Received: 22 October 2021 | Revised: 12 April 2022 | Accepted: 7 May 2022

DOI: 10.1002/ejp.1974

REVIEW ARTICLE

The available evidence on the effectiveness of 10 common approaches to the management of non-specific low back pain: An evidence map

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Abstract

Background and Objective: Low back pain is common and remains one of the leading causes of disability globally. This study aimed to develop an evidence map of the quantity of available evidence assessing approaches to manage low back pain, to identify potential redundancies or gaps in the synthesized data, and guide future research focus.

Databases and Data treatment: MEDLINE, Embase, CENTRAL and CINAHL were searched to March 2022 for systematic reviews assessing the effectiveness of 10 guideline-recommended approaches to manage low back pain. For each management strategy, the number of systematic reviews, date of publication, eligibility criteria and included primary trials were extracted and descriptive data presented.

Results: Substantial evidence, including both systematic reviews and primary trials, was available for each management approach except for patient reassurance. The quantity of available evidence has continued to increase over time. Cochrane reviews have been performed for all 10 treatments, except reassurance of the benign nature of low back pain; however, many of the Cochrane reviews were performed prior to 2015. Substantial heterogeneity in the eligibility criteria between systematic reviews exists; however, some age ranges (children and older adults), clinical settings (emergency), and conditions (radiculopathy) were infrequently assessed.

Conclusions: Based on systematic reviews, there is a large body of evidence assessing the effectiveness of common approaches to manage low back pain. Justification of the need for further systematic reviews and primary trials should consider the available evidence and is essential to avoid potential research redundancy when investigating effective management of low back pain.

Significance: Substantial evidence (systematic reviews and primary trials) exists for 10 approaches to manage low back pain. The quantity of available evidence has continued to increase over time. The quantity and large heterogeneity of inclusion criteria in available systematic reviews may influence conflicting recommendations in clinical practice guidelines. Justification of the need for further

systematic reviews and primary trials is essential to avoid potential research redundancy.

1 | INTRODUCTION

Low back pain is a common condition (Hoy et al., 2012), identified as one of the leading causes of disability globally (Hurwitz et al., 2018) and associated with considerable health care demand and expenditure (Dagenais et al., 2008). Identification and implementation of (cost) effective and safe strategies to diagnose, manage and prevent low back pain are essential to improve patient outcomes and decrease health care costs. Despite many trials and reviews into the effectiveness of low back pain management, low back pain prevalence and disability remain high (Foster et al., 2018). Challenges may include poor implementation of evidence-based management strategies into clinical practice or a lack of evidence for the effectiveness of commonly used approaches to management (Buchbinder et al., 2018; Foster et al., 2018).

Research resources are limited, and it is necessary to identify areas with sufficient or insufficient available research to assist in prioritizing future research. Research waste is an important concern; examples include: research addressing low-priority research questions; research conducted without considering existing systematic reviews; and poorly designed research (Chalmers & Glasziou, 2009). High-value research is performed on important research gaps, defined as 'a research question for which missing or insufficient information limits the ability to reach a conclusion' (Nyanchoka et al., 2019). Evidence mapping has been used in a number of different disciplines (Bragge et al., 2011; Miake-Lye et al., 2016; Nyanchoka et al., 2019; O'Leary et al., 2017; Saran & White, 2018) to provide an overview and summary of the quantity of available evidence for a particular research question, with the intention of identifying potential research gaps (Miake-Lye et al., 2016).

Clinical practice guidelines for the management of low back pain provide a resource to guide clinicians in management decisions based on current evidence. Many guidelines for the management of low back pain have been produced, and common recommendations have been summarized; however, recommendations can vary across guidelines. For example, guidelines vary in recommendations for and against the use of paracetamol, opioids, antidepressants, muscle relaxants and spinal manipulation (Oliveira et al., 2018). Variability in recommendations may result from a lack of high-certainty evidence, leading to consensus determinations that may differ due to the differing beliefs or preferences of the guideline committees.

The quantity of evidence available to assess the effectiveness of common management strategies for low back pain is currently unclear. There are a large number of systematic reviews addressing the effectiveness of different approaches to low back pain management. However, it is unknown how many systematic reviews assess management strategies commonly recommended in clinical practice guidelines, how they differ with respect to eligibility criteria, number of included trials and their size and whether there is an apparent duplication of effort.

The aim of this study was to develop an evidence map of the quantity and characteristics of systematic reviews (and included primary trials) assessing the effectiveness of commonly recommended management strategies for low back pain. This is the first step to identify potential redundancies or gaps in the synthesized data.

2 | METHODS

Evidence mapping was informed by previous methods (Bragge et al., 2011; Nyanchoka et al., 2019; O'Leary et al., 2017; Saran & White, 2018) and performed in four stages, as depicted in Figure 1. The scope of the evidence map was defined by the research team as the quantity and characteristics of systematic reviews assessing the effectiveness of management strategies for low back pain, which are commonly recommended by clinical practice guidelines.

2.1 | Identification of commonly recommended management strategies for low back pain

Commonly recommended management strategies for low back pain were identified from a recent overview of 15 clinical practice guidelines (Oliveira et al., 2018). Management approaches could include a medication or class of medication, non-pharmacologic interventions or a specific treatment recommendation (e.g. provision of advice to stay active). Management could relate to any subpopulation of people with low back pain (e.g. any duration of symptoms or clinical setting).

For feasibility of the mapping exercise, we decided to identify a maximum of 10 commonly recommended management strategies by a prioritization process, performed independently by four of the authors (HJ, MH, GF, AD) and then discussed with the whole team to

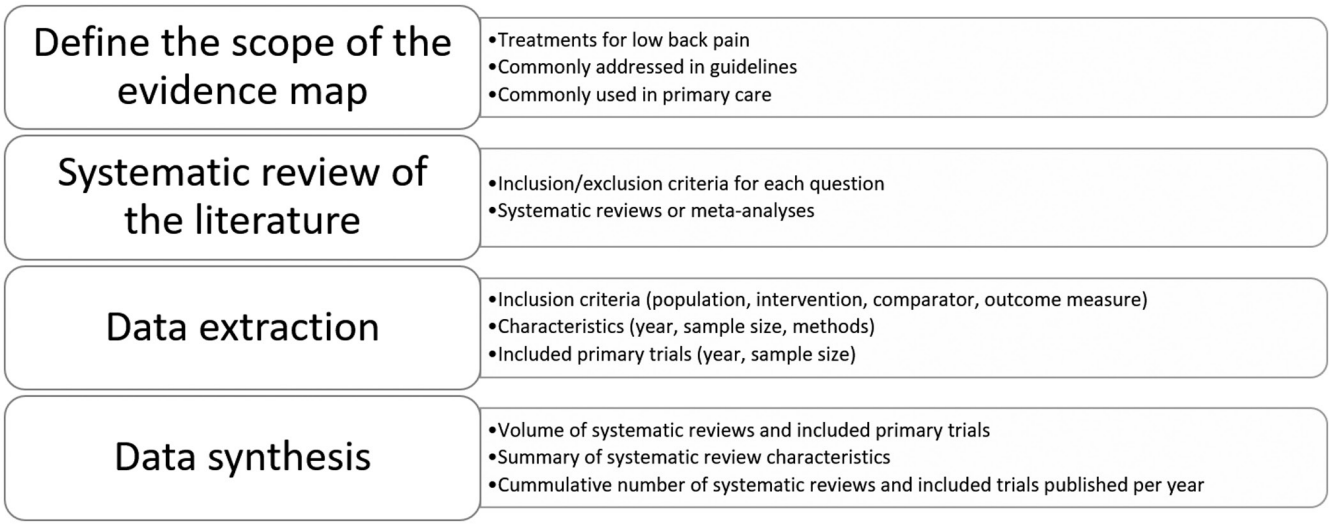

FIGURE 1 Evidence mapping approach

determine final inclusion. Approaches to management were prioritized if they were: (i) addressed by a majority of the guidelines (at least 8 out of 15 guidelines); (ii) typically used in primary care; (iii) the subject of conflicting recommendations across guidelines and/or (iv) evidence for the effectiveness was considered important by the researcher.

2.2 | Identification of systematic reviews assessing effectiveness of the included management strategies

2.2.1 | Systematic review selection

The eligibility criteria for systematic review inclusion are outlined in Table S1. Systematic reviews needed to identify specific inclusion/exclusion criteria and assess the risk of bias of included randomized or controlled trials. Systematic reviews could include one or more of the included management strategies or a related subcategory (e.g. a review may assess the effectiveness of exercise broadly or be limited to a specific approach to exercise, e.g. Pilates). Systematic reviews assessing a broader topic area (e.g. musculoskeletal pain) were also eligible for inclusion provided that results for the effects of management of low back pain were presented separately.

The search strategy (available in the supplementary materials, methods S1) was developed in consultation with a research librarian to search for terms related to 'low back pain', 'systematic review' and each of the 10 included management strategies. MEDLINE, Embase, CENTRAL and CINAHL were searched from inception to 8 March 2022. The reference lists of the guidelines included in the overview of reviews (Oliveira et al., 2018) were also handsearched to identify additional reviews not captured by our database search.

Titles, abstracts and then full-texts of potentially eligible studies were independently screened by two authors (HJ, MH, GF, AD). Discrepancies in inclusion were discussed and resolved by the author team.

2.3 | Data extraction

Data were extracted from approximately 10% of systematic reviews for each treatment (27 reviews and 1710 items) by two authors (HJ, GF). As there was almost perfect agreement (97.3%, or 1663/1710 items), data for the remaining reviews were extracted by a single author (HJ).

Data were extracted to a piloted form and included: authors, publication year, number of primary trials; population, including number of participants, duration of back pain considered (acute, chronic, not specified), whether leg pain or radiculopathy were included (low back pain alone, low back pain +/− leg pain, radiculopathy), age or other population restrictions (children only, any adults, adults (excluding older adults), older adults only (over 55 years), pregnant women); setting restrictions (primary care, emergency); treatment/s (and subcategories, e.g., specific type of exercise); comparator/s (placebo, no treatment or usual care and/or comparative treatment); pain intensity and/or disability outcomes considered; Cochrane review (yes/no) and if certainty of evidence was assessed (yes/no). Where updates of the same systematic review were available (e.g. updated Cochrane reviews), only the most recent update was extracted and reported. Non-English systematic

reviews were translated wherever possible using Google Translate. If a review included more than one management strategy, data were extracted separately for each strategy.

2.4 | Data synthesis

Summary data included within the systematic reviews were reported descriptively for each of the 10 approaches to management. Specifically, we reported the number of systematic reviews published, including their i) population (including any restrictions by, e.g. age, pain duration or clinical setting), ii) subcategory (e.g. limitation to a specific type of exercise such as Pilates) and iii) comparator groups (e.g. placebo, usual care or other active treatment).

We tabulated the number of included primary trials and participants, the number of reviews that were Cochrane reviews and/or updates of Cochrane reviews, and the cumulative amount of evidence published over time.

The number of trials and participants for each management strategy was reported as median, range and interquartile range per systematic review and the total number of trials and participants across all reviews (with duplicate trials reported in more than one systematic review removed). Cumulative data per year were reported for: the number of systematic reviews and trials (included within the reviews and excluding subsequent publications for the same trial); the ratio of systematic reviews compared with trials; and the proportion of systematic reviews assessing certainty of evidence.

3 | RESULTS

3.1 | Identification of commonly recommended approaches to manage low back pain

Fifty management strategies were identified from the overview of clinical practice guidelines. These were categorized into 17 unique management recommendations (Table S2). The 10 management strategies prioritized for inclusion in our evidence map included five medications or medication categories (paracetamol, NSAIDs, opioids, muscle relaxants, antidepressants) and five non-pharmacological interventions (provision of advice to stay active or avoid bed rest, provision of reassurance of the benign nature of low back pain, exercise, manipulation/mobilization, psychological/behavioural). We combined advice to stay active and advice to avoid bed rest as they were both rated as high priority and address similar concepts.

3.2 | Identification of systematic reviews assessing effectiveness of the included management strategies

Figure 2 shows the flow chart for systematic review selection. Of 3898 articles screened by abstract and full-text, 220 systematic reviews met eligibility criteria for inclusion (Table S3). The most common reason for exclusion was narrative review or inclusion of studies other than randomized or controlled trials within the review.

3.3 | Characteristics of systematic reviews assessing effectiveness of the included management strategies

All approaches to management had up to date systematic reviews published in 2020 or later, and at least one Cochrane review, except for provision of reassurance of the benign nature of low back pain which had not been reviewed since 2014 (Table 1). The number of systematic reviews, included studies and total number of trial participants for each management strategy ranged from 3 to 120, 4 to 651 and 1954 to 54,701, respectively (Table 1 and Figure 3), with the least available evidence for reassurance of the benign nature of low back pain and the most for exercise. For all approaches to management, the number of included primary trials and included participants increased with the number of systematic reviews (Figure 3). However, there were almost as many systematic reviews as included trials for paracetamol (10 reviews, 14 trials) and reassurance of the benign nature of low back pain (3 reviews, 4 trials). The maximum number of trials included in a single systematic review was 249 (exercise) and one review assessing muscle relaxants did not find any trials. For a given management strategy, individual reviews included at the most between 27% (NSAIDs) and 58% (antidepressants) of trials identified from all included reviews.

Table 2 details the characteristics and number of the included systematic reviews by management strategy and Table S4 maps combinations of eligibility criteria across reviews. Most reviews included trials of participants with low back pain alone (33% of reassurance to 85% of psychological/behavioural). Less reviews included participants with low back pain +/− leg pain (10% of paracetamol to 34% of exercise) or lumbar radiculopathy (0% of psychological/behavioural to 33% of reassurance and advice to stay active). Most reviews did not exclude trials on the basis of back pain duration. Exceptions were opioid reviews, which mainly included trials of participants with chronic pain (53%), and reassurance of the benign nature of low back pain, which mainly included trials of participants with acute pain (67%). Very few systematic

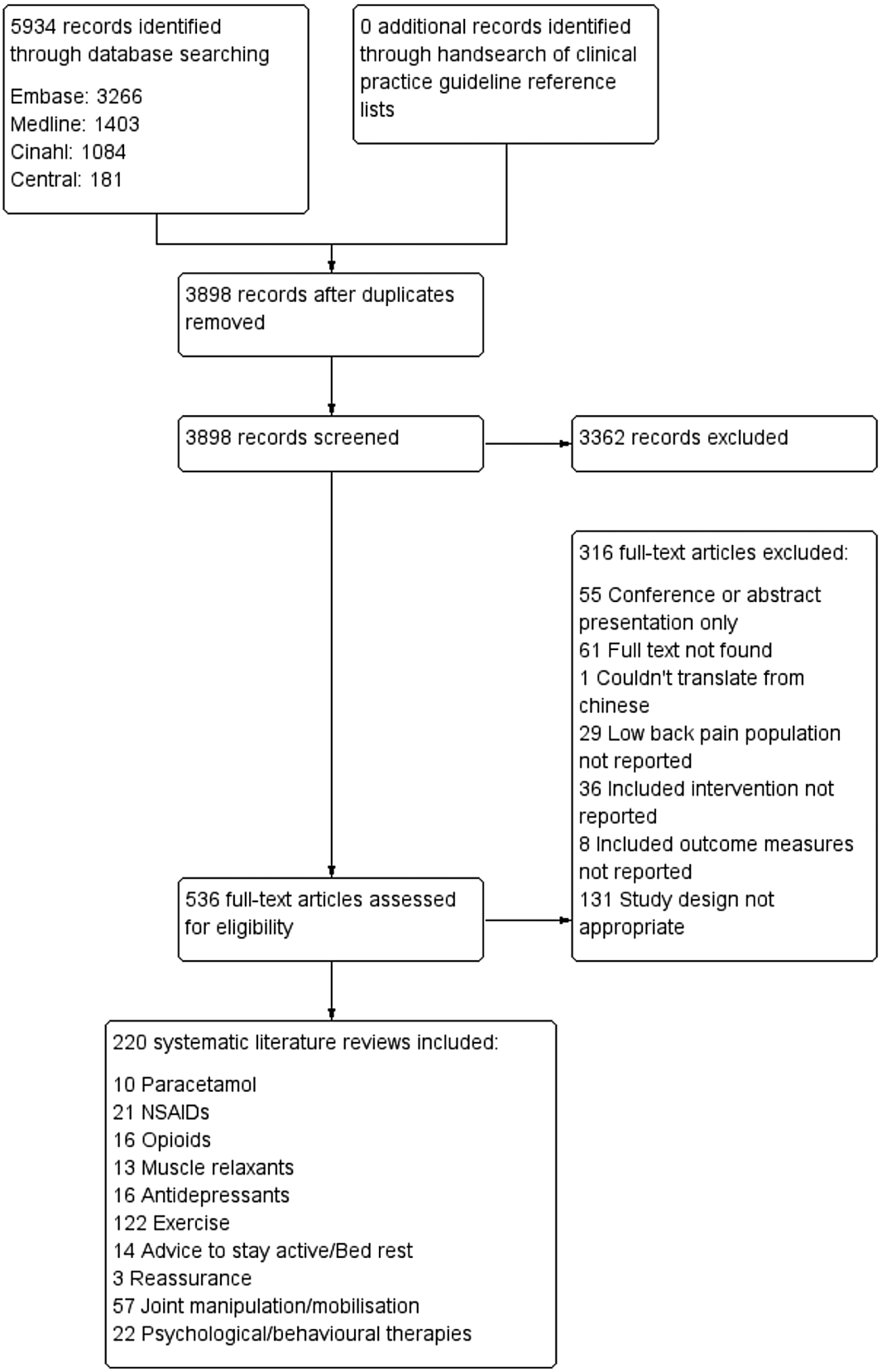

FIGURE 2 Study flow diagram

reviews were restricted to children (1% of exercise) or older adults (3% of exercise to 10% of psychological/behavioural). There were nine reviews specifically for low back pain during pregnancy (of exercise, manipulation/mobilization, or paracetamol); however, most other reviews excluded trials that included pregnant women.

TABLE 1 Summary of systematic reviews and included primary trials for each management strategy

Intervention	Systematic reviews (year range)	Cochrane review[a] (year/year range)	Assessed certainty of evidence	Median number of primary trials per review (IQR)[b]	Median sample size per review (IQR)[b,c]	Discrete primary trials across all reviews (year range)	Total sample size primary trials (median, IQR)[b]
Paracetamol	10 (2004–2021)	1 (2016)	5/9 (56%)	1.5 (1.8) Range: 1–6	282 (572.5)Range: 25–1825	14 (1980–2020)	2912 (99.5, 91.5)Range: 25–1652
NSAIDs	19 (1997–2020)	3 (2016–2020)	12/19 (63%)	9 (12.5)Range: 1–26	1290 (2072)Range: 104–5356	96 (1968–2020)	16,834 (114, 164)Range: 12–1359
Opioids	15 (2004–2020)	1 (2013)	8/15 (53%)	9 (9.5)Range: 1–21	2350 (4562)Range: 28–7644	60 (1991–2019)	17,293 (180, 292.5)Range: 33–1583
Muscle relaxants	13 (1997–2021)	1 (2003)	9/13 (69%)	6 (13)Range: 0–36	990 (2750.8)Range: 59–5501	74 (1965–2019)	12,300 (106, 150)Range: 20–1153
Antidepressants	16 (1997–2021)	1 (2008)	6/16 (38%)	5 (5)Range: 1–19	472 (831.25)Range: 31–3209	33 (1976–2020)	4996 (78, 186)Range: 15–524
Advice to stay active or bed rest	12 (1997–2020)	1 (2010)	7/12 (58%)	5 (5)Range: 1–18	806 (1527.25)Range: 110–4516	46 (1961–2013)	9220 (163, 186.5)Range: 16–975
Reassurance	3 (2002–2014)	0	2/3 (67%)	2 (0.5)Range: 1–2	1234 (564.5)Range: 283–1412	4 (1995–2008)	1954 (360, 294.5)Range: 259–975
Exercise	120 (1991–2022)	7 (2005–2021)	48/120 (40%)	8 (9.25)Range: 1–249	711 (1009)Range: 28–24,573	651 (1966–2021)	54,701 (60, 65)Range: 6–855
Manipulation/ mobilization	55 (1991–2021)	3 (2011–2015)	309/55 (55%)	8 (17)Range: 1–61	848.5 (2271.75)Range: 57–9211	205 (1955–2020)	26,070 (86, 114)Range: 6–1749
Psychological/ behavioural	20 (1997–2022)	1 (2010)	8/20 (40%)	8.5 (14.75)Range: 1–30	1033.5 (1649.75)Range: 34–3737	107 (1982–2021)	15,252 (94, 101.5)Range: 12–1334

[a]For Cochrane reviews only the most recent update for a specific management strategy was extracted. Three Cochrane reviews were performed on NSAIDs for: acute low back pain (2020), chronic low back pain (2016) and sciatica (2016). Seven Cochrane reviews were performed on: exercise for low back pain (2005), pilates for low back pain (2015), low back and pelvic pain in pregnancy (2015), motor control exercise for acute low back pain (2016), motor control exercise for chronic low back pain (2016), yoga for chronic low back pain (2017) and exercise for chronic low back pain (2021). Three Cochrane reviews were performed on spinal manipulation for chronic low back pain (2011), acute low back pain (2012) and low back and pelvic pain in pregnancy (2015).

[b]IQR, interquartile range.

[c]For reviews with at least one included trial.

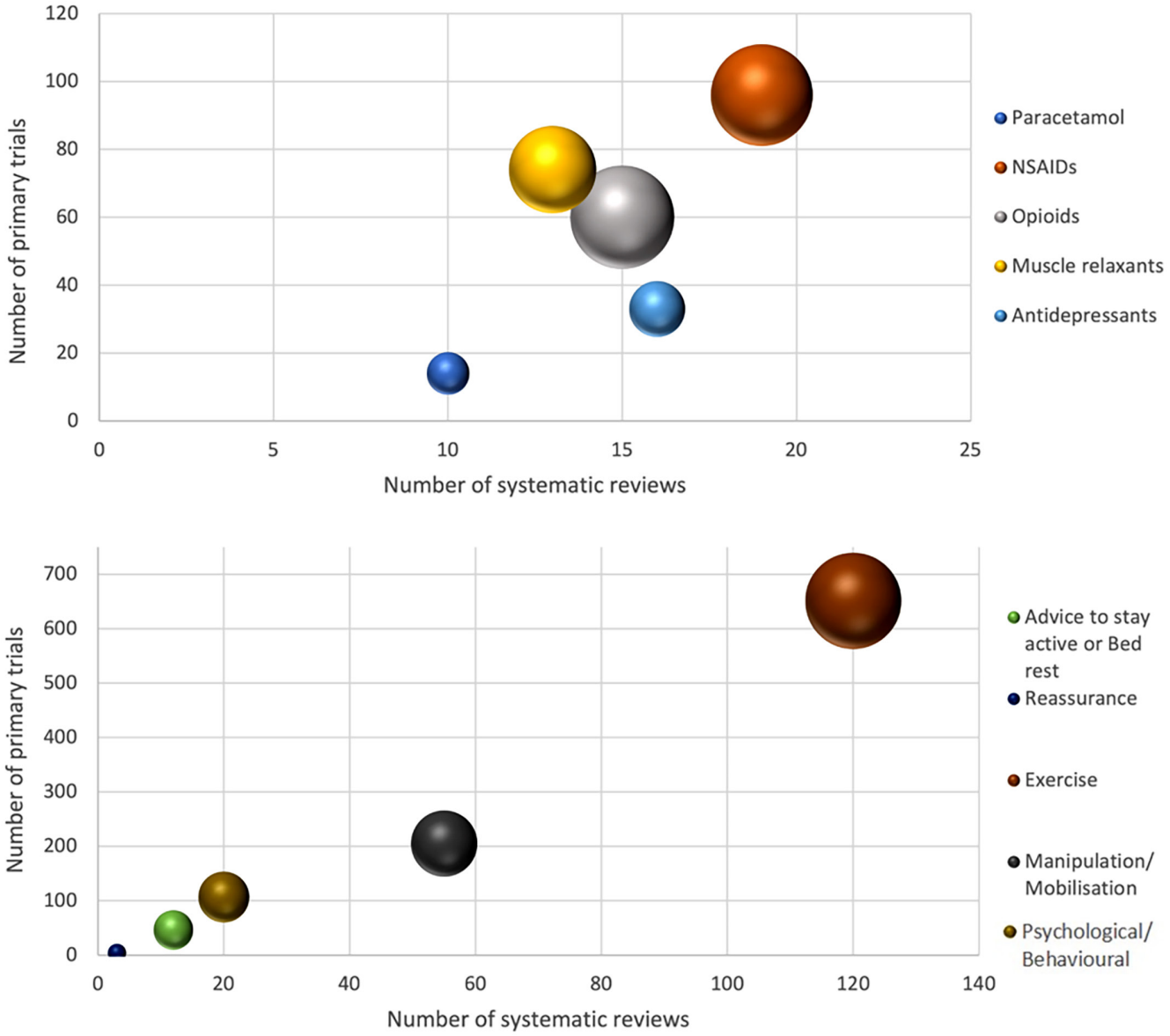

FIGURE 3 Bubble plot depicting the number of systematic reviews, primary trials and sample size for each management strategy. *Total sample size of included primary trials represented by the size of each bubble, (i) Pharmaceutical treatments, (ii) Non-pharmaceutical treatments.

Few reviews limited inclusion to trials recruiting participants in the emergency department setting (8% of advice to stay active to 20% of paracetamol).

Some reviews of muscle relaxants, antidepressants, exercise, manipulation/mobilization and psychological/behavioural treatments assessed a specific subcategory or medication class. In particular, most (71%) exercise reviews were for specific types of exercise. Of the 20 different types of exercise, there were 16 (13%) reviews for motor control/stabilization exercises, 13 (11%) for yoga, 10 (8%) for Pilates, and 9 (8%) for McKenzie technique. Most reviews considered a range of comparators including placebo, no/minimal treatment or usual care or another active treatment. The proportion of reviews that assessed certainty of evidence ranged from 38% for antidepressants to 69% for muscle relaxants (Table 1).

Figure 4 shows the cumulative number of systematic reviews (Figure 4i) and primary trials (Figure 4ii) published per calendar year for each management strategy. The number of reviews and trials for exercise has increased exponentially over time while there has been a more linear rise in number of reviews and trials for all other approaches to management, except reassurance of the benign nature of low back pain. The ratio of reviews to trials appears to be generally increasing over time (Figure 4iii). Conversely, no clear time-related trend was observed for the proportion of reviews assessing certainty of evidence (Figure 4iv).

TABLE 2 Number of systematic reviews per management strategy addressing specific eligibility criteria

	Paracetamol (*N* = 10)	NSAIDs (*N* = 19)	Opioids (*N* = 15)	Muscle relaxants (*N* = 13)[b]	Antidepressants (*N* = 16)[b]	Advice to stay active or bed rest(*N* = 12)	Reassurance (*N* = 3)	Exercise (*N* = 120)	Manipulation/ mobilization (*N* = 55)	Psychological/ Behavioural (*N* = 16)
Pain duration										
Any pain duration	8 (80%)	12 (63%)	7 (47%)	11 (85%)	8 (50%)	7 (58%)	1 (33%)	70 (58%)	36 (65%)	10 (50%)
Acute	1 (10%)	2 (11%)	0	0	0	4 (33%)	2 (67%)	2 (2%)	5 (9%)	0
Chronic	1 (10%)	5 (26%)	8 (53%)	2 (15%)	8 (50%)	1 (8%)	0	48 (40%)	14 (25%)	10 (50%)
Population[a]										
Any age population	4 (40%)	9 (47%)	5 (33%)	8 (62%)	9 (56%)	5 (41.7%)	2 (67%)	49 (41%)	22 (40%)	7 (35%)
Children only	0	0	0	0	0	0	0	1 (1%)	0	0
Adults, any	3 (30%)	9 (47%)	9 (60%)	4 (31%)	6 (38%)	5 (42%)	1 (33%)	59 (49%)	25 (45%)	10 (50%)
Adults, excluding older adults	2 (20%)	1 (5%)	1 (7%)	1 (8%)	1 (6%)	2 (17%)	0	8 (7%)	6 (11%)	1 (5%)
Older adults only	1 (10%)	0	0	0	0	0	0	3 (3%)	2 (4%)	2 (10%)
Setting										
Any setting	7 (70%)	16 (84%)	13 (87%)	10 (77%)	15 (94%)	10 (83%)	3 (100%)	119 (99%)	50 (91%)	18 (90%)
Primary care	1 (10%)	1 (5%)	0	1 (8%)	1 (6%)	1 (8%)	0	1 (1%)	5 (9%)	2 (10%)
Emergency	2 (20%)	2 (11%)	2 (13%)	2 (15%)	0	1 (8%)	0	0	0	0
Condition										
Low back pain	8 (80%)	9 (47%)	7 (47%)	8 (62%)	10 (63%)	5 (42%)	1 (33%)	76 (63%%)	36 (65%)	17 (85%)
Low back pain +/− leg pain	1 (10%)	5 (26%)	5 (33%)	3 (23%)	5 (31%)	3 (25%)	1 (33%)	40 (33%)	14 (25%)	3 (15%)
Radiculopathy	1 (10%)	5 (26%)	2 (13%)	2 (15%)	1 (6%)	4 (33%)	1 (33%)	4 (3%)	5 (9%)	0
Intervention										
Specific strategy[b]	0	0	0	2 (15%)	3 (19%)	0	0	85 (71%)	27 (49%)	12 (60%)
Comparator										
Any comparator group	6 (60%)	11 (58%)	9 (60%)	7 (54%)	6 (38%)	8 (67%)	2 (67%)	78 (65%)	26 (47%)	10 (50%)
Placebo	3 (30%)	6 (32%)	3 (20%)	5 (38%)	8 (50%)	1 (8%)	1 (33%)	8 (7%)	19 (35%)	2 (10%)
No/minimal treatment, usual care	2 (20%)	2 (11%)	1 (7%)	1 (8%)	2 (13%)	1 (8%)	1 (33%)	25 (21.0%)	15 (27%)	9 (45%)
Comparative treatment[c]	0	4 (21%)	4 (27%)	3 (23%)	2 (13%)	3 (25%)	0	34 (28%)	22 (40%)	7 (35%)

[a]Other populations specified included pregnancy (9 reviews (8%) for exercise, 5 reviews (9%) for manipulation/mobilization and 1 review (10%) for paracetamol) and athletes (2 reviews (2%) for exercise, and 1 review (2%) for manipulation/mobilization).

[b]Number of reviews assessing specific muscle relaxant drugs: cyclobenzapine 1(8%), baclofen 1 (8%). Number of reviews assessing specific antidepressant drugs: amitryptilline 1 (6%), duloxetine 2 (13%). Number of reviews assessing specific treatments for exercise: motor control/stabilization exercises 16 (13%), yoga 13 (11%), Pilates 10 (8%), McKenzie 9 (8%), Tai chi 7 (6%), walking 6 (5%), mindful exercises (e.g. Baduanjin) 5 (4%), aquatic exercise 3 (3%), graded activity 3 (3%), PNF techniques 3 (3%), hip exercises 2 (2%), low back strengthening exercises 2 (2%), pelvic floor exercises 2 (2%), Alexander technique 1 (1%), low back unloaded exercises 1 (1%), sling exercises 1 (1%), slump stretching 1 (1%), sports climbing: 1 (1%), technology-supported exercise 1 (1%), whole body vibration exercise 1 (1%), posterior chain exercises 1 (1%), home-based exercises 1 (1%), individualized/personalized exercises 1 (1%). Number of reviews assessing specific treatments for manipulation/mobilization: manipulation only 12 (23%), mobilization only (4%), with additional treatment (21%), performed by: chiropractor 3 (6%), osteopath 2 (4%), physical therapist 1 (2%). Number of reviews assessing specific treatments for psychological/behavioural: cognitive behavioural 4 (20%), mindfulness 5 (25%), performed by non-psychologist 2 (10%), acceptance and commitment therapy 1 (10%), operant conditioning 1 (5%), with another treatment 1 (5%).

[c]Number of reviews assessing comparative treatment for NSAIDs: other drug 4 (21%), other non-drug treatment 2 (11%). Number of reviews assessing comparative treatment for opioids: other drug 4 (27%), other non-drug treatment 2 (13%). Number of reviews assessing comparative treatment for muscle relaxants: other drug 3 (23%). Number of reviews assessing comparative treatment for antidepressants: other drug 2 (13%), other non-drug treatment 1 (6%). Number of reviews assessing comparative treatment for advice to stay active or bed rest: any treatment 1 (8%), bed rest or advice to stay active opposite to intervention 1 (8%), exercise (1%). Number of reviews assessing comparative treatment for exercise: any treatment 13 (11%), other exercise 8 (7%), physical therapy 6 (5%), manual therapy 4 (3%), advice 2 (2%). Number of reviews assessing comparative treatment for manipulation/mobilization: any treatment 16 (29%), other manipulation 4 (7%), exercise 3 (5%), advice 1 (2%). Number of reviews assessing comparative treatment for psychological/behavioural: any treatment 5 (25%), other psychological/behavioural 2 (20%).

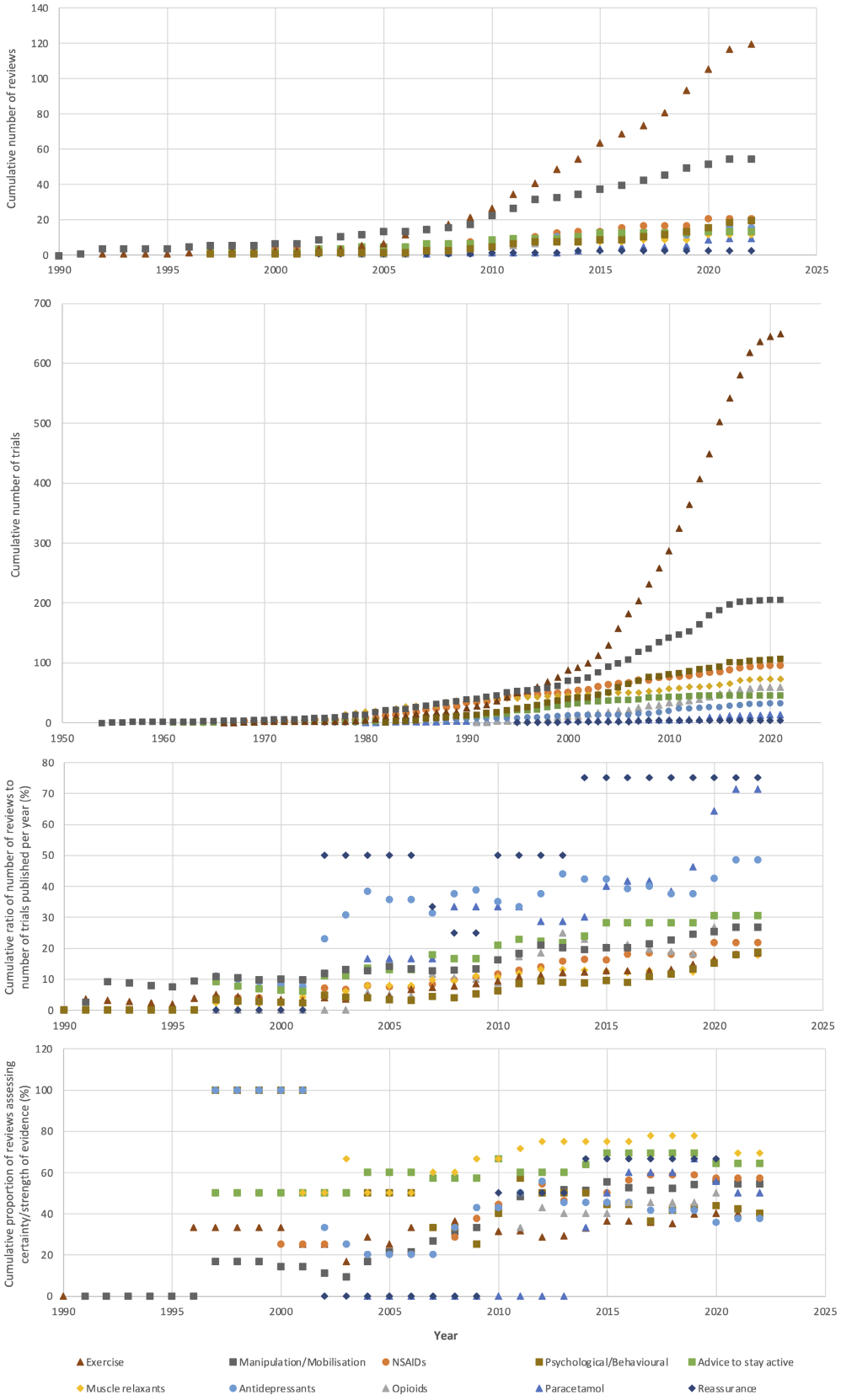

FIGURE 4 Systematic reviews and included trials for each management strategy, performed over time. (i) Cumulative number of systematic reviews performed for each management strategy over time, (ii) Cumulative number of primary trials included in the systematic reviews over time, (iii) Rate of the number of reviews to the number of primary trials performed per year, (iv) Percentage of reviews assessing strength/certainty of evidence over time.

4 | DISCUSSION

4.1 | Key findings

We developed an evidence map of published systematic reviews and their included primary trials, for 10 commonly recommended management strategies for low back pain. Substantial evidence is available for each strategy except for the provision of reassurance of the benign nature of low back pain. However, at least one third (and up to two thirds) of systematic reviews did not assess the certainty of evidence.

The quantity of available evidence has increased steadily over time, except for systematic reviews and primary trials on the effectiveness of exercise, which show more exponential growth. Large heterogeneity in the eligibility criteria between systematic reviews is present, particularly for exercise where 20 specific types of exercise were assessed. However, some age ranges (children and older adults), clinical settings (emergency) and conditions (radiculopathy) were infrequently assessed. Cochrane reviews have been performed for all management strategies except reassurance of the benign nature of low back pain; however, many were published prior to 2015 and may be out of date.

4.2 | High quantity of evidence (potential research redundancy)

Generally, a high quantity of evidence, including both systematic reviews and primary trials, is available to assess the effectiveness of the investigated management strategies. Therefore, any decision to conduct further research into the effectiveness of these approaches should provide clear justification, for example, need for an updated review to increase the certainty of evidence, precision of the effect estimates, or to investigate a particular subpopulation. Research redundancy has been identified as a potential issue, particularly as research is time consuming and expensive, and funding is limited (Chalmers & Glasziou, 2009). Research performed on low priority research questions, or without reference to how a further review would add to previous systematic reviews, contributes to research waste (Chalmers & Glasziou, 2009). The large number of systematic reviews addressing the investigated management strategies suggests at least some duplication of effort, although varied eligibility criteria may explain some of this. The large number of systematic reviews may also add to confusion in articulation of research findings, particularly if there are different conclusions between the reviews. It may also have contributed to conflicting guideline recommendations for five treatments (paracetamol, opioids, muscle relaxants, antidepressants, manipulation/mobilization) (Oliveira et al., 2018).

4.3 | Low quantity of evidence (potential research gaps)

A paucity of evidence exists to determine the effectiveness of provision of reassurance of the benign nature of low back pain to decrease low back pain intensity or disability. Only three systematic reviews have assessed clinical trial evidence for this treatment, with no systematic reviews performed after 2014 (Abdel Shaheed et al., 2014; Ford et al., 2020; Pengel et al., 2002), and no Cochrane review. Four primary trials, including 1954 participants, were included within the three systematic reviews. However, all trials assessed the effectiveness of a combination of reassurance with advice to stay active and it is unclear if there are any primary trials assessing the effectiveness of reassurance alone. Despite the limited evidence, reassurance is recommended in approximately 70% of guidelines (Oliveira et al., 2018), and thus may need further investigation.

Although Cochrane reviews have been undertaken for the majority of management strategies included in this evidence map, most of the reviews were published prior to 2015 and may require updating depending on whether or not an update is likely to alter the conclusions. The last Cochrane review for muscle relaxants was published in 2003 (van Tulder et al., 2003) and the last Cochrane review for general exercise for any pain duration was published in 2005 (Hayden et al., 2005), with more recent Cochrane reviews for exercise addressing motor control exercises (Macedo et al., 2016; Saragiotto et al., 2016), yoga (Wieland et al., 2017), Pilates (Yamato et al., 2015), and chronic pain (Jill A Hayden et al., 2021) specifically.

Systematic reviews may not be including all of the available primary trials. For a given management strategy, reviews included at the most between 28% (psychological/behavioural) and 58% (antidepressants) of trials identified from all included reviews for that treatment. This relatively small proportion of trials could be explained by the timing of the review in relation to the trial publications as well as the specific eligibility criteria for the reviews; however, even the most up-to-date systematic reviews with the least restrictive inclusion criteria did not include all available trials.

Despite the large volume of systematic reviews, there appears to be a paucity of reviews with specific eligibility criteria related to children, older adults, emergency care settings, and radiculopathy as a clinical presentation. In

addition, none of the reviews specified eligibility criteria related to geographic location or ethnicity. It is currently unclear how much evidence exists to determine effectiveness of the investigated management strategies for these specific populations, and research gaps in these areas have been previously identified (Foster et al., 2018; Michaleff et al., 2014; Paeck et al., 2014). Systematic reviews assessing these specific populations may be indicated if the results of a more general review cannot be reasonably extrapolated to the population in question.

4.4 | Limitations

This evidence mapping provides a broad overview of the volume of available evidence for 10 commonly recommended management strategies for low back pain. The search was limited to systematic reviews and the primary trials contained within the reviews and therefore may underestimate the total number of primary trials, especially those conducted very recently, and may explain the apparent plateau observed in the number of primary trials across all treatments (Figure 4). Individual systematic review quality and results, including effect sizes and certainty of evidence, were not assessed in this evidence map; therefore, no conclusions regarding the consistency and certainty of the evidence of effectiveness can be made from this study. However, the results of this evidence map provide an indication of likely areas of research redundancy or gaps which require further assessment.

4.5 | Recommendations for future research

A large quantity of available evidence has been identified for each of the 10 investigated approaches for managing low back pain. Different eligibility criteria and dates of publication mean that there is variability in the primary trials included within each systematic review and potentially variability in systematic review conclusions. Umbrella reviews are indicated to assess the quality of systematic reviews and the consistency and certainty of evidence, particularly for treatments such as exercise and spinal manipulation/mobilization where there are a large number of reviews and some variability in guideline recommendations. This will help to determine which management strategies have sufficient evidence and identify approaches with low consistency and/or certainty of evidence, where further research may be indicated.

Strategies to reduce the potential repetition of research work should be considered. To be justified, future systematic reviews and primary trials need to first identify a clear research gap. Cochrane reviews should be regularly updated; unless there is already high certainty evidence for a particular treatment. Where possible, future reviews should be conducted within the auspices of Cochrane to avoid duplication and ensure that reviews are conducted to the highest standards, including standardized assessment of certainty of evidence using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria (Guyatt et al., 2008).

5 | CONCLUSION

Based on systematic reviews, there is a large body of evidence assessing the effectiveness of common approaches to manage low back pain. The quantity of available evidence has continued to increase over time and justification of the need for further systematic reviews and primary trials is essential to avoid potential research redundancy when investigating effective management of low back pain.

AUTHOR CONTRIBUTIONS

HJ is responsible for the integrity of the work. HJ provided substantial contribution to the conception and design of the review; collected, analysed and interpreted the data; drafted the initial article and approved the final version to be published. GF provided substantial contribution to the conception and design of the review; collected and interpreted the data; revised the article critically for important intellectual content and approved the final version to be published. AD provided substantial contribution to the conception and design of the review; interpreted the data; revised the article critically for important intellectual content and approved the final version to be published. CM provided substantial contribution to the conception and design of the review; interpreted the data; revised the article critically for important intellectual content and approved the final version to be published. RB provided substantial contribution to the conception and design of the review; interpreted the data; revised the article critically for important intellectual content and approved the final version to be published. MH provided substantial contribution to the conception and design of the review; interpreted the data; revised the article critically for important intellectual content and approved the final version to be published.

FUNDING INFORMATION

No funding was obtained for this study.

ACKNOWLEDGEMENTS

Open access publishing facilitated by Macquarie University, as part of the Wiley - Macquarie University agreement via the Council of Australian University Librarians.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

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How to cite this article: Jenkins, H. J., Ferreira, G., Downie, A., Maher, C., Buchbinder, R., & Hancock, M. J. (2022). The available evidence on the effectiveness of 10 common approaches to the management of non-specific low back pain: An evidence map. *European Journal of Pain*, *26*, 1399–1411. https://doi.org/10.1002/ejp.1974