a table.

All statistical analyses were performed using the IBM SPSS software version 20.0 (IBM corporation, Somers, NY, USA).

3. Results

3.1. Systematic review characteristics

The electronic search retrieved 21,706 articles from the databases and from the reference list, and 3,253 duplicates were removed. After the title, abstract and full-text screening, we included 17 systematic reviews on this systematic review (Fig. 1). More than two-thirds (n = 14; 82.3%) of the reviews were conducted in high-income countries published between 2010 and 2022. Most reviews included in this study (n = 14; 82.3%) were non-Cochrane reviews. Two (11.8%) reviews received funding, four (23.5%) were registered, three (17.6%) had the protocol published, and 16 (94.1%) were published in English. The characteristics of the included studies are detailed in Table 1.

3.2. Methodological quality and overall confidence of included systematic reviews

Overall, nine systematic reviews (52.9%) were rated as "critically low", seven (41.2%) were rated as "low", one (5.9%) was rated as "high" and none of the reviews were rated as "moderate" methodological quality according to the AMSTAR 2. The most positive item (rated as "yes") was item 9 (Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review) (n = 16; 94.1%; 95% CI 73 to 98.9). The least positive items were item 2 (Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?) and item 15 (If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?) (n = 2; 11.8%; 95% CI 3.3 to 34.3) (Fig. 2 and Table 2).

3.3. Reporting quality of the included systematic reviews

The item with higher completeness of reporting was item 18 (study characteristics) (n = 17; 100%; 95% CI 81.6 to 100). The item with lower completeness of reporting was item 22 (risk of bias across studies) (n = 3; 17.6%, 95% CI 6.2 to 41). Fig. 3 presents the result of the reporting quality judgments (for numerical data, see Appendix 4 – Table 3**)**.

4. Discussion

The present study summarises empirical evidence about the overall methodological and reporting quality of systematic reviews on physical interventions for children and adolescents with musculoskeletal pain. Systematic reviews of non-pharmacological management for children and adolescents with musculoskeletal pain demonstrate poor reporting quality and low overall confidence level. The empirical evidence from 17 reviews (n = 6,990 children and adolescents' participants) indicated a "critically low" to "high" overall methodological quality, however only one study achieved high methodological quality. The overall

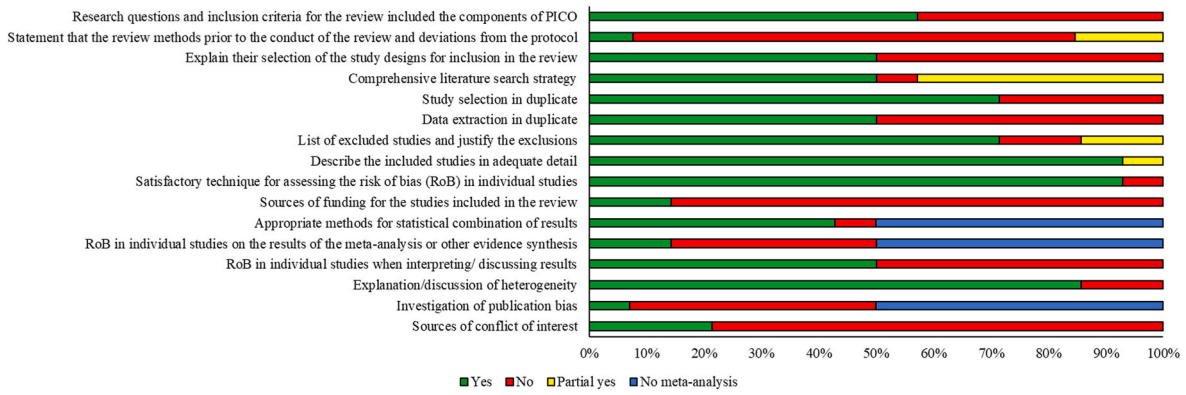

Fig. 2. Graph of the methodological quality assessment, presented as percentages across all included systematic reviews.

AMSTAR score of completed items ranged from 11.8% to 94.1%. The reporting completeness by overall percentage ranged from 17.6% to 100% by PRISMA.

Previous studies have used the AMSTAR and the PRISMA statement to measure the methodological and the reporting qualities of systematic reviews. A previous review assessed the methodological quality of systematic reviews on exercises for chronic low back pain (Almeida et al., 2020). The authors found that 74% of the systematic reviews were classified as "critically low", 16% as "low", 3% as "moderate" and 8% as "high" methodological quality (Almeida et al., 2020). The reviews rated as "moderate" and "high" were all Cochrane Systematic Reviews, with protocol prospectively published (Almeida et al., 2020). Previous studies also found that Cochrane Systematic Reviews had better methodological quality (Popovich et al., 2012; Estevam et al., 2021). Another review assessed the methodological quality of systematic reviews in the paediatric surgery area using the AMSTAR (Cullis et al., 2017). The authors found that 68% of the AMSTAR items and 56.8% of the PRISMA items were described adequately in the included systematic reviews (Cullis et al., 2017). In our study, all systematic reviews were rated as "critically low" to "low" methodological quality, including Cochrane Systematic Reviews, except one recently non-Cochrane Systematic Review. This is possibly explained by the fact that most systematic reviews did not have a previous protocol published, which is a critical item of the AMSTAR 2 (Shea et al., 2017b).

Nevertheless, a previous study assessed the completeness reporting in the paediatric surgery field (Cullis et al., 2017). The authors found higher completeness for item 1 (title) and item 3 (rationale), and lower completeness for items as 22 (risk of bias across studies) and 27 (sources of support) (Cullis et al., 2017). Other authors also found lower completeness for item 5 (protocol and registration), item 22 (risk of bias across studies) and item 27 (sources of support) (Nawijn et al., 2019; Wasiak et al., 2017; Sun et al., 2021). In our study, we found higher completeness for item 18 (study characteristics), and lower completeness for item 22 (risk of bias across studies). A common problem observed in all included studies of this systematic review is that the studies seem to not measure the risk of bias across studies.

Systematic reviews of randomised controlled trials are a useful option to be considered by clinicians in clinical practice decisions (Cook et al., 1997). Although reviews are a good resource to find the available evidence, the results of our methodological review show that caution is needed. The methodological quality assessment of the included reviews ranges from "critically low" to "high" (only one). Thus, clinicians are probably making decisions about interventions for children and adolescents with musculoskeletal pain, based on low-quality systematic reviews. This means that the data that provides information for the readers may not accurately, and not even comprehensively, summarise the evidence of physical interventions for children and adolescents with musculoskeletal pain (Shea et al., 2017a). Regarding the reporting, the quality of the descriptions of physical interventions for children and adolescents with musculoskeletal pain is poor. One item presented less reporting quality (risk of bias across studies) reflecting the low methodological quality of the area. Another item with poor adherence was item 2 (structured summary), which implies that clinicians could not find all the necessary information in the reviews' abstracts. Therefore, although there are tools to guide for better methodological quality (e.g., Cochrane Handbook for Systematic Reviews of Interventions) and for better reporting of systematic reviews (e.g., PRISMA checklist), the systematic reviews have still been showing low methodological and reporting quality (Liberati et al., 2009a; Cochrane). Possible reasons to this happen can be poor divulgation of importance of use good guides and checklists and not mandatory use of checklists.

The main strength of this study is the assessment of the overall confidence level and completeness of reporting using valid and well-recognised tools (Liberati et al., 2009a; Bühn et al., 2021; Pieper et al., 2017). The AMSTAR 2 previously showed to have a moderate to perfect test-retest agreement (Bühn et al., 2021), and the PRISMA 2009 checklist is a well-recognised tool to improve reporting of systematic reviews (Liberati et al., 2009a; Cochrane). A possible limitation of this study is the use of the PRIMA 2009 checklist, instead of using the new updated PRISMA 2020 checklist (Page et al., 2021). However, as the majority of included studies were conducted before 2020, we thought it would be better to use the PRISMA 2009 checklist, as it was available during the period that the most included studies were published.

Protocol registration or being a Cochrane systematic review are factors that have been associated with methodological quality and reporting previously (Ge et al., 2018/01; Sideri et al., 2018). In this present study, the main factors that might be related to poor methodological and reporting quality are unknown. Studies and systematic reviews in healthcare have been increasing over the years (Page et al., 2016), which leads to the possibility of future studies exploring these unknown factors. The available evidence provides empirical evidence highlighting efforts for the poor methodological quality and reporting of systematic reviews. Reviewers might consider the use of free resources available such as the Cochrane Handbook for Systematic Reviews of Interventions, JBI Manual for Evidence Synthesis and other guidelines to conduct high-quality systematic reviews (Aromataris and Munn, 2020; Higgins et al., 2019). The Equator Network, editors and journals reviewers, and other organizations has advocated the importance to adhere the reporting guidelines over the years (Page et al., 2021/06; Liberati et al., 2009b; network, 2022). Journals could make mandatory the process of registration and the use of the PRISMA reporting quality for example. Furthermore, journals could encourage the reviewers to use tools such as the AMSTAR-2 to be used during the peer-review process. This study showed that reviews of physical interventions for children and adolescents with musculoskeletal pain have sub-optimal methodological and reporting quality. This sub-optimal methodological and reporting quality can interfere in the replication of treatments in clinical practice. The reviews were rated as "critical low" to "high" (only one) in

Table 2
Methodological quality assessment of each included systematic review.

Study	AMSTAR 2 items																Overall rating
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
Bernardy et al. (2018)	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Low
Burger et al. (2019)	Y	N	Y	PY	Y	N	N	PY	Y	N	N	N	Y	Y	N	N	Critically low
Chan et al. (2012)	N	N	Y	PY	N	N	PY	PY	Y	N	NM	NM	Y	Y	NM	N	Low
Cohen et al. (2017)	N	N	N	PY	N	N	PY	Y	Y	N	NM	NM	N	Y	NM	N	Critically low
Cordeiro et al. (2020)	N	N	N	N	N	N	N	Y	Y	N	NM	NM	N	Y	NM	N	Critically low
Evans et al. (2022)	Y	PY	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Low
Fellas et al. (2017)	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	Critically low
Gámiz-Bermúdez et al. (2022)	Y	Y	Y	Y	Y	Y	PY	PY	Y	N	Y	Y	Y	Y	Y	Y	High
Iversen et al. (2022)	N	PY	Y	N	Y	N	Y	PY	Y	Y	NM	NM	Y	Y	NM	Y	Low
Klepper et al. (2019)	Y	N	N	PY	Y	Y	PY	PY	Y	N	NM	NM	Y	Y	NM	N	Low
Ceballos Laita et al. (2018)	N	N	N	PY	Y	Y	Y	PY	Y	N	NM	NM	N	N	NM	N	Critically low
Lonergan (2016)	N	N	N	PY	N	N	PY	PY	N	N	NM	NM	N	N	NM	N	Critically low
Michaleff et al. (2014)	N	N	Y	Y	Y	Y	PY	Y	Y	N	Y	N	Y	Y	N	N	Critically low
Peterson et al. (2018)	N	PY	Y	Y	Y	N	Y	Y	Y	N	NM	NM	N	Y	NM	N	Low
Reychler et al. (2021)	N	N	Y	N	Y	N	PY	PY	Y	N	NM	NM	N	Y	NM	Y	Critically low
Takken et al. (2008)	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	N	Low
Thompson et al. (2019)	Y	N	N	PY	Y	Y	Y	PY	Y	N	Y	N	Y	Y	N	N	Critically low
Percentage (95% CI)	41.2 (21.6, 64)	11.8 (3.3, 34.3)	52.9 (31, 73.8)	41.2 (21.6, 64)	76.5 (52.7, 90.4)	47.1 (26.2, 69)	47.1 (26.2, 69)	47.1 (26.2, 69)	94.1 (73, 98.9)	17.6 (6.2, 41)	41.2 (21.6, 64)	17.6 (6.2, 41)	52.9 (30.1, 73.8)	88.2 (65.7, 96.7)	11.8 (3.3, 34.3)	35.3 (17.3, 58.7)	–

Items: 1) Did the research questions and inclusion criteria for the review include the components of PICO?; 2) Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?; 3) Did the review authors explain their selection of the study designs for inclusion in the review?; 4) Did the review authors use a comprehensive literature search strategy?; 5) Did the review authors perform study selection in duplicate?; 6) Did the review authors perform data extraction in duplicate?; 7) Did the review authors provide a list of excluded studies and justify the exclusions?; 8) Did the review authors describe the included studies in adequate detail?; 9) Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?; 10) Did the review authors report on the sources of funding for the studies included in the review?; 11) If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?; 12) If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?; 13) Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?; 14) Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?; 15) If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?; 16) Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?.
Y: Yes; N: No; PY: Partial Yes; NM: No meta-analysis

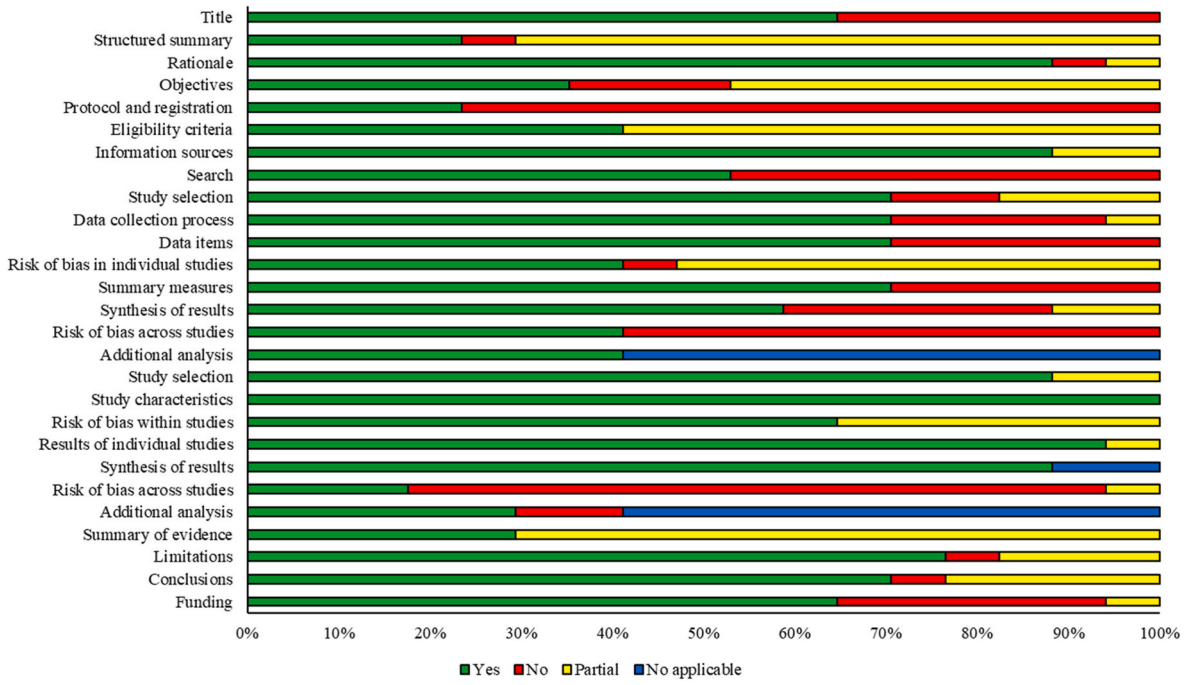

Fig. 3. Reporting quality graph presented as percentages across all included systematic reviews.

our study, with a lot of items not adequately reported across reviews. Efforts to enhance methodological and reporting qualities are needed to provide high-quality systematic reviews to consumers.

5. Conclusion

This systematic review of physical intervention in children and adolescents showed overall 'very low' to 'high' methodological quality and a usually poor reporting quality. Further initiatives, from journals and reviewers, should be endorsed for the use of specific tools to improve the reporting quality and, especially, the methodological quality.

Protocol deviations

The methodological and reporting quality was conducted by two reviewers, independently instead of four reviewers, as stated a priori in the protocol. This decision has been done due to the number of systematic reviews included.

We did not conduct the formal pilot with 10% of the included reviews and reliability measured. In the literature, we had data about reliability, and instead of pilot, we conducted a meeting to discuss each item and what consider in each item of AMSTAR 2 and PRISMA checklist.

There is only one previous study reporting PRISMA checklist as final score (Ge et al., 2018). Therefore, we decided not considering the PRISMA checklist final score due to limited evidence for its use.

We did not conduct a regression analysis to identify the items associated with worse methodological and reporting quality as we only had a few systematic reviews included, so we believe it could give us an unrealistic perspective.

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Conflicts of interest

All authors declare no conflict of interest.

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Appendix A. Supplementary data

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References

Almeida, M.O., Yamato, T.P., Parreira, P., Costa, L.O.P., Kamper, S., Saragiotto, B.T., 2020. Overall confidence in the results of systematic reviews on exercise therapy for chronic low back pain: a cross-sectional analysis using the Assessing the Methodological Quality of Systematic Reviews (AMSTAR) 2 tool. Braz. J. Phys. Ther. 24 (2), 103–117. https://doi.org/10.1016/j.bjpt.2019.04.004.

Aromataris, E., Munn, Z. (Eds.), 2020. JBI Manual for Evidence Synthesis. JBI. https://doi.org/10.46658/JBIMES-20-01.2020. Available from: https://synthesismanual.jbi.global.

Bernardy, K., Klose, P., Welsch, P., Häuser, W., 2018. Efficacy, acceptability and safety of cognitive behavioural therapies in fibromyalgia syndrome - a systematic review and meta-analysis of randomized controlled trials. Eur J Pain. Feb 22 (2), 242–260. https://doi.org/10.1002/ejp.1121.

Bramer, W.M., Milic, J., Mast, F., 2017. Reviewing retrieved references for inclusion in systematic reviews using EndNote. J. Med. Libr. Assoc. 105 (1), 84–87. https://doi.org/10.5195/jmla.2017.111.

Bühn, S., Ober, P., Mathes, T., Wegewitz, U., Jacobs, A., Pieper, D., 2021. Measuring test-retest reliability (TRR) of AMSTAR provides moderate to perfect agreement - a contribution to the discussion of the importance of TRR in relation to the psychometric properties of assessment tools. BMC Med. Res. Methodol. 21 (1), 51. https://doi.org/10.1186/s12874-021-01231-y. Mar 11.

Burger, M., Coetzee, W., du Plessis, L.Z., et al., 2019. The effectiveness of Schroth exercises in adolescents with idiopathic scoliosis: a systematic review and meta-analysis. S Afr J Physiother 75 (1), 904. https://doi.org/10.4102/sajp.v75i1.904.

Ceballos Laita, L., Tejedor Cubillo, C., Mingo Gómez, T., Jiménez Del Barrio, S., 2018. Effects of corrective, therapeutic exercise techniques on adolescent idiopathic scoliosis. a systematic review. Arch Argent Pediatr 116 (4), e582–e589. https://doi.org/10.5546/aap.2018.eng.e582. Efectos de las técnicas de ejercicio terapéutico correctivo en la escoliosis idiopática del adolescente. Revisión sistemática.

Chan, C.L., Wang, C.W., Ho, R.T., Ng, S.M., Ziea, E.T., Wong, V.T., 2012. Qigong exercise for the treatment of fibromyalgia: a systematic review of randomized controlled trials. J Altern Complement Med. Jul 18 (7), 641–646. https://doi.org/10.1089/acm.2011.0347.

Cochrane, Cochrane. Handbook for systematic reviews of interventions version 6.0. www.training.cochrane.org/handbook.

Cohen, E.M., Morley-Fletcher, A., Mehta, D.H., Lee, Y.C., 2017. A systematic review of psychosocial therapies for children with rheumatic diseases. Pediatr Rheumatol Online J 15 (1), 6. https://doi.org/10.1186/s12969-016-0133-1.

Cook, D.J., Mulrow, C.D., Haynes, R.B., 1997. Systematic reviews: synthesis of best evidence for clinical decisions. Ann. Intern. Med. 126 (5), 376–380. https://doi.org/10.7326/0003-4819-126-5-199703010-00006. Mar 1.

Cordeiro, S.E.M., Silva, E.C., Lopes, L.H.A., Leão, L.F., Campos, H.L.M., 2020. Cinesioterapia aplicada ao tratamento da escoliose em adolescentes: um estudo de qualidade metodológica. Fisioterapia Brasil 21, 3916. https://doi.org/10.33233/fb.v21i4.3916.

Cullis, P.S., Gudlaugsdottir, K., Andrews, J., 2017. A systematic review of the quality of conduct and reporting of systematic reviews and meta-analyses in paediatric surgery. PLoS One 12 (4), e0175213. https://doi.org/10.1371/journal.pone.0175213.

de Oliveira, R.F., Fandim, J.V., Fioratti, I., Fernandes, L.G., Saragiotto, B.T., Pena Costa, L.O., 2019. The contemporary management of nonspecific lower back pain. Pain Manag. 9 (5), 475–482. https://doi.org/10.2217/pmt-2019-0016. Sep.

Eccleston, C., Fisher, E., Cooper, T.E., et al., 2019. Pharmacological interventions for chronic pain in children: an overview of systematic reviews. Pain 160 (8), 1698–1707. https://doi.org/10.1097/j.pain.0000000000001609.

Estevam, JdA., Franco, E.S.B., Kriebel, C.F., Peccin, M.S., 2021. Methodological quality analysis of systematic review for the treatment of rotator cuff disease. Rev. Bras. Ortop. (Sao Paulo). 56 (4), 485–489. https://doi.org/10.1055/s-0040-1710334.

Ge, L., Tian, J.H., Li, Y.N., et al., 2018. Association between prospective registration and overall reporting and methodological quality of systematic reviews: a meta-epidemiological study. J. Clin. Epidemiol. 93, 45–55. https://doi.org/10.1016/j.jclinepi.2017.10.012.

Evans, A.M., Rome, K., Carroll, M., Hawke, F., 2022. Foot orthoses for treating paediatric flat feet. Cochrane Database Syst Rev. Jan 26 1 (1), Cd006311. https://doi.org/10.1002/14651858.CD006311.pub4.

Fellas, A., Coda, A., Hawke, F., 2017. Physical and mechanical therapies for lower-limb problems in juvenile idiopathic arthritis (A systematic review with meta-analysis). J Am Podiatr Med Assoc. 107 (5), 399–412. https://doi.org/10.7547/15-213.

Gámiz-Bermúdez, F., Obrero-Gaitán, E., Zagalaz-Anula, N., Lomas-Vega, R., 2022. Corrective exercise-based therapy for adolescent idiopathic scoliosis: systematic review and meta-analysis. Clin Rehabil. 36 (5), 597–608. https://doi.org/10.1177/02692155211070452.

Ge, L., Jin-hui, Tian, Ya-nan, Li, et al., 2018. Association between prospective registration and overall reporting and methodological quality of systematic reviews: a meta-epidemiological study. J. Clin. Epidemiol. 93, 45–55. https://doi.org/10.1016/j.jclinepi.2017.10.012.

Henschke, N., Kamper, S.J., Maher, C.G., 2015. The epidemiology and economic consequences of pain. Mayo Clin. Proc. Jan 90 (1), 139–147. https://doi.org/10.1016/j.mayocp.2014.09.010.

Hestbaek, L., Leboeuf-Yde, C., Kyvik, K.O., Manniche, C., 2006. The course of low back pain from adolescence to adulthood: eight-year follow-up of 9600 twins. Spine (Phila Pa 1976) 31 (4), 468–472. https://doi.org/10.1097/01.brs.0000199958.04073.d9.

Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., 2019. Cochrane Handbook for Systematic Reviews of Interventions Version 6.0 2019.

IfHMa, Evaluation. Global Burden of Disease Accessed June 2023. https://vizhub.healthdata.org/gbd-compare/.

Iversen, M.D., Andre, M., von Heideken, J., 2022. Physical activity interventions in children with juvenile idiopathic arthritis: a systematic review of randomized controlled trials. Pediatric Health Med Ther 13, 115–143. https://doi.org/10.2147/phmt.S282611.

King, S., Chambers, C.T., Huguet, A., et al., 2011. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. Pain 152 (12), 2729–2738. https://doi.org/10.1016/j.pain.2011.07.016.

Klepper, S., Mano Khong, T.T., Klotz, R., Gregorek, A.O., Chan, Y.C., Sawade, S., 2019. Effects of structured exercise training in children and adolescents with juvenile idiopathic arthritis. Pediatr Phys Ther 31 (1), 3–21. https://doi.org/10.1097/pep.0000000000000555.

Leite, M.N., Kamper, S.J., Broderick, C., Yamato, T.P., 2022. What works when Treating children and adolescents with low back pain? J. Orthop. Sports Phys. Ther. 1–18. https://doi.org/10.2519/jospt.2022.10768.

Liberati, A., Altman, D.G., Tetzlaff, J., et al., 2009a. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. PLoS Med. 6 (7), e1000100 https://doi.org/10.1371/journal.pmed.1000100.

Liberati, A., Altman, D.G., Tetzlaff, J., et al., 2009b. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. J. Clin. Epidemiol. 62 (10), e1–e34. https://doi.org/10.1136/bmj.b2700.

Lonergan, A., 2016. The effectiveness of cognitive behavioural therapy for pain in childhood and adolescence: a meta-analytic review. Ir J Psychol Med 33 (4), 251–264. https://doi.org/10.1017/ipm.2015.59.

Michaleff, Z.A., Kamper, S.J., Maher, C.G., Evans, R., Broderick, C., Henschke, N., 2014. Low back pain in children and adolescents: a systematic review and meta-analysis evaluating the effectiveness of conservative interventions. Eur Spine J 23 (10), 2046–2058. https://doi.org/10.1007/s00586-014-3461-1.

Murad, M.H., Wang, Z., 2017. Guidelines for reporting meta-epidemiological methodology research. Evid. Base Med. 22 (4), 139–142. https://doi.org/10.1136/ebmed-2017-110713.

Nascimento Leite, M., Kamper, S.J., O'Connell, N.E., et al., 2023. Physical activity and education about physical activity for chronic musculoskeletal pain in children and adolescents. Cochrane Database Syst. Rev. 7. https://doi.org/10.1002/14651858.CD013527.pub2.

Nawijn, F., Ham, W.H.W., Houwert, R.M., Groenwold, R.H.H., Hietbrink, F., DPJ, Smeeing, 2019. Quality of reporting of systematic reviews and meta-analyses in emergency medicine based on the PRISMA statement. BMC Emerg. Med. 19 (1), 19. https://doi.org/10.1186/s12873-019-0233-6. Feb 11.

network, E., 2022. Equator (Enhancing the QUAlity and Transparency of Health Research): Reporting Guideline. 07/06. https://www.equator-network.org/reporting-guidelines/.

Organization, W.H., 1989. The Health of Youth.

Page, M.J., Moher, D., 2017. Evaluations of the uptake and impact of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement and extensions: a scoping review. Syst. Rev. 6 (1) https://doi.org/10.1186/s13643-017-0663-8, 263-263.

Page, M.J., Shamseer, L., Altman, D.G., et al., 2016. Epidemiology and reporting characteristics of systematic reviews of biomedical research: a cross-sectional study. PLoS Med. 13 (5), e1002028 https://doi.org/10.1371/journal.pmed.1002028.

Page, M.J., McKenzie, J.E., Bossuyt, P.M., et al., 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 372, n71. https://doi.org/10.1136/bmj.n71.

Page, M.J., McKenzie, J.E., Bossuyt, P.M., et al., 2021. Updating guidance for reporting systematic reviews: development of the PRISMA 2020 statement. J. Clin. Epidemiol. 134, 103–112. https://doi.org/10.1016/j.jclinepi.2021.02.003.

Peterson, B., Coda, A., Pacey, V., Hawke, F., 2018. Physical and mechanical therapies for lower limb symptoms in children with Hypermobility Spectrum Disorder and Hypermobile Ehlers-Danlos Syndrome: a systematic review. J Foot Ankle Res 11, 59. https://doi.org/10.1186/s13047-018-0302-1.

Pieper, D., Jacobs, A., Weikert, B., Fishta, A., Wegewitz, U., 2017. Inter-rater reliability of AMSTAR is dependent on the pair of reviewers. BMC Med. Res. Methodol. 17 (1) https://doi.org/10.1186/s12874-017-0380-y, 98-98.

Pierce, C.A., Voss, B., 2010. Efficacy and safety of ibuprofen and acetaminophen in children and adults: a meta-analysis and qualitative review. Ann. Pharmacother. 44 (3), 489–506. https://doi.org/10.1345/aph.1M332. Mar.

Pollock, M., Fernandes, R.M., Hartling, L., 2017. Evaluation of AMSTAR to assess the methodological quality of systematic reviews in overviews of reviews of healthcare interventions. BMC Med. Res. Methodol. 17 (1) https://doi.org/10.1186/s12874-017-0325-5, 48-48.

Popovich, I., Windsor, B., Jordan, V., Showell, M., Shea, B., Farquhar, C.M., 2012. Methodological quality of systematic reviews in subfertility: a comparison of two different approaches. PLoS One 7 (12), e50403. https://doi.org/10.1371/journal.pone.0050403.

Reports, P., 2023. The Predatory Journals List. https://predatoryreports.org/the-predatory-journals.

Reychler, G., De Backer, M.M, Piraux, E., Poncin, W., Caty, G., 2021. Physical therapy treatment of hypermobile Ehlers-Danlos syndrome: a systematic review. Am J Med Genet A 185 (10), 2986–2994. https://doi.org/10.1002/ajmg.a.62393.

Santos, V.S., Leite, M.N., Camargo, B.I.A., Saragiotto, B.T., Kamper, S.J., Yamato, T.P., 2022. Three in every 10 school-aged children in Brazil report back pain in any given year: 12-month prospective cohort study of prevalence, incidence, and prognosis. J. Orthop. Sports Phys. Ther. 52 (8), 554–562. https://doi.org/10.2519/jospt.2022.10819.

Shea, B.J., Grimshaw, J.M., Wells, G.A., et al., 2007. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med. Res. Methodol. 7 (1), 10. https://doi.org/10.1186/1471-2288-7-10.

Shea, B.J., Reeves, B.C., Wells, G., et al., 2017a. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ (Clinical research ed) 358. https://doi.org/10.1136/bmj.j4008 j4008-j4008.

Shea, B.J., Reeves, B.C., Wells, G., et al., 2017b. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ (Clinical research ed) 358, j4008. https://doi.org/10.1136/bmj.j4008.

Sideri, S., Papageorgiou, S.N., E, T., 2018. Registration in the international prospective register of systematic reviews (PROSPERO) of systematic review protocols was associated with increased review quality. J. Clin. Epidemiol. 100, 103–110. https://doi.org/10.1016/j.jclinepi.2018.01.003.

Sun, X., Wang, D., Wang, M., Li, H., Liu, B., 2021. The reporting and methodological quality of systematic reviews and meta-analyses of nursing interventions for chronic obstructive pulmonary disease - a systematic review. Nurs. Open 8 (3), 1489–1500. https://doi.org/10.1002/nop2.767.

Takken, T., Van Brussel, M., Engelbert, R.H., van der Net, J.J., Kuis, W., Helders, P., 2008. Exercise therapy in juvenile idiopathic arthritis. Cochrane Database Syst. Rev. (2) https://doi.org/10.1002/14651858.CD005954.pub2.

Thompson, J.Y., Williamson, E.M., Williams, M.A., Heine, P.J., Lamb, S.E., 2019. Effectiveness of scoliosis-specific exercises for adolescent idiopathic scoliosis compared with other non-surgical interventions: a systematic review and meta-analysis. Physiotherapy 105 (2), 214–234. https://doi.org/10.1016/j.physio.2018.10.004.

Walker, L.S., Sherman, A.L., Bruehl, S., Garber, J., Smith, C.A., 2012. Functional abdominal pain patient subtypes in childhood predict functional gastrointestinal disorders with chronic pain and psychiatric comorbidities in adolescence and adulthood. Pain 153 (9), 1798–1806. https://doi.org/10.1016/j.pain.2012.03.026.

Wasiak, J., Tyack, Z., Ware, R., Goodwin, N., Faggion Jr., C.M., 2017. Poor methodological quality and reporting standards of systematic reviews in burn care management. Int. Wound J. 14 (5), 754–763. https://doi.org/10.1111/iwj.12692.

World Health, O., 2020. Guidelines on the Management of Chronic Pain in Children. World Health Organization.

Yang, C., Hao, Z., Zhang, L.L., Guo, Q., 2015. Efficacy and safety of acupuncture in children: an overview of systematic reviews. Pediatr. Res. 78 (2), 112–119. https://doi.org/10.1038/pr.2015.91.