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Rehabilitative management of back pain in children: Protocol for a mixed studies systematic review

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Title: Rehabilitative management of back pain in children: Protocol for a mixed studies systematic review

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ABSTRACT

Introduction: Little is known about effective, efficient and acceptable management of back pain in children. A comprehensive and updated evidence synthesis can help to inform clinical practice guidelines.

Objective: To inform a clinical practice guideline, we aim to conduct a systematic review of the literature and synthesize the evidence regarding effective, cost-effective and safe rehabilitation interventions for children with back pain to improve their pain, functioning and health outcomes.

Methods and analysis: We will search MEDLINE, Embase, PsycINFO, CINAHL, the Index to Chiropractic Literature, the Cochrane Controlled Register of Trials, and EconLit for primary studies published from inception in all languages. We will include quantitative studies (randomized controlled trials, cohort and case-control studies), qualitative studies, mixed methods studies, and full economic evaluations. To augment our search of the bibliographic electronic databases, we will search reference lists of included studies and relevant systematic reviews, Google Scholar, the WHO International Clinical Trials Registry Platform, and consult with content experts. We will assess risk of bias using appropriate critical appraisal tools. We will extract data about study and participant characteristics, intervention type and comparators, context and setting, outcomes, themes and methodological quality assessment. We will use a sequential approach at the review level to integrate data from the quantitative, qualitative and economic evidence syntheses.

Ethics and dissemination: Ethics approval is not required. We will disseminate findings through activities including: (1) presentations in national and international conferences; (2) meetings with national and international decision makers; (3) publications in peer-reviewed journals; and (4) posts on organizational websites and social media.

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3 **Systematic review registration number:** PROSPERO CRD42019135009
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5 **Key words:** systematic review, back pain, child, adolescent
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10 **Article Summary**

11
12 Strengths and limitations of this study
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- 14 • A systematic review integrating quantitative, qualitative and economic evidence to
15 examine the rehabilitative management of back pain in children.
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- 17 • Includes studies with a broad range of rehabilitation interventions as described by the
18 World Health Organization (WHO), and outcomes as described by the International
19 Classification of Functioning, Disability and Health (ICF) framework.
20
- 21 • Implements the Preferred Reporting Items for Systematic Review and Meta-Analysis
22 Protocols guidelines.
23
- 24 • There is no language restriction in articles.
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- 26 • Our search strategies, while comprehensive, may miss relevant studies.
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35 **Word count:** 4,160
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INTRODUCTION

Rationale

A significant proportion of children over 10 years of age suffer from back pain.¹⁻⁵ The prevalence of back pain in children ranges between 4% and 74%; the wide range is due to heterogeneous populations studied, and outcome measurements and methodologies used.^{6,7} Data from the World Health Organization (WHO) Global Burden of Disease study shows that low back pain is responsible for the 2nd most years lived with disability for children 15-19 years of age.⁵ Back pain begins early in life with physical, mental and social consequences (e.g., impact on school-related and sporting activities, general physical activity and well-being) that extend into adulthood.⁸⁻¹⁰ Most episodes of spinal pain are brief; however, in a three-year prospective cohort study of 1,465 school children in Denmark, up to 25% of children had three or more episodes over one year, and approximately 13% of children reported episodes lasting five or more weeks.¹¹

Two recent systematic reviews assessed the effectiveness of manual therapy to treat a number of conditions including back pain in children, but low-quality evidence precludes drawing conclusions.^{12,13} A previous systematic review and meta-analysis which evaluated the effectiveness of conservative interventions for low back pain in children under 18 years of age reported that exercise interventions may be promising for improving pain scores in children compared to no treatment; however, the evidence was very limited and of low-quality.¹⁴ This evidence needs updating. Additionally, to our knowledge, no integrative systematic review – one that incorporates both quantitative and qualitative studies – has been conducted regarding the rehabilitative management of back pain in children. Compared to traditional systematic reviews

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3 of quantitative studies, combining evidence of the effectiveness and efficiency of interventions
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5 with qualitative understanding from people's lived experiences can better inform clinical practice
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7 guidelines and policy.¹⁵
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12 This comprehensive knowledge synthesis can inform clinical practice guidelines for decision
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14 makers involved with caring for children with back pain including healthcare professionals in a
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16 variety of clinical, rehabilitation or community settings (e.g., physicians, nurses,
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18 physiotherapists, chiropractors, psychologists, occupational therapists, registered massage
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20 therapists). Moreover, the knowledge gaps that we identify can inform future research agendas.
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26 **Objectives**

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28 To inform the development of a clinical practice guideline, we aim to conduct an integrative
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30 systematic review of quantitative, qualitative and economic evidence regarding the rehabilitative
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32 management of back pain (including mid-back and low back pain) in children aged 19 years and
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34 under. Our review will address the following questions:
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38 1) What is the effectiveness and safety of rehabilitation interventions for improving pain,
39
40 functioning, and health outcomes in children with back pain?
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42 2) What are the patients', caregivers' and providers' experiences, preferences, expectations
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44 and valued outcomes regarding rehabilitation interventions for back pain?
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46 3) What is the cost-effectiveness of rehabilitation interventions for improving pain,
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48 functioning, and health outcomes in children with back pain?
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3 4) What can be hypothesized from the integration of the quantitative, qualitative and
4
5 economic evidence about the effectiveness, cost-effectiveness and safety of rehabilitation
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7 interventions for low back pain in children?
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10 We are targeting decision makers (clinicians, health managers/administrators, policy makers,
11 patients, and caregivers) involved in implementing, delivering or receiving rehabilitation
12 interventions or programs of care. We aim to provide them with knowledge regarding effective,
13 acceptable and positively experienced interventions for children with back pain and their
14 caregivers.
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24 **METHODS**

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26 We developed this systematic review protocol using the Preferred Reporting Items for
27 Systematic Reviews and Meta-Analyses for Protocols (PRISMA-P)¹⁶ (Additional File 1). We
28 registered our protocol on the International Prospective Register of Systematic Reviews
29 (PROSPERO) (registration # CRD42019135009).¹⁷ We will report our systematic review
30 according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses
31 (PRISMA) statement,¹⁸ or the Synthesis Without Meta-analysis (SWiM) reporting guideline,¹⁹
32 and the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ)
33 reporting guideline.²⁰
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47 **Eligibility criteria**

48 ***Population***

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50 We will target studies including children (aged 19 years or younger)²¹ with non-specific low
51 back or thoracic spine pain. We define LBP as pain and discomfort below the costal margin and
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3 above the inferior gluteal folds, with or without radiculopathy (referred leg pain).²²

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5 Radiculopathy refers to inflammation, injury/dysfunction, or compression of spinal nerve roots
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7 that can present as pain, weakness, or altered sensation in a myotomal or dermatomal
8
9 distribution. Lumbar radiculopathy is commonly attributed to lumbar disc herniation (localized
10
11 displacement of disc material beyond the normal margins of the intervertebral disc space).²³ We
12
13 define thoracic spine pain as pain within the region bounded superiorly by the first thoracic
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15 spinous process, inferiorly by the last thoracic spinous process, and laterally by the most lateral
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17 margins of the erector spinae muscles.²⁴ We will include studies investigating diagnoses
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19 including low back pain, mid-back pain, mechanical back pain, lumbago, lumbar sprain or strain,
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21 back sprain or strain, lumbopelvic pain, lumbar radiculopathy, lumbar disc herniation, sacroiliac
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23 syndrome, sciatica, musculoskeletal or non-specific chest wall pain (pain referred to the chest
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25 wall from the thoracic spine).
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33 We will exclude studies of children with back pain attributed to major structural or systemic
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35 pathology (e.g., fracture, infection, tumour, osteoporosis, inflammatory arthritides, cauda equina
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37 syndrome, neuromuscular disease, myelopathy, and scoliosis); and (2) studies of children with
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39 back pain attributed to a non-spine-related condition that might refer pain to the chest wall (e.g.,
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41 heart, lung or esophagus conditions).
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47 ***Intervention***

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49 We will include studies that investigate the effectiveness and safety of rehabilitation
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51 interventions or programs of care for children with back pain, including pharmacological and
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53 psychological interventions. The WHO defines rehabilitation as a set of interventions that assist
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3 individuals who experience, or are likely to experience, disability to achieve and maintain
4 optimal functioning when interacting with their environments.²⁵ Rehabilitation interventions
5
6 include rehabilitation medicine/therapy, which aims to: 1) improve function through the
7 diagnosis and treatment of health conditions, reducing impairments, preventing or treating
8 complications; and 2) restore and compensate loss of functioning, and prevent or slow
9 deterioration in functioning in every area of a person's life.²⁵ It may also include assistive
10 devices, which refers to any item, piece of equipment, or product used to increase, maintain, or
11 improve functional capabilities.²⁵ Various healthcare providers may provide interventions
12 including, but not limited to, general practitioners, nurses, physiotherapists, chiropractors,
13 occupational therapists, psychologists, and registered massage therapists (Table 1). We will
14 exclude studies assessing surgical interventions, and interventions solely conducted at the
15 societal level, such as barrier removal initiatives (e.g., fitting a ramp to a public building).
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33 **Comparison**

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35 The quantitative component of this review will consider comparisons including other
36 interventions, placebo or sham interventions, wait list, standard care, and no intervention.
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42 **Outcomes**

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44 We will include outcomes related to pain, functioning and health as described by the ICF
45 framework domains *body functions and structures* (to describe a child's impairment), and
46 *activities and participation* (to describe a child's functional status and involvement in life
47 situations).²⁶ We will also include adverse events, cost measures, and qualitative outcomes
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54 (Table 2).
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Types of studies

We will include randomized controlled trials, cohort studies, case-control studies, and mixed-methods studies (quantitative component) for question 1 (effectiveness and safety of interventions); qualitative and mixed-methods studies (qualitative component) for question 2 (users' experiences, preferences, expectations and valued outcomes of interventions); and trial- and model-based full economic evaluations for question 3 (cost-effectiveness of interventions) (Table 2).

We will exclude the following types of studies: cross-sectional studies, pilot studies assessing feasibility, protocol studies, case reports, case series, studies assessing only prevention of back pain and incidence outcomes, systematic reviews (although their reference lists will be searched for potentially relevant studies) and other review papers, clinical practice guidelines, biomechanical studies, laboratory studies, cadaveric or animal studies, conceptual papers, letters, editorials, commentaries, books and book chapters, conference proceedings, meeting abstracts, lectures and addresses, consensus development statements, guideline statements, and studies reviewing solely partial economic evaluations (e.g., cost of illness studies).

Context and setting

We will consider rehabilitation interventions/programs of care delivered in any healthcare system within an urban or rural area and in any healthcare setting (e.g., acute care, hospital, primary health care, rehabilitation clinics), or in the community. Community-based rehabilitation is implemented through the combined efforts of individuals with disabilities, their families and

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3 communities, and relevant government and non-government health, education, social and other
4 services (e.g., advocacy programme).²⁷
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10 **Information sources**

11 We will develop the initial search strategy in MEDLINE, in consultation with an experienced
12 health sciences librarian. A second experienced health sciences librarian will review the search
13 strategy assessing its appropriateness and comprehensiveness using the Peer Review of
14 Electronic Search Strategies (PRESS) Checklist.^{28 29} We will conduct electronic searches of the
15 following databases from database inception to the present: MEDLINE (Ovid), Embase (Ovid),
16 PsycINFO (Ovid), CINAHL (Cumulative Index to Nursing and Allied Health Literature,
17 EBSCO*host*), the Index to Chiropractic Literature (Chiropractic Library Collaboration), the
18 Cochrane Controlled Register of Trials (Ovid), and EconLit (EBSCO*host*). We will augment our
19 search of the bibliographic electronic databases to identify additional relevant studies, and
20 mitigate the potential impact of publication bias and selective outcome reporting bias.³⁰ We will
21 search reference lists of included studies from the database searches and relevant systematic
22 reviews; we will search Google Scholar; and we will consult with content experts. We will ask
23 experts to suggest up to three targeted websites that may contain relevant studies and other
24 potentially relevant studies not captured by our search strategy. Lastly, we will search the WHO
25 International Clinical Trials Registry Platform (<http://apps.who.int/trialsearch/>). For studies only
26 reported in the registry, we will contact first authors by email (with two reminders over one
27 month) to obtain full study reports, or additional study or outcome data. We will include studies
28 in any language and will use professional medical translation services where required.
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Search strategy

The searches will include a combination of subject headings specific to databases (e.g. MeSH in MEDLINE) and free text words to capture the key concepts of rehabilitative management of back pain in children (Additional file 2). We will search Google Scholar using the terms *back pain AND children AND rehabilitation*.

Patient and public involvement

Patients were not involved in the design of our study. However, we will seek patient and public consultation during the development of clinical practice guidelines, which will be the next phase of this project.

Data management

We will download the electronic search results into Endnote X9 reference manager software (Clarivate Analytics, PA, USA). We will remove duplicates and upload the remaining references to the Evidence for Policy and Practice Information and Coordinating (EPPI) Centre Reviewer software for the data extraction stages (EPPI-Reviewer version 4, UCL Institute of Education, University of London, UK). EPPI-Reviewer software stores references, manages and monitors the data extraction process and provides an audit trail for the review.³¹

Screening for eligibility

Using the inclusion and exclusion criteria, pairs of reviewers will independently screen titles and abstracts, and subsequently the full text of each selected article in order to confirm inclusion into the study. Titles and abstracts will be classified as possibly relevant or irrelevant. With respect to

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3 Google Scholar, for reasons of feasibility, we will perform title and abstract screening for only
4 the first 250 results. Subsequently, full-text articles of abstracts classified as possibly relevant
5 will be retrieved, reviewed and classified as relevant or irrelevant.
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11 We will conduct training exercises prior to initiating the screening process to ensure reliability
12 between reviewers. Reviewers will first screen a random sample of 50 records based on titles and
13 abstracts. Paired reviewers must reach 90% agreement before completing title and abstract
14 screening for the remaining studies.³² If this threshold is not reached for all review teams, all
15 team members will discuss differences in classification to clarify and potentially modify the
16 eligibility criteria prior to completing title and abstract screening. Next, reviewers will screen a
17 random sample of 25 full-text articles. All paired reviewers must again reach 90% agreement
18 before completing full-text article screening for the remaining studies. If not, all team members
19 will discuss to clarify eligibility criteria and resolve disagreements prior to completing full-text
20 article screening. Upon completing full-text article screening, paired reviewers will discuss
21 disagreements and reach consensus related to the inclusion of any article, involving a third
22 reviewer if necessary.
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42 **Risk of bias in individual studies**

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44 We will assess the quality of studies using the Scottish Intercollegiate Guidelines Network
45 (SIGN) criteria for randomized controlled trials (RCTs), cohort and case-control studies;³³ the
46 Joanna Briggs Institute (JBI) Critical Appraisal Checklist for qualitative studies;³⁴ the Mixed
47 Methods Appraisal Tool (MMAT) for mixed methods studies;³⁵ and the Drummond checklist for
48 economic evaluations.³⁶ The SIGN checklists allow reviewers to assess internal validity by
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3 considering the impact of selection bias, information bias, and confounding on study results. The
4 JBI checklist allows reviewers to assess the possibility of bias in qualitative studies' design,
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6 JBI checklist allows reviewers to assess the possibility of bias in qualitative studies' design,
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8 conduct and analysis. The MMAT allows reviewers to assess the interdependent qualitative and
9
10 quantitative components of the study and criteria to consider, such as justification for mixing
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12 evidence, and appropriate ways of integrating the data. The Drummond checklist allows
13
14 reviewers to identify elements that demonstrate a sound economic evaluation such as the
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16 assessment of both costs and effects of interventions, accurate measurements of costs and effects,
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18 and allowances made for uncertainty in the estimates of costs and effects. We will categorize the
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20 validity or credibility of each study as either low risk of bias, some concerns, or high risk of bias.
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22 We will contact the authors of papers to request missing or additional data for clarification where
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24 required. Paired reviewers will independently assess the eligible studies for quality. Any
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26 disagreements that arise between the reviewers will be resolved through discussion, or with a
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28 third reviewer.
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35 **Data items and data extraction process**

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37 Paired reviewers will independently extract the data from all eligible studies. For the quantitative
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39 studies, we will extract data on the study and participant characteristics; intervention and
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41 comparator intervention characteristics using the Template for Intervention Description and
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43 Replication (TIDieR) checklist,³⁷ outcomes broadly categorized according to the ICF categories
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45 (body functions and structures, activities and participation;³⁸⁻⁴⁰ adverse events; key findings; and
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47 methodological quality. The TIDieR checklist³⁷ consists of items to help readers better
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49 understand the interventions and how they were delivered (i.e., name of intervention, why, what
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51 (materials), what (procedure), who provided, how, where, when and how much, tailoring,
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3 modifications, how well (planned), how well (actual)).³⁷ We will use the PerSPecTIF question
4 formulation framework to guide data extraction for the qualitative studies regarding the items:
5 perspective, setting, phenomenon of interest, environment, timing, and findings (e.g., themes).⁴¹
6
7 We will also extract data describing the qualitative approach used and methodological quality of
8 studies. For both quantitative and qualitative studies, we will extract data on the ICF categories
9
10 ‘environmental factors’ (contextual factors that make up the physical, social and attitudinal
11 environment in which people live and conduct their lives) and ‘personal factors’ (internal
12 contextual factors that influence how disability is experienced by the individual) to add context
13 to the interventions and outcomes.²⁶ For the economic evaluations, we will use the Consolidated
14 Health Economic Evaluation Reporting Standards (CHEERS) statement⁴² and extract data on the
15 analytic approach (trial- or model-based), evaluation type, the analytic perspective, time horizon
16 adopted for costs, main cost items, setting, key findings, and methodological quality of studies.
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33 Paired reviewers will pretest the data extraction form and revise as needed. We will use EPPI-
34 Reviewer software to manage the data extraction process. Any disagreements that arise between
35 the reviewers will be resolved through discussion, or with a third reviewer. We will contact
36 authors of papers to request missing or additional data, if required.
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45 **DATA SYNTHESIS**

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47 We will use a sequential approach at the review level to synthesize and integrate the data.⁴³ This
48 will involve separate quantitative, economic, and qualitative findings synthesis followed by
49 integration of the resultant quantitative, economic, and qualitative economic evidence. In each
50 synthesis, we will use ICF categories in the evidence table and text to synthesize the relevant
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3 data. Specifically, we will synthesize outcomes as *body functions and structures* (to describe a
4 child's impairment) or *activities and participation* (to describe a child's function and
5 involvement in life situations). We will also synthesize data according to *personal factors* (e.g.,
6 participants' expectations regarding the interventions or outcomes, and experiences with the
7 outcomes), and *environmental factors* (e.g., the environment in which people live or receive
8 rehabilitation interventions; or interventions that modify a child's physical, social or attitudinal
9 environment).

20 21 ***Quantitative synthesis***

22 We will assess clinical, methodological, and statistical heterogeneity among studies. Differences
23 in populations, interventions, comparators, or outcomes across studies may result in clinical
24 heterogeneity. Methodological and statistical heterogeneity may result from differences in risk of
25 bias and differences in outcomes across studies beyond what could be expected by chance alone.
26 We will assess the methodological heterogeneity across studies using our assessments from the
27 SIGN checklist as either low risk of bias, some concerns, or high risk of bias. We will assess
28 statistical heterogeneity using the I^2 statistic, whereby I^2 of <25-50% will be considered low to
29 moderate (homogeneous), and $\geq 50\%$ considered high (heterogeneous).⁴⁴ If two or more studies
30 are clinically homogeneous (i.e., similar populations, interventions, comparators and outcomes)
31 and statistically homogeneous (i.e., $I^2 < 25-50\%$), we will perform a random effects meta-analysis
32 using EPPI-Reviewer software using the relative risk (or odds ratio for rare events) effect
33 measure for dichotomous data, mean differences for continuous data, hazard rate ratios for time-
34 to-event data, and rates or rate ratios for count data. We will explore the impact of
35 methodological heterogeneity through sensitivity analyses. We will first analyze all studies (i.e.,
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3 low risk of bias, some concerns, and high risk of bias), then analyze the studies with some
4 concerns and low risk of bias studies separately. We will base our recommendations on studies
5 with low risk of bias and some concerns.⁴⁵
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12 If the studies are heterogeneous (i.e., if there is clinical, methodological, and statistical
13 heterogeneity), we will describe the findings of all eligible studies, stratified by low risk of bias,
14 some concerns, and high risk of bias. We will further stratify findings by study design (i.e.,
15 randomized controlled trial, cohort study, case-control study). We will then stratify findings by
16 type of intervention, and finally by type of outcome. If multiple outcome measures are used to
17 assess one construct, we will further stratify our analyses by outcome measure and describe how
18 the results vary. To quantify the effectiveness of interventions, we will use the data provided in
19 the studies to compute effect measures and 95% confidence intervals (i.e., odds ratio or relative
20 risk for dichotomous outcomes, mean differences for continuous outcomes, hazard rate ratios for
21 time-to-event outcomes, and rates or rate ratios for count outcomes).⁴⁶ Regarding adverse events,
22 we will report the unit of analysis as reported by the study authors (e.g., proportion of
23 participants that experienced adverse events, or number of adverse event experienced). We will
24 interpret the evidence on the effectiveness of interventions (i.e., whether an intervention was
25 superior, equal or inferior to a comparison intervention) by considering the direction, magnitude,
26 and precision of effect estimates across studies, impact of risk of bias in sensitivity analyses, and
27 the generalizability of findings. We will base our recommendations on studies with low risk of
28 bias and some concerns.⁴⁵
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51 52 53 ***Economic synthesis*** 54 55 56 57 58 59 60

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3 We will report the main findings of economic studies, first stratified by low risk of bias, some
4 concerns, and high risk of bias. We will further stratify findings by study design (i.e., cost-
5 effectiveness, cost-utility, cost-benefit, or cost-consequences). We will then stratify findings by
6 type of intervention, outcome, and cost measure.
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14 To indicate whether an intervention might be judged favourable (or unfavourably) from an
15 economic perspective,⁴⁷ we will use the Dominance Ranking Matrix (DRM) to classify the
16 interventions into one of three options.⁴⁸ *Strong dominance* for the intervention will be selected
17 when the incremental cost-effectiveness measure shows the intervention as: (i) more effective
18 and less costly than the comparator; or (ii) effective and less costly; or (iii) equal cost and more
19 effective. In this case, from an efficiency perspective, decision makers should favor the
20 intervention over the comparator (in circumstances similar to those of the evaluations). *Weak*
21 *dominance* for the intervention will be selected when the measure shows the interventions as: (i)
22 equally costly and effective as the comparator; or (ii) more effective and more costly; or (iii) less
23 effective and less costly. In this case, no conclusion may be drawn about whether the
24 intervention is preferable from an efficiency perspective without further information on the
25 priorities or preferences of decision makers in a particular context. Decision makers must
26 determine whether the cost/benefit trade-offs are worth the implementing an intervention in their
27 particular context. Lastly, *non-dominance* for the intervention will be selected when the measure
28 shows the intervention as: (i) more costly and less effective; or (ii) equally as costly and less
29 effective; or (iii) more costly and as effective. In this case the evidence we will interpret the
30 evidence as suggesting the comparator is favourable from an efficiency perspective (in
31 circumstances similar to those of the evaluations).
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Qualitative synthesis

We will stratify the qualitative findings similarly to the quantitative and economic findings. We will first stratify the findings by risk of bias (high risk of bias, some concerns, or low risk of bias), then by study approach or design (e.g., qualitative descriptive, ethnography, grounded theory), and by intervention type and outcome.

Additionally, we will stratify findings according to individual perspective (i.e., patient (children), caregivers (parents/guardians), healthcare providers, community service providers, or others involved with the rehabilitation of back pain in children). We will use thematic synthesis to synthesize the qualitative research findings.^{49 50} First, we will enter all the text labelled as ‘results’ or ‘findings’ of the primary studies verbatim into EPPI-Reviewer. Then, pairs of trained reviewers will independently code each line of text according to its meaning and content, and group codes hierarchically into descriptive themes, including the *a priori* themes (intervention type and outcomes according to the ICF framework). Reviewers will also generate themes *a posteriori* to answer our review question (i.e., experiences, preferences, expectations and valued outcomes regarding rehabilitation interventions for back pain in children). Reviewers will finalize the themes through discussion. We will base our recommendations on studies with low risk of bias and some concerns.⁴⁵

Integration of quantitative, qualitative and economic evidence

Various methods can be used to integrate diverse study types including: (1) juxtaposing findings in a matrix, (2) using logic models/conceptual framework, (3) analyzing program theory, (4)

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3 testing hypothesis derived using subgroup analysis, and (5) qualitative comparative analysis.⁴³
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5 We will integrate the evidence by juxtaposing findings in a matrix to generate hypotheses
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7 regarding the effectiveness, cost-effectiveness and safety of rehabilitation interventions for low
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9 back pain in children. We selected this methodology because it is suitable for comparing and
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11 contrasting the findings across the individual quantitative, qualitative and economic evidence
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13 syntheses in our review.⁴³ The use of a matrix will allow us to explore heterogeneity in the
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15 findings of the quantitative studies and may indicate why some interventions may be effective,
16
17 cost-effective and safe, and some may not.⁴³ For example, we may list themes from the
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19 qualitative synthesis along one side of the matrix, and then plot the interventions evaluated in the
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21 quantitative synthesis against the themes as either a match (when the intervention matched a
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23 theme) or a mismatch (when the intervention was the opposite of a theme). We will also plot the
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25 economic evaluation findings against the corresponding intervention and theme. We will identify
26
27 gaps in knowledge if a particular theme for an intervention does not match with any of the
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29 interventions evaluated in the quantitative studies.
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38 **DISSEMINATION**

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40 Knowledge translation activities will include presentations to clinicians and researchers at
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42 national and international conferences; meetings with national and international decision makers
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44 (clinicians, health managers/administrators, policy makers and patients); publications in peer-
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46 reviewed journals; clinician and patient/caregiver resources; posts and lay language summaries
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48 on organizations' websites (open access) and other social media platforms.
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54 **DISCUSSION**

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3 Findings from this mixed studies review will advance our knowledge of the effectiveness, safety,
4 user experience, and cost-effectiveness of a wide range of rehabilitation interventions for
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6 children with back pain. This work will provide the evidentiary basis to develop clinical practice
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8 guidelines and care pathways outlining the evidence-based management of back pain in children,
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10 which can be adapted for specific settings (e.g., hospitals, rehabilitation clinics, and schools) and
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12 geographical regions. Specifically, decision makers should consider interventions that are
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14 identified as effective, safe, efficient, and positively experienced by patients and caregivers.
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16 Mapping findings to the ICF framework will allow decision makers to use standardized language
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18 in the assessment and management of children during their care program. This may further
19
20 facilitate improvements in functioning and health outcomes in this patient population.
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29 A potential limitation of our review is that our search strategy may miss potentially relevant
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31 studies, however, we have mitigated this by expanding our search strategy to include content
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33 experts and searching relevant websites. A potential risk is that there may be too little evidence
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35 available to answer our review questions.
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40 Findings from this review will guide future research by identifying methodological limitations
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42 and knowledge gaps in the available literature. Future studies can be designed to address these
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44 limitations and gaps. This novel interpretation of quantitative, qualitative and economic evidence
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46 according to the ICF framework serves as a model for how outcomes related to functioning and
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48 health can be prioritized in future research.⁵¹
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ADDITIONAL FILES

Additional file 1: PRISMA-P 2015 Checklist. Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement

Additional file 2: Literature search strategies

DECLARATIONS

Ethics approval and consent to participate: Not applicable

Consent for publication: Not applicable

Availability of data and materials: Not applicable

Competing interests: None declared.

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Author contributions:

All authors assisted in developing the research questions and systematic review methodology. CC and JJW drafted the manuscript. All authors reviewed and revised the manuscript, and approved the final manuscript.

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43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

REFERENCES

1. Joergensen AC, Hestbaek L, Andersen PK, et al. Epidemiology of spinal pain in children: a study within the Danish National Birth Cohort. *Eur J Pediatr* 2019;178(5):695-706. doi: 10.1007/s00431-019-03326-7 [published Online First: 2019/02/23]
2. Aartun E, Hartvigsen J, Wedderkopp N, et al. Spinal pain in adolescents: prevalence, incidence, and course: a school-based two-year prospective cohort study in 1,300 Danes aged 11-13. *BMC Musculoskelet Disord* 2014;15:187. doi: 10.1186/1471-2474-15-187 [published Online First: 2014/06/03]
3. Beynon AM, Hebert JJ, Lebouef-Yde C, et al. Potential risk factors and triggers for back pain in children and young adults. A scoping review, part I: incident and episodic back pain. *Chiropr Man Therap* 2019;27:58. doi: 10.1186/s12998-019-0280-9 [published Online First: 2019/12/13]
4. Kamper SJ, Yamato TP, Williams CM. The prevalence, risk factors, prognosis and treatment for back pain in children and adolescents: An overview of systematic reviews. *Best Pract Res Clin Rheumatol* 2016;30(6):1021-36. doi: 10.1016/j.berh.2017.04.003 [published Online First: 2017/11/07]
5. Calvo-Munoz I, Gomez-Conesa A, Sanchez-Meca J. Prevalence of low back pain in children and adolescents: a meta-analysis. *BMC Pediatr* 2013;13:14. doi: 10.1186/1471-2431-13-14 [published Online First: 2013/01/29]
6. King S, Chambers CT, Huguet A, et al. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. *Pain* 2011;152(12):2729-38. doi: 10.1016/j.pain.2011.07.016 [published Online First: 2011/11/15]

- 1
2
3 7. Jeffries LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain: a
4
5 systematic overview of the research literature. *Spine (Phila Pa 1976)* 2007;32(23):2630-
6
7 7. doi: 10.1097/BRS.0b013e318158d70b [published Online First: 2007/11/06]
8
9
- 10 8. Batley S, Aartun E, Boyle E, et al. The association between psychological and social factors
11
12 and spinal pain in adolescents. *Eur J Pediatr* 2019;178(3):275-86. doi: 10.1007/s00431-
13
14 018-3291-y [published Online First: 2018/11/23]
15
16
- 17 9. Kamper SJ, Henschke N, Hestbaek L, et al. Musculoskeletal pain in children and adolescents.
18
19 *Braz J Phys Ther* 2016;20(3):275-84. doi: 10.1590/bjpt-rbf.2014.0149 [published Online
20
21 First: 2016/07/22]
22
23
- 24 10. Stallknecht SE, Strandberg-Larsen K, Hestbaek L, et al. Spinal pain and co-occurrence with
25
26 stress and general well-being among young adolescents: a study within the Danish
27
28 National Birth Cohort. *Eur J Pediatr* 2017;176(6):807-14. doi: 10.1007/s00431-017-
29
30 2915-y [published Online First: 2017/05/05]
31
32
- 33 11. Dissing KB, Hestbaek L, Hartvigsen J, et al. Spinal pain in Danish school children - how
34
35 often and how long? The CHAMPS Study-DK. *BMC Musculoskelet Disord*
36
37 2017;18(1):67. doi: 10.1186/s12891-017-1424-5 [published Online First: 2017/03/28]
38
39
- 40 12. Driehuis F, Hoogeboom TJ, Nijhuis-van der Sanden MWG, et al. Spinal manual therapy in
41
42 infants, children and adolescents: A systematic review and meta-analysis on treatment
43
44 indication, technique and outcomes. *PLoS One* 2019;14(6):e0218940. doi:
45
46 10.1371/journal.pone.0218940 [published Online First: 2019/06/27]
47
48
- 49 13. Parnell Prevost C, Gleberzon B, Carleo B, et al. Manual therapy for the pediatric population:
50
51 a systematic review. *BMC Complement Altern Med* 2019;19(1):60. doi: 10.1186/s12906-
52
53 019-2447-2 [published Online First: 2019/03/15]
54
55
56
57
58
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4
5
6
7
8
9
10
11
12
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41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
14. Michaleff ZA, Kamper SJ, Maher CG, et al. Low back pain in children and adolescents: a systematic review and meta-analysis evaluating the effectiveness of conservative interventions. *Eur Spine J* 2014;23(10):2046-58. doi: 10.1007/s00586-014-3461-1 [published Online First: 2014/07/30]
 15. Harden A, Thomas J. Methodological issues in combining diverse study types in systematic reviews. *International Journal of Social Research Methodology* 2005;8(3):257-71.
 16. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;4:1. doi: 10.1186/2046-4053-4-1 [published Online First: 2015/01/03]
 17. National Institute for Health Research. International Prospective Register of Systematic Reviews (PROSPERO). Available at: <https://www.crd.york.ac.uk/prospero/> (accessed Jan 10, 2019).
 18. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *J Clin Epidemiol* 2009;62(10):1006-12. doi: 10.1016/j.jclinepi.2009.06.005 [published Online First: 2009/07/28]
 19. Campbell M, McKenzie JE, Sowden A, et al. Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline. *BMJ* 2020;368:l6890. doi: 10.1136/bmj.l6890 [published Online First: 2020/01/18]
 20. Tong A, Flemming K, McInnes E, et al. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Med Res Methodol* 2012;12:181. doi: 10.1186/1471-2288-12-181 [published Online First: 2012/11/29]

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2
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4
5
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43
44
45
46
47
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50
51
52
53
54
55
56
57
58
59
60
21. World Health Organization. Definition of key terms. Age groups and population [Available from: <https://www.who.int/hiv/pub/guidelines/arv2013/intro/keyterms/en/> accessed January 15, 2020.
22. Amundsen PA, Evans DW, Rajendran D, et al. Inclusion and exclusion criteria used in non-specific low back pain trials: a review of randomised controlled trials published between 2006 and 2012. *BMC Musculoskelet Disord* 2018;19(1):113. doi: 10.1186/s12891-018-2034-6 [published Online First: 2018/04/14]
23. North American Spine Society. NASS Clinical Guidelines: Lumbar Disc Herniation with Radiculopathy. Available at: <https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf> (accessed Dec 12, 2018).
24. Merskey H, Bogduk N, International Association for the Study of Pain, et al. Classification of chronic pain: descriptions of chronic pain syndromes and definitions of pain terms. 2nd ed. Seattle: IASP Press 1994:xvi, 222 p. p.
25. The World Health Organization. World Report on Disability: Chapter 4 Rehabilitation. Available at: <https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf> (access Dec 16, 2018).
26. World Health Organization. The International Classification of Functioning, Disability and Health (ICF). Available at: <https://www.who.int/classifications/icf/icfbeginnersguide.pdf> (accessed Dec 1, 2018).
27. World Health Organization. Community-based rehabilitation. Available at: <https://www.who.int/disabilities/cbr/en/> (accessed Dec. 1, 2018).

- 1
2
3 28. Sampson M, McGowan J, Cogo E, et al. An evidence-based practice guideline for the peer
4 review of electronic search strategies. *J Clin Epidemiol* 2009;62(9):944-52. doi:
5
6 10.1016/j.jclinepi.2008.10.012 [published Online First: 2009/02/24]
7
8
9
10 29. McGowan J, Sampson M, Salzwedel DM, et al. PRESS Peer Review of Electronic Search
11 Strategies: 2015 Guideline Statement. *J Clin Epidemiol* 2016;75:40-6. doi:
12
13 10.1016/j.jclinepi.2016.01.021 [published Online First: 2016/03/24]
14
15
16
17 30. Godin K, Stapleton J, Kirkpatrick SI, et al. Applying systematic review search methods to the
18 grey literature: a case study examining guidelines for school-based breakfast programs in
19 Canada. *Syst Rev* 2015;4:138. doi: 10.1186/s13643-015-0125-0 [published Online First:
20
21 2015/10/27]
22
23
24
25
26 31. Centre EfPaPIaC. EPPI-Reviewer 4 software [Available from: eppi.ioe.ac.uk accessed
27 November 20, 2019].
28
29
30
31 32. Belur J, Tompson L, Thornton A, et al. Interrater reliability in systematic review
32 methodology: Exploring variation in coder decision-making. *Sociological Methods &*
33
34 *Research* 2018;1-29.
35
36
37
38 33. Scottish Intercollegiate Guidelines Network (SIGN). Critical appraisal notes and checklists,
39 2019. Available at: <https://www.sign.ac.uk/checklists-and-notes.html> (accessed Feb 1,
40
41 2019).
42
43
44
45 34. Lockwood C, Munn Z, Porritt K. Qualitative research synthesis: methodological guidance for
46 systematic reviewers utilizing meta-aggregation. *Int J Evid Based Healthc*
47
48 2015;13(3):179-87. doi: 10.1097/xeb.000000000000062 [published Online First:
49
50 2015/08/12]
51
52
53
54
55
56
57
58
59
60

- 1
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4
5
6
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41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
35. Pluye P, Gagnon MP, Griffiths F, et al. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. *Int J Nurs Stud* 2009;46(4):529-46. doi: 10.1016/j.ijnurstu.2009.01.009 [published Online First: 2009/02/24]
36. Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic submissions to the BMJ. The BMJ Economic Evaluation Working Party. *BMJ* 1996;313(7052):275-83. doi: 10.1136/bmj.313.7052.275 [published Online First: 1996/08/03]
37. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ* 2014;348:g1687. doi: 10.1136/bmj.g1687 [published Online First: 2014/03/13]
38. Cieza A, Brockow T, Ewert T, et al. Linking health-status measurements to the International Classification of Functioning, Disability and Health. *J Rehabil Med* 2002;34(5):205-10. [published Online First: 2002/10/24]
39. Cieza A, Fayed N, Bickenbach J, et al. Refinements of the ICF Linking Rules to strengthen their potential for establishing comparability of health information. *Disabil Rehabil* 2016;1-10. doi: 10.3109/09638288.2016.1145258 [published Online First: 2016/03/18]
40. Cieza A, Geyh S, Chatterji S, et al. ICF linking rules: an update based on lessons learned. *J Rehabil Med* 2005;37(4):212-8. doi: 10.1080/16501970510040263 [published Online First: 2005/07/19]
41. Booth A, Noyes J, Flemming K, et al. Formulating questions to explore complex interventions within qualitative evidence synthesis. *BMJ Glob Health* 2019;4(Suppl 1):e001107. doi: 10.1136/bmjgh-2018-001107 [published Online First: 2019/02/19]

- 1
2
3 42. Husereau D, Drummond M, Petrou S, et al. Consolidated Health Economic Evaluation
4 Reporting Standards (CHEERS) statement. *BMJ* 2013;346:f1049. doi:
5
6 10.1136/bmj.f1049 [published Online First: 2013/03/27]
7
8
9
10 43. Harden A, Thomas J, Cargo M, et al. Cochrane Qualitative and Implementation Methods
11 Group guidance series-paper 5: Methods for integrating qualitative and implementation
12 evidence within intervention effectiveness reviews. *J Clin Epidemiol* 2018;97:70-78. doi:
13 10.1016/j.jclinepi.2017.11.029 [published Online First: 2017/12/16]
14
15
16
17
18 44. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Stat Med*
19 2002;21(11):1539-58. doi: 10.1002/sim.1186
20
21
22
23 45. Slavin RE. Best evidence synthesis: an intelligent alternative to meta-analysis. *J Clin*
24 *Epidemiol* 1995;48(1):9-18. [published Online First: 1995/01/01]
25
26
27
28 46. McKenzie JE, Brennan SE. Chapter 12: Synthesizing and presenting findings using other
29 methods. In: Higgins JPT TJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA., ed.
30 Cochrane Handbook for Systematic Reviews of Interventions version 60 (updated July
31 2019): Cochrane, 2019.
32
33
34
35
36
37 47. Shemilt I, Aluko P, Graybill E, et al. Economic Evidence. In: Higgins JPT TJ, Chandler J,
38 Cumpston M, Li T, Page MJ, Welch VA., ed. Cochrane Handbook for Systematic
39 Reviews of Interventions version 60, 2019.
40
41
42
43
44 48. Joanna Briggs Institute. Chapter 6: Systematic reviews of economic evidence 2019
45 [Available from:
46
47 [https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of](https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of+economic+evidence)
48
49 [+economic+evidence](https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of+economic+evidence) accessed February 1, 2020.
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 49. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic
4 reviews. *BMC Med Res Methodol* 2008;8:45. doi: 10.1186/1471-2288-8-45 [published
5
6 Online First: 2008/07/12]
7
8
9
- 10 50. Noyes J, Booth A, Flemming K, et al. Cochrane Qualitative and Implementation Methods
11 Group guidance series-paper 3: Methods for assessing methodological limitations, data
12 extraction and synthesis, and confidence in synthesized qualitative findings. *J Clin*
13 *Epidemiol* 2018;97:49-58. doi: 10.1016/j.jclinepi.2017.06.020 [published Online First:
14
15 2017/12/17]
16
17
18
19
- 20 51. Global Burden of Disease 2015 Disease and Injury Incidence and Prevalence Collaborators,
21 et al. Global, regional, and national incidence, prevalence, and years lived with disability
22 for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: A systematic
23 analysis for the Global Burden of Disease Study 2013. *Lancet* 2015;386(9995):743-800.
24
25 doi: 10.1016/s0140-6736(15)60692-4 [published Online First: 2015/06/13]
26
27
28
29
30
31
32
- 33 52. Hicks CL, von Baeyer CL, Spafford PA, et al. The Faces Pain Scale-Revised: toward a
34 common metric in pediatric pain measurement. *Pain* 2001;93(2):173-83. doi:
35
36 10.1016/s0304-3959(01)00314-1 [published Online First: 2001/06/28]
37
38
39
- 40 53. Michaleff ZA, Kamper SJ, Stinson JN, et al. Measuring Musculoskeletal Pain in Infants,
41 Children, and Adolescents. *J Orthop Sports Phys Ther* 2017;47(10):712-30. doi:
42
43 10.2519/jospt.2017.7469 [published Online First: 2017/09/19]
44
45
46
- 47 54. Chorpita BF, Yim L, Moffitt C, et al. Assessment of symptoms of DSM-IV anxiety and
48 depression in children: a revised child anxiety and depression scale. *Behav Res Ther*
49
50 2000;38(8):835-55. doi: 10.1016/s0005-7967(99)00130-8 [published Online First:
51
52 2000/08/11]
53
54
55
56
57
58
59
60

- 1
2
3 55. Spielberger CD. Manual for the State-Trait Anxiety Inventory for Children. Palo Alto, Calif,
4
5 USA: Consulting Psychologists Press 1973.
6
7
8 56. Health Measures, . [January 14, 2020]. Available from:
9
10 [http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
11
12 [promis/list-of-pediatric-measures.](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
13
14
15 57. Fairbank JC, Couper J, Davies JB, et al. The Oswestry low back pain disability
16
17 questionnaire. *Physiotherapy* 1980;66(8):271-3. [published Online First: 1980/08/01]
18
19 58. Ravens-Sieberer U, Gosch A, Rajmil L, et al. The KIDSCREEN-52 quality of life measure
20
21 for children and adolescents: psychometric results from a cross-cultural survey in 13
22
23 European countries. *Value Health* 2008;11(4):645-58. doi: 10.1111/j.1524-
24
25 4733.2007.00291.x [published Online First: 2008/01/09]
26
27
28 59. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of
29
30 Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med*
31
32 *Care* 2001;39(8):800-12. doi: 10.1097/00005650-200108000-00006 [published Online
33
34 First: 2001/07/27]
35
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37 60. Pohlman KA, O'Beirne M, Thiel H, et al. Development and validation of providers' and
38
39 patients' measurement instruments to evaluate adverse events after spinal manipulation
40
41 therapy. *Eur J Integr Med* 2014;6(4):451-66.
42
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44 61. Zorzela L, Boon H, Mior S, et al. Serious adverse events associated with pediatric
45
46 complementary and alternative medicine. *European Journal of Integrative Medicine*
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48 2014;6(4):467-72.
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Table 1: Examples of rehabilitation interventions

Intervention	Definition	Examples
Patient or caregiver education and self-management strategies (structured or unstructured)	Teaching patients skills that they can use to manage their health condition	<ul style="list-style-type: none"> • Learning disease-specific information • Learning general managing skills (e.g., problem-solving, finding and using community resources, working with healthcare team) • Learning strategies to increase confidence (i.e., self-efficacy) in ability to engage in behaviours that are needed to manage their condition on a daily basis • Adequate peer role models and support networks that facilitate the initiation and maintenance of desired behavioural changes
Exercise	A subcategory of physical activity that is planned, structured, repetitive, and purposeful; can be supervised (e.g., by a healthcare professional) or unsupervised	<ul style="list-style-type: none"> • Stretching • Strengthening • Range of motion exercises • Aerobic (e.g., swimming, cycling, walking, running) • Anaerobic (e.g., jumping, sprinting, weight lifting)
Manual therapies	<ul style="list-style-type: none"> - Manipulation: Techniques incorporating a high-velocity low-amplitude impulse or thrust applied at or near the end of a joint's passive range of motion - Mobilization: Techniques incorporating a low-velocity and small or large amplitude oscillatory movement, within a joint's passive range of motion - Traction: Manual or mechanically assisted application of an intermittent or continuous distractive force - Soft tissue therapy: A mechanical form of therapy where soft-tissue structures are pressed and kneaded, using physical contact with the hand or mechanical device 	<ul style="list-style-type: none"> • Lumbar manipulation, mobilization, or traction • Massage • Muscle energy technique • Strain-counterstrain
Passive physical modalities	A form of cold, heat, or light application affecting the body at the skin level or ultrasonic or electromagnetic radiation affecting structures beneath the skin surface:	<ul style="list-style-type: none"> • Heat application: heat pack, hydrotherapy • Cryotherapy: cold pack, vapocoolant spray

	- Passive assistive devices: Device to encourage immobilization in anatomic positions or actively inhibit or prevent movement	<ul style="list-style-type: none"> • Low-level laser • Electrical muscle stimulation • Pulsed electromagnetic therapy
Acupuncture	Any body-needling, moxibustion, electric acupuncture, laser acupuncture, microsystem acupuncture, and acupressure	<ul style="list-style-type: none"> • Traditional needling • Dry needling • Burning of specific herbs • Electro-acupuncture • Photo-acupuncture
Pharmacological interventions	A substance used in treating disease or relieving pain	<ul style="list-style-type: none"> • Acetaminophen • Nonsteroidal anti-inflammatory drugs • Muscle relaxants • Antidepressants
Psychological interventions	Activities used to modify behaviour, emotional state, or feelings	<ul style="list-style-type: none"> • Cognitive behavioural therapy • Counselling • Social network and environment-based therapies • Psychoeducational interventions • Mindfulness meditation
Modifications to environment		<ul style="list-style-type: none"> • Ergonomic interventions at school or work
Assistive devices	Any item, piece of equipment or product system, used to increase, maintain, or improve the functional capabilities of people with disabilities	<ul style="list-style-type: none"> • Walking aids • Orthoses • Braces • Wheelchairs

Table 2. Research questions, outcomes and study types

Research Question	Outcomes	Study Types
<p>What is the effectiveness and safety of rehabilitation interventions for improving pain, functioning, and health outcomes in children with back pain?</p>	<ol style="list-style-type: none"> 1. Outcomes related to <i>body functions and structures</i> to describe a child's impairment: e.g., pain intensity, frequency, duration; range of motion; psychological outcomes such as depression and anxiety. <u>Examples of outcome measures:</u> NRS, VAS, Faces Pain Scale - Revised;^{52 53} goniometer, Revised Child Anxiety and Depression Scale,⁵⁴ State-Trait Anxiety Inventory for Children,⁵⁵ PROMIS Pediatric Self Report Scale⁵⁶ 2. Outcomes related to <i>activities and participation</i> to describe a child's functional status and involvement in life situations: e.g., disability, communication, mobility, interpersonal interactions, preferences, self-care, learning, applying knowledge, return to activities/school. <u>Examples of outcome measures:</u> Modified Oswestry Low Back Pain Disability Questionnaire,⁵⁷ KIDSCREEN-52,⁵⁸ Pediatric Quality of Life Inventory⁵⁹ 3. Adverse events: any unfavourable sign, symptom, or disease temporarily associated with the treatment, whether or not caused by the treatment.⁶⁰ We will also consider indirect harms, where the use of an intervention delays a diagnosis or treatment, and such delay holds a potential harm.⁶¹ 	<p>Randomized controlled trials</p> <p>Cohort studies</p> <p>Case-control studies</p> <p>Mixed methods studies (quantitative component)</p>
<p>What are the patients', caregivers' and providers' experiences, preferences, expectations and valued outcomes regarding rehabilitation interventions for back pain?</p>	<p>Experiences, preferences, expectations, valued outcomes</p>	<p>Qualitative studies (e.g., phenomenology, grounded theory, ethnography, action research, descriptive qualitative studies)</p> <p>Mixed-methods studies (qualitative component)</p>

<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14</p> <p>What is the cost-effectiveness of rehabilitation interventions for improving pain, functioning, and health outcomes in children with back pain?</p>	<p>Direct costs: resources consumed or saved by an intervention</p> <p>Indirect costs: productivity gains or losses (e.g., time consumed or freed by the intervention)</p> <p>Economic health outcomes: QALY, ICER, NMB</p> <p>Intangible: e.g., pain or suffering saved or brought on by an intervention</p>	<p>Full economic evaluations (trial- and model-based): cost-effectiveness, cost-utility, cost-benefit, cost-consequences</p>
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15 ICER: incremental cost-effectiveness ratio; NMB: measure of net monetary benefit; NRS: Numerical
 16 Rating Scale; PROMIS: Patient-Reported Outcomes Measurement Information System; QALY: quality
 17 adjusted life years; VAS: Visual Analogue Scale
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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	(Page No.#)
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	4
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1-2
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	22-23
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial or other support for the review	22
Sponsor	5b	Provide name for the review funder and/or sponsor	
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	5-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	6-7
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	7-11
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	11
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits such that it could be repeated	Additional File 2

Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	12
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	12, 16-7
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently in duplicate), any processes for obtaining and confirming data from investigators	14-5
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	14-5
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	17
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	13-4
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	16-7
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I ² , Kendall's τ)	
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	11
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	17

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Appendix 2. Literatures search strategies

Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® 1946-Present

- 1 exp Infant/
- 2 Child, Preschool/
- 3 Child/
- 4 Adolescent/
- 5 Pediatrics/
- 6 (baby or babies).ab,ti.
- 7 "newborn*".ab,ti.
- 8 (infant or infants).ab,ti.
- 9 (child or children*).ab,ti.
- 10 (adolescent* or adolescence).ab,ti.
- 11 (teen or teens or teenager).ab,ti.
- 12 (pediatric* or paediatric*).ab,ti.
- 13 (young adj3 (person* or people)).ab,ti.
- 14 emerging adult*.ab,ti.
- 15 "youth*".ab,ti.
- 16 or/1-15 [**pediatric population]
- 17 exp Back Injuries/
- 18 exp Back Pain/
- 19 Coccyx/in [Injuries]
- 20 Intervertebral Disc Degeneration/
- 21 Intervertebral Disc Displacement/
- 22 Lumbar Vertebrae/in [Injuries]
- 23 Lumbosacral Region/in [Injuries]
- 24 Osteoarthritis, Spine/
- 25 Piriformis Muscle Syndrome/
- 26 Radiculopathy/
- 27 Sciatica/
- 28 Spinal Diseases/

- 1 29 Spinal Stenosis/
 2
 3 30 Thoracic Injuries/
 4
 5 31 Thoracic Vertebrae/
 6
 7 32 (back adj3 (ache* or injur* or pain*)).ab,ti.
 8
 9 33 (backache* adj3 (injur* or pain*)).ab,ti.
 10
 11 34 (back pain or back-pain).ab,ti.
 12
 13 35 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
 14
 15 36 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
 16
 17 37 "low* back pain".ab,ti.
 18
 19 38 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or
 20 zygapophys*)).ab,ti.
 21
 22 39 "Piriformis syndrome*".ab,ti.
 23
 24 40 radiculopathy.ab,ti.
 25
 26 41 (sacral adj2 pain*).ab,ti.
 27
 28 42 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
 29
 30 43 spondylosis.ab,ti.
 31
 32 44 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
 33
 34 45 (T-spine or T-spinal).ab,ti.
 35
 36 46 or/17-45 [**back pain]
 37
 38 47 Acupressure/
 39
 40 48 Acupuncture/
 41
 42 49 exp Acupuncture Therapy/
 43
 44 50 "Bedding and Linens"/
 45
 46 51 Behavior Therapy/
 47
 48 52 exp Biofeedback, Psychology/
 49
 50 53 exp Cognitive Behavioral Therapy/
 51
 52 54 Combined Modality Therapy/
 53
 54 55 Community-Based Participatory Research/
 55
 56 56 Community Health Services/
 57
 58 57 Community Participation/
 59
 60 58 Complementary Therapies/
 59
 60 59 Cryotherapy/

1 60 exp Diathermy/
2
3 61 exp Electric Stimulation Therapy/
4
5 62 Electroacupuncture/
6
7 63 Ergonomics/
8
9 64 exp Exercise/
10
11 65 exp Exercise Movement Techniques/
12
13 66 exp Exercise Therapy/
14
15 67 Fluid Therapy/
16
17 68 High-Energy Shock Waves/tu [Therapeutic Use]
18
19 69 Immobilization/
20
21 70 Hot Temperature/tu [Therapeutic Use]
22
23 71 exp Hydrotherapy/
24
25 72 Laser Therapy, Low-Level/
26
27 73 Low-Level Light Therapy/
28
29 74 Magnetic Field Therapy/
30
31 75 Magnetics/tu [Therapeutic Use]
32
33 76 Massage/
34
35 77 exp Medicine, Chinese Traditional/
36
37 78 exp Musculoskeletal Manipulations/
38
39 79 Patient Education as Topic/
40
41 80 Physical Therapy Modalities/
42
43 81 Self Care/
44
45 82 Self-Help Devices/
46
47 83 Physical Fitness/
48
49 84 Restraint, Physical/
50
51 85 Transcutaneous Electric Nerve Stimulation/
52
53 86 Vibration/tu [Therapeutic Use]
54
55 87 Wheelchairs/
56
57 88 acupressure.ab,ti.
58
59 89 "acupunctur*".ab,ti.
60 90 (advice or advise or advised).ab,ti.
91 alexander technique.ab,ti.

- 1 92 "assistive device*".ab,ti.
2
3 93 "back belt*".ab,ti.
4
5 94 "back school*".ab,ti.
6
7 95 (back adj2 work).ab,ti.
8
9 96 (braces or brace or bracing).ab,ti.
10
11 97 canes.ab,ti.
12
13 98 chiropract*.ab,ti.
14
15 99 "cognitive behavioral therap*".ab,ti.
16
17 100 "cognitive behavioural therap*".ab,ti.
18
19 101 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
20
21 102 "core stabili*".ab,ti.
22
23 103 (corset or corsets).ab,ti.
24
25 104 crutches.ab,ti.
26
27 105 cryotherap*.ab,ti.
28
29 106 "deep tissue therap*".ab,ti.
30
31 107 diathermy.ab,ti.
32
33 108 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
34
35 109 electro-acupuncture.ab,ti.
36
37 110 (electrogalvanic stimulation or EGS).ab,ti.
38
39 111 (electromagnet* and (radiation or therap*)).ab,ti.
40
41 112 electromodalit*.ab,ti.
42
43 113 electrotherapy.ab,ti.
44
45 114 (exercise or exercises or exercising).ab,ti.
46
47 115 (flexion-distraction or flexion distraction).ab,ti.
48
49 116 fluidotherap*.ab,ti.
50
51 117 galvanic stimulation.ab,ti.
52
53 118 (H-Wave Device Stimulation or HWDS).ab,ti.
54
55 119 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or
56
57 bottle or superficial or therapeutic)).ab,ti.
58
59 120 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
60
61 121 "hydrotherap*".ab,ti.
62
63 122 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.

- 1 123 "interferential current*".ab,ti.
2
3 124 infrared.ab,ti.
4
5 125 iontophoresis.ab,ti.
6
7 126 electroanalgesia.ab,ti.
8
9 127 ergonomic*.ab,ti.
10
11 128 kinesiostat*.ab,ti.
12 129 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
13
14 130 "low level laser*".ab,ti.
15
16 131 "lumbar support*".ab,ti.
17
18 132 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
19
20 133 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
21
22 134 "manual therap*".ab,ti.
23
24 135 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
25
26 136 microwave*.ab,ti.
27 137 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
28
29 138 "moist air bath*".ab,ti.
30
31 139 moxibustion.ab,ti.
32
33 140 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or
34 procedure* or package* or manage*)).ab,ti.
35
36 141 muscle activation.ab,ti.
37
38 142 "muscle energy technique*".ab,ti.
39
40 143 myofascial release.ab,ti.
41
42 144 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
43
44 145 orthotic*.ab,ti.
45
46 146 "passive modalit*".ab,ti.
47
48 147 (patient* adj3 (educat* or train*)).ab,ti.
49
50 148 "Percutaneous Electric* Nerve Stimulation".ab,ti.
51
52 149 (physical adj therap*).ab,ti.
53
54 150 physiotherap*.ab,ti.
55
56 151 photo-acupuncture.ab,ti.
57
58 152 pillow*.ab,ti.
59
60 153 pilates.ab,ti.

- 1 154 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
2
3 155 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
4
5 156 radiant light.ab,ti.
6
7 157 Russian stimulation.ab,ti.
8
9 158 "seat adj cushion*".ab,ti.
10
11 159 (self-manage* or self manage*).ab,ti.
12
13 160 (short wave* or short-wave*).ab,ti.
14
15 161 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
16
17 162 "soft tissue therap*".ab,ti.
18
19 163 "spray and stretch".ab,ti.
20
21 164 strain-counterstrain.ab,ti.
22
23 165 strengthen*.ab,ti.
24
25 166 stretching.ab,ti.
26
27 167 (tape or taping).ab,ti.
28
29 168 thoracolumbosacral orthosis.ab,ti.
30
31 169 traction.ab,ti.
32
33 170 traditional Chinese medicine.ab,ti.
34
35 171 (transcutaneous electrical stimulation or TENS).ab,ti.
36
37 172 ultrasound.ab,ti.
38
39 173 vapocoolant spray.ab,ti.
40
41 174 "vibration therap*".ab,ti.
42
43 175 walkers.ab,ti.
44
45 176 "walking adj3 aid*".ab,ti.
46
47 177 "warm compress*".ab,ti.
48
49 178 whirlpool*.ab,ti.
50
51 179 yoga.ab,ti.
52
53 180 or/47-179 [**interventions]
54
55 181 Case-Control Studies/
56
57 182 Cohort Studies/
58
59 183 Controlled Clinical Trials as Topic/
60
61 184 Epidemiologic Studies/
62
63 185 Epidemiology/

1 186 Follow-Up Studies/
2
3 187 Longitudinal Studies/
4
5 188 Prospective Studies/
6
7 189 Retrospective Studies/
8
9 190 Randomized Controlled Trials as Topic/
10
11 191 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
12
13 192 (cohort adj3 (stud* or design* or analysis)).ab,ti.
14
15 193 controlled clinical trial.pt.
16
17 194 "epidemiolog*".ab,ti.
18
19 195 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
20
21 196 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
22
23 197 (prospective adj3 (stud* or design* or analysis)).ab,ti.
24
25 198 (random* and (control* or clinical or allocat*)).ab,ti.
26
27 199 randomized controlled trial.pt.
28
29 200 (retrospective adj3 (stud* or design*)).ab,ti.
30
31 201 or/181-200 [**study designs_effectiveness]
32
33 202 16 and 46 and 180 and 201
34
35 203 Anthropology, Cultural/
36
37 204 Attitude/
38
39 205 Awareness/
40
41 206 Behavioral Research/
42
43 207 Diary as Topic/
44
45 208 Emotions/
46
47 209 Ethnology/
48
49 210 Ethnopsychology/
50
51 211 Focus Groups/
52
53 212 Grounded Theory/
54
55 213 Interview, Psychological/
56
57 214 Interviews as Topic/
58
59 215 Mindfulness/
60
216 Motivation/
217 Narration/

- 1 218 Observation/
2
3 219 Perception/
4
5 220 Personal Narratives as Topic/
6
7 221 Personal Satisfaction/
8
9 222 Qualitative Research/
10
11 223 Self Report/
12
13 224 "Surveys and Questionnaires"/
14
15 225 Tape Recording/
16
17 226 Thinking/
18
19 227 Video Recording/ or Videotape Recording/
20
21 228 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or
22 perception* or perspective*).ab,ti.
23
24 229 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
25
26 230 ((behavioral or behavioural) adj2 research).ab,ti.
27
28 231 biographical method*.ab,ti.
29
30 232 (constant adj2 (comparative or comparison)).ab,ti.
31
32 233 ((content or conversation or discourse) adj2 analys*).ab,ti.
33
34 234 descriptive research.ab,ti.
35
36 235 (diary or diaries).ab,ti.
37
38 236 emotions.ab,ti.
39
40 237 ethnograph*.ab,ti.
41
42 238 ethnology.ab,ti.
43
44 239 ethnopsychology.ab,ti.
45
46 240 feelings.ab,ti.
47
48 241 (field adj2 (notes or research or study or studies)).ab,ti.
49
50 242 (focus adj2 group*).ab,ti.
51
52 243 framework analysis.ab,ti.
53
54 244 grounded theory.ab,ti.
55
56 245 interview*.ab,ti.
57
58 246 life world.ab,ti.
59
60 247 lived experience.ab,ti.
248 (meaning or meanings).ab,ti.

- 1 249 (narrative* or narration*).ab,ti.
- 2
- 3 250 (observe* or observation*).ab,ti.
- 4
- 5 251 (open adj ended).ab,ti.
- 6
- 7 252 phenomenology.ab,ti.
- 8
- 9 253 purposive sampl*.ab,ti.
- 10
- 11 254 qualitative.ab,ti.
- 12
- 13 255 questionnaire*.ab,ti.
- 14
- 15 256 (realist adj3 (review* or research or synthesis)).ab,ti.
- 16
- 17 257 satisfaction.ab,ti.
- 18
- 19 258 self report*.ab,ti.
- 20
- 21 259 semantic analysis.ab,ti.
- 22
- 23 260 standpoint*.ab,ti.
- 24
- 25 261 (story or stories).ab,ti.
- 26
- 27 262 survey*.ab,ti.
- 28
- 29 263 (theme* or thematic).ab,ti.
- 30
- 31 264 (theoretical adj2 (sampl* or saturation)).ab,ti.
- 32
- 33 265 (thoughts or thinking).ab,ti.
- 34
- 35 266 ((video adj record*) or videorecord* or videotap*).ab,ti.
- 36
- 37 267 or/203-266 [**experience/qualitative]
- 38
- 39 268 "Costs and Cost Analysis"/
- 40
- 41 269 exp Cost-Benefit Analysis/
- 42
- 43 270 Quality-Adjusted Life Years/
- 44
- 45 271 Economics, Medical/
- 46
- 47 272 (economic* adj4 (evaluat* or stud*)).ab,ti.
- 48
- 49 273 (health economic* adj4 (evaluat* or stud*)).ab,ti.
- 50
- 51 274 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
- 52
- 53 275 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
- 54
- 55 276 (CEA or CUA or CBA).ab,ti.
- 56
- 57 277 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
- 58
- 59 278 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
- 60 279 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.

- 1 280 (decision adj1 (tree* or analy* or model*)).ab,ti.
- 2
- 3 281 economics.fs.
- 4
- 5 282 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
- 6
- 7 283 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or
- 8 quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
- 9
- 10 284 (markov* or monte carlo*).ab,ti.
- 11
- 12 285 or/268-284 [**cost effectiveness]
- 13
- 14 286 Delivery of Health Care/
- 15
- 16 287 Delivery of Health Care, Integrated/
- 17
- 18 288 Health Planning/
- 19
- 20 289 Health Promotion/
- 21
- 22 290 Health Services Administration/
- 23
- 24 291 Integrative Medicine/
- 25
- 26 292 Interprofessional Relations/
- 27
- 28 293 Patient Care Management/
- 29
- 30 294 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
- 31
- 32 295 barrier*.ab,ti.
- 33
- 34 296 facilitator*.ab,ti.
- 35
- 36 297 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention*
- 37 or model* or plan* or process* or program*or services or strateg* or system* or team*)).ab,ti.
- 38
- 39 298 implement*.ab,ti.
- 40
- 41 299 (innovate* adj3 (intervention* or model* or plan* or process* or program*or strateg* or system*)).ab,ti.
- 42
- 43 300 (model* adj care).ab,ti.
- 44
- 45 301 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
- 46 intervention* or model* or plan* or process* or program*or strateg* or system* or challenge* or benefit* or
- 47 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
- 48 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
- 49
- 50 302 (pathway* adj3 (clinical or care)).ab,ti.
- 51
- 52 303 (program* adj3 (assess* or evaluat*)).ab,ti.
- 53
- 54 304 or/286-303 [**implementation]
- 55
- 56 305 16 and 46 and 180 and (201 or 267 or 285 or 304)
- 57
- 58 306 16 and 46 and 180 [**pediatric, back pain, interventions]
- 59
- 60

Embase Classic+Embase 1947 to 2020

- 1 newborn/
- 2 infant/ or infancy/ or baby/
- 3 childhood/
- 4 child/
- 5 adolescent/ or adolescence/
- 6 juvenile/
- 7 (baby or babies).ab,ti.
- 8 "newborn*".ab,ti.
- 9 (infant or infants).ab,ti.
- 10 (child or children*).ab,ti.
- 11 (adolescent* or adolescence).ab,ti.
- 12 (teen or teens or teenager).ab,ti.
- 13 (pediatric* or paediatric*).ab,ti.
- 14 (young adj3 (person* or people)).ab,ti.
- 15 emerging adult*.ab,ti.
- 16 "youth*".ab,ti.
- 17 or/1-16 [**pediatric population]
- 18 backache/
- 19 low back pain/
- 20 intervertebral disc degeneration/
- 21 intervertebral disk hernia/
- 22 lumbar vertebra/
- 23 lumbosacral region/
- 24 piriformis syndrome/
- 25 radiculopathy/
- 26 sciatica/
- 27 spine disease/
- 28 vertebral canal stenosis/
- 29 spondylosis/
- 30 (back adj3 (ache* or injur* or pain*)).ab,ti.

- 1 31 (backache* adj3 (injur* or pain*)).ab,ti.
2
3 32 (back pain or back-pain).ab,ti.
4
5 33 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
6
7 34 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
8
9 35 "low* back pain".ab,ti.
10
11 36 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or
12 zygapophys*)).ab,ti.
13
14 37 "Piriformis syndrome*".ab,ti.
15
16 38 radiculopathy.ab,ti.
17
18 39 (sacral adj2 pain*).ab,ti.
19
20 40 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
21
22 41 spondylosis.ab,ti.
23
24 42 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
25
26 43 (T-spine or T-spinal).ab,ti.
27
28 44 or/18-43 [**back injuries]
29
30 45 acupressure/
31
32 46 acupuncture/
33
34 47 behavior therapy/
35
36 48 biofeedback/
37
38 49 cognitive behavioral therapy/
39
40 50 participatory research/
41
42 51 community care/
43
44 52 community participation/
45
46 53 alternative medicine/
47
48 54 cryotherapy/
49
50 55 diathermy/
51
52 56 electrostimulation therapy/
53
54 57 electroacupuncture/
55
56 58 ergonomics/
57
58 59 exp exercise/
59
60 60 exp kinesiotherapy/
61
62 61 fitness/

- 1 62 fluid therapy/
- 2
- 3 63 shock wave/
- 4
- 5 64 immobilization/
- 6
- 7 65 heat/
- 8
- 9 66 exp hydrotherapy/
- 10
- 11 67 low level laser therapy/
- 12
- 13 68 phototherapy/
- 14
- 15 69 exp magnetism/
- 16
- 17 70 magnetotherapy/
- 18
- 19 71 massage/
- 20
- 21 72 Chinese medicine/
- 22
- 23 73 manipulative medicine/
- 24
- 25 74 patient education/
- 26
- 27 75 physiotherapy/
- 28
- 29 76 self care/
- 30
- 31 77 transcutaneous nerve stimulation/
- 32
- 33 78 whole body vibration/
- 34
- 35 79 acupressure.ab,ti.
- 36
- 37 80 "acupunctur*".ab,ti.
- 38
- 39 81 (advice or advise or advised).ab,ti.
- 40
- 41 82 alexander technique.ab,ti.
- 42
- 43 83 "assistive device*".ab,ti.
- 44
- 45 84 "back belt*".ab,ti.
- 46
- 47 85 "back school*".ab,ti.
- 48
- 49 86 (back adj2 work).ab,ti.
- 50
- 51 87 (braces or brace or bracing).ab,ti.
- 52
- 53 88 chiropract*.ab,ti.
- 54
- 55 89 "cognitive behavioral therap*".ab,ti.
- 56
- 57 90 "cognitive behavioural therap*".ab,ti.
- 58
- 59 91 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
- 60
- 92 "core stabili*".ab,ti.
- 93 (corset or corsets).ab,ti.

- 1 94 crutches.ab,ti.
2
3 95 cryotherap*.ab,ti.
4
5 96 "deep tissue therap*".ab,ti.
6
7 97 diathermy.ab,ti.
8
9 98 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
10
11 99 electro-acupuncture.ab,ti.
12
13 100 (electrogalvanic stimulation or EGS).ab,ti.
14
15 101 (electromagnet* and (radiation or therap*)).ab,ti.
16
17 102 electromodalit*.ab,ti.
18
19 103 electrotherapy.ab,ti.
20
21 104 (exercise or exercises or exercising).ab,ti.
22
23 105 (flexion-distraction or flexion distraction).ab,ti.
24
25 106 fluidotherap*.ab,ti.
26
27 107 galvanic stimulation.ab,ti.
28
29 108 (H-Wave Device Stimulation or HWDS).ab,ti.
30
31 109 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
32 superficial or therapeutic)).ab,ti.
33
34 110 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
35
36 111 "hydrotherap*".ab,ti.
37
38 112 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
39
40 113 "interferential current*".ab,ti.
41
42 114 infrared.ab,ti.
43
44 115 iontophoresis.ab,ti.
45
46 116 electroanalgesia.ab,ti.
47
48 117 ergonomic*.ab,ti.
49
50 118 kinesiopat*.ab,ti.
51
52 119 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
53
54 120 "low level laser*".ab,ti.
55
56 121 "lumbar support*".ab,ti.
57
58 122 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
59
60 123 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
124 "manual therap*".ab,ti.

- 1 125 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
2
3 126 microwave*.ab,ti.
4
5 127 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
6
7 128 "moist air bath*".ab,ti.
8
9 129 moxibustion.ab,ti.
10
11 130 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or
12 package* or manage*)).ab,ti.
13
14 131 muscle activation.ab,ti.
15
16 132 "muscle energy technique*".ab,ti.
17
18 133 myofascial release.ab,ti.
19
20 134 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
21
22 135 orthotic*.ab,ti.
23
24 136 "passive modalit*".ab,ti.
25
26 137 (patient* adj3 (educat* or train*)).ab,ti.
27
28 138 "Percutaneous Electric* Nerve Stimulation".ab,ti.
29
30 139 (physical adj therap*).ab,ti.
31
32 140 physiotherap*.ab,ti.
33
34 141 photo-acupuncture.ab,ti.
35
36 142 pillow*.ab,ti.
37
38 143 pilates.ab,ti.
39
40 144 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
41
42 145 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
43
44 146 radiant light.ab,ti.
45
46 147 Russian stimulation.ab,ti.
47
48 148 "seat adj cushion*".ab,ti.
49
50 149 (self-manage* or self manage*).ab,ti.
51
52 150 (short wave* or short-wave*).ab,ti.
53
54 151 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
55
56 152 "soft tissue therap*".ab,ti.
57
58 153 "spray and stretch".ab,ti.
59
60 154 strain-counterstrain.ab,ti.
155 strengthen*.ab,ti.

1 156 stretching.ab,ti.
2
3 157 (tape or taping).ab,ti.
4
5 158 thoracolumbosacral orthosis.ab,ti.
6
7 159 traction.ab,ti.
8
9 160 traditional Chinese medicine.ab,ti.
10
11 161 (transcutaneous electrical stimulation or TENS).ab,ti.
12
13 162 ultrasound.ab,ti.
14
15 163 vapocoolant spray.ab,ti.
16
17 164 "vibration therap*".ab,ti.
18
19 165 walkers.ab,ti.
20
21 166 "walking adj3 aid*".ab,ti.
22
23 167 "warm compress*".ab,ti.
24
25 168 whirlpool*.ab,ti.
26
27 169 yoga.ab,ti.
28
29 170 or/45-169 [**interventions]
30
31 171 case control study/
32
33 172 cohort analysis/
34
35 173 "controlled clinical trial (topic)"/
36
37 174 longitudinal study/
38
39 175 "randomized controlled trial (topic)"/
40
41 176 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
42
43 177 (cohort adj3 (stud* or design* or analysis)).ab,ti.
44
45 178 "epidemiolog*".ab,ti.
46
47 179 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
48
49 180 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
50
51 181 (prospective adj3 (stud* or design* or analysis)).ab,ti.
52
53 182 (random* and (control* or clinical or allocat* or trial*)).ab,ti.
54
55 183 (retrospective adj3 (stud* or design*)).ab,ti.
56
57 184 or/171-183 [**effectiveness]
58
59 185 attitude to health/
60
61 186 patient attitude/
62
63 187 awareness/

- 1 188 behavioral research/
 2
 3 189 writing/
 4
 5 190 emotion/
 6
 7 191 ethnology/
 8
 9 192 cultural psychology/
 10
 11 193 information processing/
 12
 13 194 grounded theory/
 14
 15 195 interview/
 16
 17 196 mindfulness/
 18
 19 197 motivation/
 20
 21 198 exp verbal communication/
 22
 23 199 observation/ or participant observation/
 24
 25 200 perception/
 26
 27 201 satisfaction/ or patient satisfaction/
 28
 29 202 qualitative research/
 30
 31 203 self report/
 32
 33 204 health survey/
 34
 35 205 questionnaire/
 36
 37 206 exp recording/
 38
 39 207 exp thinking/
 40
 41 208 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception*
 42 or perspective*).ab,ti.
 43
 44 209 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
 45
 46 210 ((behavioral or behavioural) adj2 research).ab,ti.
 47
 48 211 biographical method*.ab,ti.
 49
 50 212 (constant adj2 (comparative or comparison)).ab,ti.
 51
 52 213 ((content or conversation or discourse) adj2 analys*).ab,ti.
 53
 54 214 descriptive research.ab,ti.
 55
 56 215 (diary or diaries).ab,ti.
 57
 58 216 emotions.ab,ti.
 59
 60 217 ethnograph*.ab,ti.
 218 ethnology.ab,ti.

1 219 ethnopsychology.ab,ti.
2
3 220 feelings.ab,ti.
4
5 221 (field adj2 (notes or research or study or studies)).ab,ti.
6
7 222 (focus adj2 group*).ab,ti.
8
9 223 framework analysis.ab,ti.
10
11 224 grounded theory.ab,ti.
12
13 225 interview*.ab,ti.
14
15 226 life world.ab,ti.
16
17 227 lived experience.ab,ti.
18
19 228 (meaning or meanings).ab,ti.
20
21 229 (narrative* or narration*).ab,ti.
22
23 230 (observe* or observation*).ab,ti.
24
25 231 (open adj ended).ab,ti.
26
27 232 phenomenology.ab,ti.
28
29 233 purposive sampl*.ab,ti.
30
31 234 qualitative.ab,ti.
32
33 235 questionnaire*.ab,ti.
34
35 236 (realist adj3 (review* or research or synthesis)).ab,ti.
36
37 237 satisfaction.ab,ti.
38
39 238 self report*.ab,ti.
40
41 239 semantic analysis.ab,ti.
42
43 240 standpoint*.ab,ti.
44
45 241 (story or stories).ab,ti.
46
47 242 survey*.ab,ti.
48
49 243 (theme* or thematic).ab,ti.
50
51 244 (theoretical adj2 (sampl* or saturation)).ab,ti.
52
53 245 (thoughts or thinking).ab,ti.
54
55 246 ((video adj record*) or videorecord* or videotap*).ab,ti.
56
57 247 or/185-246 [**qualitative_experience]
58
59 248 "cost effectiveness analysis"/
60 249 "cost benefit analysis"/
250 quality adjusted life year/

- 1 251 health economics/
2
3 252 (economic* adj4 (evaluat* or stud*)).ab,ti.
4
5 253 (health economic* adj4 (evaluat* or stud*)).ab,ti.
6
7 254 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
8
9 255 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
10
11 256 (CEA or CUA or CBA).ab,ti.
12
13 257 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
14
15 258 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
16
17 259 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit*
18 or consequence* or unit*)).ab,ti.
19
20 260 (decision adj1 (tree* or analy* or model*)).ab,ti.
21
22 261 economics.fs.
23
24 262 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
25
26 263 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-
27 adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
28
29 264 (markov* or monte carlo*).ab,ti.
30
31 265 or/248-264 [**cost effectiveness]
32
33 266 health care delivery/
34
35 267 integrated health care system/
36
37 268 health care planning/
38
39 269 health promotion/
40
41 270 health service/
42
43 271 integrative medicine/
44
45 272 case management/
46
47 273 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
48
49 274 barrier*.ab,ti.
50
51 275 facilitator*.ab,ti.
52
53 276 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or
54 model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
55
56 277 implement*.ab,ti.
57
58 278 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
59
60 279 (model* adj care).ab,ti.

1 280 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
2 intervention* or model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or
3 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
4 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
5

6
7 281 (pathway* adj3 (clinical or care)).ab,ti.
8

9 282 (program* adj3 (assess* or evaluat*)).ab,ti.
10

11 283 or/266-282 [**implementation]
12

13 284 17 and 44 and 170
14

15 285 284 and (184 or 247 or 265 or 283)
16

17 286 limit 285 to (conference abstract or conference paper or "conference review" or editorial or letter)
18

19 287 285 not 286
20
21
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PsycINFO 1806

- 1
- 2
- 3 1 (baby or babies).ab,ti.
- 4
- 5 2 "newborn".ab,ti.
- 6
- 7 3 (infant or infants).ab,ti.
- 8
- 9 4 (child or children*).ab,ti.
- 10
- 11 5 (adolescent* or adolescence).ab,ti.
- 12
- 13 6 (teen or teens or teenager).ab,ti.
- 14
- 15 7 (pediatric* or paediatric*).ab,ti.
- 16
- 17 8 (young adj3 (person* or people)).ab,ti.
- 18
- 19 9 emerging adult*.ab,ti.
- 20
- 21 10 "youth".ab,ti.
- 22
- 23 11 or/1-10 [**pediatric population]
- 24
- 25 12 exp Back Pain/
- 26
- 27 13 Lumbar Spinal Cord/
- 28
- 29 14 Spinal Cord Injuries/
- 30
- 31 15 Spinal Column/
- 32
- 33 16 (back adj3 (ache* or injur* or pain*)).ab,ti.
- 34
- 35 17 (backache* adj3 (injur* or pain*)).ab,ti.
- 36
- 37 18 (back pain or back-pain).ab,ti.
- 38
- 39 19 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 40
- 41 20 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 42
- 43 21 "low* back pain".ab,ti.
- 44
- 45 22 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or zygapophys*)).ab,ti.
- 46
- 47 23 "Piriformis syndrome".ab,ti.
- 48
- 49 24 radiculopathy.ab,ti.
- 50
- 51 25 (sacral adj2 pain*).ab,ti.
- 52
- 53 26 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
- 54
- 55 27 spondylosis.ab,ti.
- 56
- 57 28 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
- 58
- 59 29 (T-spine or T-spinal).ab,ti.
- 60
- 30 or/12-29 [**back injuries]

1	31	Acupuncture/
2		
3	32	exp Behavior Therapy/
4		
5	33	exp Biofeedback/
6		
7	34	exp Cognitive Behavior Therapy/
8		
9	35	Alternative Medicine/
10		
11	36	Electrical Stimulation/
12		
13	37	Human Factors Engineering/
14		
15	38	exp Exercise/
16		
17	39	Movement Therapy/
18		
19	40	Shock Therapy/
20		
21	41	Heat/
22		
23	42	exp Hydrotherapy/
24		
25	43	Laser Irradiation/
26		
27	44	exp Magnetism/
28		
29	45	Massage/
30		
31	46	Client Education/
32		
33	47	Self-Care Skills/
34		
35	48	Physical Therapy/
36		
37	49	Self-Help Techniques/
38		
39	50	Physical Fitness/
40		
41	51	Vibration/
42		
43	52	acupressure.ab,ti.
44		
45	53	"acupunctur*".ab,ti.
46		
47	54	(advice or advise or advised).ab,ti.
48		
49	55	alexander technique.ab,ti.
50		
51	56	"assistive device*".ab,ti.
52		
53	57	"back belt*".ab,ti.
54		
55	58	"back school*".ab,ti.
56		
57	59	(back adj2 work).ab,ti.
58		
59	60	(braces or brace or bracing).ab,ti.
60		
	61	canes.ab,ti.
	62	chiropract*.ab,ti.

- 1 63 "cognitive behavioral therap*".ab,ti.
2
3 64 "cognitive behavioural therap*".ab,ti.
4
5 65 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
6
7 66 "core stabili*".ab,ti.
8
9 67 (corset or corsets).ab,ti.
10
11 68 crutches.ab,ti.
12
13 69 cryotherap*.ab,ti.
14
15 70 "deep tissue therap*".ab,ti.
16
17 71 diathermy.ab,ti.
18
19 72 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
20
21 73 electro-acupuncture.ab,ti.
22
23 74 (electrogalvanic stimulation or EGS).ab,ti.
24
25 75 (electromagnet* and (radiation or therap*)).ab,ti.
26
27 76 electromodalit*.ab,ti.
28
29 77 electrotherapy.ab,ti.
30
31 78 (exercise or exercises or exercising).ab,ti.
32
33 79 (flexion-distraction or flexion distraction).ab,ti.
34
35 80 fluidotherap*.ab,ti.
36
37 81 galvanic stimulation.ab,ti.
38
39 82 (H-Wave Device Stimulation or HWDS).ab,ti.
40
41 83 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
42 superficial or therapeutic)).ab,ti.
43
44 84 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
45
46 85 "hydrotherap*".ab,ti.
47
48 86 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
49
50 87 "interferential current*".ab,ti.
51
52 88 infrared.ab,ti.
53
54 89 iontophoresis.ab,ti.
55
56 90 electroanalgesia.ab,ti.
57
58 91 ergonomic*.ab,ti.
59
60 92 kinesiotap*.ab,ti.
61
62 93 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.

1	94	"low level laser*".ab,ti.
2		
3	95	"lumbar support*".ab,ti.
4		
5	96	(magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
6		
7	97	(manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
8		
9	98	"manual therap*".ab,ti.
10		
11	99	Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
12		
13	100	microwave*.ab,ti.
14		
15	101	((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
16		
17	102	"moist air bath*".ab,ti.
18		
19	103	moxibustion.ab,ti.
20		
21	104	((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or package* or manage*)).ab,ti.
22		
23	105	muscle activation.ab,ti.
24		
25	106	"muscle energy technique*".ab,ti.
26		
27	107	myofascial release.ab,ti.
28		
29	108	(Neuromuscular Electrical Stimulation or NMES).ab,ti.
30		
31	109	orthotic*.ab,ti.
32		
33	110	"passive modalit*".ab,ti.
34		
35	111	(patient* adj3 (educat* or train*)).ab,ti.
36		
37	112	"Percutaneous Electric* Nerve Stimulation".ab,ti.
38		
39	113	(physical adj therap*).ab,ti.
40		
41	114	physiotherap*.ab,ti.
42		
43	115	photo-acupuncture.ab,ti.
44		
45	116	pillow*.ab,ti.
46		
47	117	pilates.ab,ti.
48		
49	118	(postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
50		
51	119	(pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
52		
53	120	radiant light.ab,ti.
54		
55	121	Russian stimulation.ab,ti.
56		
57	122	"seat adj cushion*".ab,ti.
58		
59	123	(self-manage* or self manage*).ab,ti.
60		
	124	(short wave* or short-wave*).ab,ti.

- 1 125 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
- 2
- 3 126 "soft tissue therap*".ab,ti.
- 4
- 5 127 "spray and stretch".ab,ti.
- 6
- 7 128 strain-counterstrain.ab,ti.
- 8
- 9 129 strengthen*.ab,ti.
- 10
- 11 130 stretching.ab,ti.
- 12
- 13 131 (tape or taping).ab,ti.
- 14
- 15 132 thoracolumbosacral orthosis.ab,ti.
- 16
- 17 133 traction.ab,ti.
- 18
- 19 134 traditional Chinese medicine.ab,ti.
- 20
- 21 135 (transcutaneous electrical stimulation or TENS).ab,ti.
- 22
- 23 136 ultrasound.ab,ti.
- 24
- 25 137 vapocoolant spray.ab,ti.
- 26
- 27 138 "vibration therap*".ab,ti.
- 28
- 29 139 walkers.ab,ti.
- 30
- 31 140 "walking adj3 aid*".ab,ti.
- 32
- 33 141 "warm compress*".ab,ti.
- 34
- 35 142 whirlpool*.ab,ti.
- 36
- 37 143 yoga.ab,ti.
- 38
- 39 144 or/31-143 [**interventions]
- 40
- 41 145 Cohort Analysis/
- 42
- 43 146 Clinical Trials/
- 44
- 45 147 Longitudinal Studies/
- 46
- 47 148 exp Randomized Controlled Trials/
- 48
- 49 149 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
- 50
- 51 150 (cohort adj3 (stud* or design* or analysis)).ab,ti.
- 52
- 53 151 controlled clinical trial.pt.
- 54
- 55 152 "epidemiolog*".ab,ti.
- 56
- 57 153 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
- 58
- 59 154 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
- 60 155 (prospective adj3 (stud* or design* or analysis)).ab,ti.
- 156 (random* and (control* or clinical or allocat*)).ab,ti.

1	157	(retrospective adj3 (stud* or design*)).ab,ti.
2		
3	158	or/145-157 [**effectiveness]
4		
5	159	exp Attitudes/
6		
7	160	Awareness/
8		
9	161	Journal Writing/
10		
11	162	Emotions/
12		
13	163	Ethnology/
14		
15	164	Focus Group/
16		
17	165	Grounded Theory/
18		
19	166	Interviews/
20		
21	167	Mindfulness/ or Mindfulness-Based Interventions/
22		
23	168	Motivation/
24		
25	169	Narratives/
26		
27	170	exp Observation Methods/
28		
29	171	Perception/
30		
31	172	Preferences/
32		
33	173	Satisfaction/
34		
35	174	Qualitative Methods/
36		
37	175	Self-Report/
38		
39	176	Surveys/ or Questionnaires/
40		
41	177	exp Tape Recorders/
42		
43	178	Thinking/
44		
45	179	Digital Video/
46		
47	180	(attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception* or perspective*).ab,ti.
48		
49	181	((audio adj record*) or audiorecord* or audiotap*).ab,ti.
50		
51	182	((behavioral or behavioural) adj2 research).ab,ti.
52		
53	183	biographical method*.ab,ti.
54		
55	184	(constant adj2 (comparative or comparison)).ab,ti.
56		
57	185	((content or conversation or discourse) adj2 analys*).ab,ti.
58		
59	186	descriptive research.ab,ti.
60		
	187	(diary or diaries).ab,ti.

1	188	emotions.ab,ti.
2		
3	189	ethnograph*.ab,ti.
4		
5	190	ethnology.ab,ti.
6		
7	191	ethnopsychology.ab,ti.
8		
9	192	feelings.ab,ti.
10		
11	193	(field adj2 (notes or research or study or studies)).ab,ti.
12		
13	194	(focus adj2 group*).ab,ti.
14		
15	195	framework analysis.ab,ti.
16		
17	196	grounded theory.ab,ti.
18		
19	197	interview*.ab,ti.
20		
21	198	life world.ab,ti.
22		
23	199	lived experience.ab,ti.
24		
25	200	(meaning or meanings).ab,ti.
26		
27	201	(narrative* or narration*).ab,ti.
28		
29	202	(observe* or observation*).ab,ti.
30		
31	203	(open adj ended).ab,ti.
32		
33	204	phenomenology.ab,ti.
34		
35	205	purposive sampl*.ab,ti.
36		
37	206	qualitative.ab,ti.
38		
39	207	questionnaire*.ab,ti.
40		
41	208	(realist adj3 (review* or research or synthesis)).ab,ti.
42		
43	209	satisfaction.ab,ti.
44		
45	210	self report*.ab,ti.
46		
47	211	semantic analysis.ab,ti.
48		
49	212	standpoint*.ab,ti.
50		
51	213	(story or stories).ab,ti.
52		
53	214	survey*.ab,ti.
54		
55	215	(theme* or thematic).ab,ti.
56		
57	216	(theoretical adj2 (sampl* or saturation)).ab,ti.
58		
59	217	(thoughts or thinking).ab,ti.
60		
	218	((video adj record* or videorecord* or videotap*).ab,ti.
	219	or/159-218 [*** qualitative_experience]

1	220	"Costs and Cost Analysis"/
2		
3	221	Health Care Costs/
4		
5	222	Quality of Life Measures/
6		
7	223	Health Care Economics/
8		
9	224	(economic* adj4 (evaluat* or stud*)).ab,ti.
10		
11	225	(health economic* adj4 (evaluat* or stud*)).ab,ti.
12		
13	226	((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
14		
15	227	((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
16		
17	228	(CEA or CUA or CBA).ab,ti.
18		
19	229	((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
20		
21	230	(economic* adj4 (impact or value or factor* or analys*)).ab,ti.
22		
23	231	(cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.
24		
25	232	(decision adj1 (tree* or analy* or model*)).ab,ti.
26		
27	233	[economics.fs.]
28		
29	234	(qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
30		
31	235	(sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
32		
33		
34	236	(markov* or monte carlo*).ab,ti.
35		
36	237	or/220-236 [**cost effectiveness]
37		
38	238	Health Care Delivery/
39		
40	239	Health Care Administration/
41		
42	240	Health Promotion/
43		
44	241	Integrated Services/
45		
46	242	Interdisciplinary Treatment Approach/
47		
48	243	Case Management/
49		
50	244	(approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
51		
52	245	barrier*.ab,ti.
53		
54	246	facilitator*.ab,ti.
55		
56	247	((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
57		
58	248	implement*.ab,ti.
59		
60		

- 1 249 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
- 2
- 3 250 (model* adj care).ab,ti.
- 4
- 5 251 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or intervention* or
- 6 model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or success* or constrain* or
- 7 difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or promot* or restrain* or restrict* or
- 8 disincentive* or factor* or capacity or enabler*)).ab,ti.
- 9
- 10
- 11 252 (pathway* adj3 (clinical or care)).ab,ti.
- 12
- 13 253 (program* adj3 (assess* or evaluat*)).ab,ti.
- 14
- 15 254 or/238-253 [**implementation]
- 16
- 17 255 11 and 30 and 144
- 18
- 19 256 limit 255 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 20 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 21 adolescence <age 13 to 17 yrs>))
- 22
- 23 257 255 and (158 or 219 or 237 or 254)
- 24
- 25 258 limit 257 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 26 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 27 adolescence <age 13 to 17 yrs>))
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BMJ Open

Rehabilitative management of back pain in children: Protocol for a mixed studies systematic review

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2 systematic review

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48 ABSTRACT

49 **Introduction:** Little is known about effective, efficient and acceptable management of back pain
50 in children. A comprehensive and updated evidence synthesis can help to inform clinical
51 practice.

52 **Objective:** To inform clinical practice, we aim to conduct a systematic review of the literature
53 and synthesize the evidence regarding effective, cost-effective and safe rehabilitation
54 interventions for children with back pain to improve their functioning and other health outcomes.

55 **Methods and analysis:** We will search MEDLINE, Embase, PsycINFO, CINAHL, the Index to
56 Chiropractic Literature, the Cochrane Controlled Register of Trials, and EconLit for primary
57 studies published from inception in all languages. We will include quantitative studies
58 (randomized controlled trials, cohort and case-control studies), qualitative studies, mixed
59 methods studies, and full economic evaluations. To augment our search of the bibliographic
60 electronic databases, we will search reference lists of included studies and relevant systematic
61 reviews, the WHO International Clinical Trials Registry Platform, and consult with content
62 experts. We will assess risk of bias using appropriate critical appraisal tools. We will extract data
63 about study and participant characteristics, intervention type and comparators, context and
64 setting, outcomes, themes and methodological quality assessment. We will use a sequential
65 approach at the review level to integrate data from the quantitative, qualitative and economic
66 evidence syntheses.

67 **Ethics and dissemination:** Ethics approval is not required. We will disseminate findings
68 through activities including: (1) presentations in national and international conferences; (2)
69 meetings with national and international decision makers; (3) publications in peer-reviewed
70 journals; and (4) posts on organizational websites and social media.

1
2
3 71 **Systematic review registration number:** PROSPERO CRD42019135009
4

5 72 **Key words:** systematic review, back pain, child, adolescent
6
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8 73

9
10 74 **Article Summary**

11
12 75 Strengths and limitations of this study
13

- 14
15 76 • A systematic review integrating quantitative, qualitative and economic evidence to
16
17 77 examine the rehabilitative management of back pain in children.
18
19 78 • Includes studies with a broad range of rehabilitation interventions as described by the
20
21 79 World Health Organization (WHO), and outcomes as described by the International
22
23 80 Classification of Functioning, Disability and Health (ICF) framework.
24
25 81 • Implements the Preferred Reporting Items for Systematic Review and Meta-Analysis
26
27 82 Protocols guidelines.
28
29 83 • There is no language restriction in articles.
30
31 84 • Our search strategies, while comprehensive, may miss relevant studies.
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36 85 **Word count:** 4,872
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94 INTRODUCTION

95 Rationale

96 A significant proportion of children over 10 years of age suffer from back pain.¹⁻⁵ The
97 prevalence of back pain in children ranges between 4% and 74%; the wide range is due to
98 heterogeneous populations studied, outcome measurements and methodologies used.^{6,7} Data
99 from the World Health Organization (WHO) Global Burden of Disease study in 2017 shows that
100 low back pain is the leading cause of global years lived with disability.⁸ Back pain begins early
101 in life with physical, mental and social consequences (e.g., impact on school-related and sporting
102 activities, general physical activity and well-being) that extend into adulthood.⁹⁻¹¹ Most episodes
103 of spinal pain are brief; however, in a three-year prospective cohort study of 1,465 school
104 children in Denmark, up to 25% of children had three or more episodes over one year, and
105 approximately 13% of children reported episodes lasting five or more weeks.¹²

106
107 Two recent systematic reviews assessed the effectiveness of manual therapy to treat a number of
108 conditions including back pain in children, but low-quality evidence precludes drawing
109 conclusions.^{13,14} A previous systematic review and meta-analysis which evaluated the
110 effectiveness of conservative interventions for low back pain in children under 18 years of age
111 reported that exercise interventions may be promising for improving pain scores in children
112 compared to no treatment; however, the evidence was very limited and of low-quality.¹⁵ This
113 evidence also needs updating. Additionally, to our knowledge, no integrative systematic review –
114 one that incorporates both quantitative and qualitative studies – has been conducted regarding the
115 rehabilitative management of back pain in children. Compared to traditional systematic reviews
116 of quantitative studies, combining evidence of the effectiveness and efficiency of interventions

1
2
3 117 with qualitative understanding from people's lived experiences can better inform clinical practice
4
5 118 guidelines and policy.¹⁶
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8 119
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10 120 This comprehensive knowledge synthesis can inform clinical practice for decision makers
11
12 121 involved with caring for children with back pain including healthcare professionals in a variety
13
14 122 of clinical, rehabilitation or community settings (e.g., physicians, nurses, physiotherapists,
15
16 123 chiropractors, psychologists, occupational therapists, registered massage therapists). Moreover,
17
18 124 the knowledge gaps that we identify can inform future research agendas.
19
20
21
22 125

23 24 126 **Objectives**

25
26 127 To support clinical practice for children with back pain, we aim to conduct an integrative
27
28 128 systematic review of quantitative, qualitative and economic evidence regarding the rehabilitative
29
30 129 management of back pain (including mid-back and low back pain) in children aged 19 years and
31
32
33 130 under. Our review will address the following questions:

- 34
35 131 1) What is the effectiveness and safety of rehabilitation interventions for improving
36
37 132 functioning and other health outcomes in children with back pain?
38
39 133 2) What are the patients', caregivers' and providers' experiences, preferences, expectations
40
41 134 and valued outcomes regarding rehabilitation interventions for back pain?
42
43 135 3) What is the cost-effectiveness of rehabilitation interventions for improving functioning
44
45 136 and other health outcomes in children with back pain?
46
47 137 4) What can be hypothesized from the integration of the quantitative, qualitative and
48
49 138 economic evidence about the effectiveness, cost-effectiveness and safety of rehabilitation
50
51 139 interventions for low back pain in children?
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3 140 We are targeting decision makers (clinicians, health managers/administrators, policy makers,
4
5 141 patients, and caregivers) involved in implementing, delivering or receiving rehabilitation
6
7 142 interventions or programs of care. We aim to provide them with knowledge regarding effective,
8
9 143 acceptable and positively experienced interventions for children with back pain and their
10
11 144 caregivers.
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15

16 17 145 18 **METHODS**

19 147 We developed this systematic review protocol using the Preferred Reporting Items for
20
21 148 Systematic Reviews and Meta-Analyses for Protocols (PRISMA-P)¹⁷ (Additional file 1). We
22
23 149 registered our protocol on the International Prospective Register of Systematic Reviews
24
25 150 (PROSPERO) (registration # CRD42019135009).¹⁸ We will report our systematic review
26
27 151 according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses
28
29 152 (PRISMA) statement,¹⁹ and the Enhancing Transparency in Reporting the Synthesis of
30
31 153 Qualitative Research (ENTREQ) reporting guideline.²⁰
32
33
34

35 154 36 37 155 **Eligibility criteria**

38 156 ***Population***

39
40 157 We will target studies including children (aged 19 years or younger)²¹ with non-specific low
41
42 158 back or thoracic spine pain of any duration and severity. We define LBP as pain and discomfort
43
44 159 below the costal margin and above the inferior gluteal folds, with or without radiculopathy
45
46 160 (referred leg pain).²² Radiculopathy refers to inflammation, injury/dysfunction, or compression
47
48 161 of spinal nerve roots that can present as pain, weakness, or altered sensation in a myotomal or
49
50 162 dermatomal distribution. Lumbar radiculopathy is commonly attributed to lumbar disc herniation
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3 163 (localized displacement of disc material beyond the normal margins of the intervertebral disc
4
5 164 space).²³ We define thoracic spine pain as pain within the region bounded superiorly by the first
6
7
8 165 thoracic spinous process, inferiorly by the last thoracic spinous process, and laterally by the most
9
10 166 lateral margins of the erector spinae muscles.²⁴ We will include studies investigating diagnoses
11
12 167 including low back pain, mid-back pain, mechanical back pain, lumbago, lumbar sprain or strain,
13
14 168 back sprain or strain, lumbopelvic pain, lumbar radiculopathy, lumbar disc herniation, sacroiliac
15
16 169 syndrome, sciatica, dysplastic or isthmic spondylolisthesis or spondylolysis, musculoskeletal or
17
18 170 non-specific chest wall pain (pain referred to the chest wall from the thoracic spine).
19
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24 172 We will exclude studies of children with back pain attributed to major structural or systemic
25
26 173 pathology (e.g., fracture, acute traumatic or pathological spondylolisthesis or spondylolysis,
27
28 174 infection, tumour, osteoporosis, inflammatory arthritides, cauda equina syndrome,
29
30 175 neuromuscular disease, myelopathy, and scoliosis); and (2) studies of children with back pain
31
32 176 attributed to a non-spine-related condition that might refer pain to the chest wall (e.g., heart, lung
33
34 177 or esophagus conditions).
35
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39 40 179 ***Intervention***

41
42 180 We will include studies that investigate the effectiveness and safety of rehabilitation
43
44 181 interventions or programs of care for children with back pain, including education and self-
45
46 182 management strategies, exercise, manual therapies, passive physical modalities, acupuncture,
47
48 183 pharmacological interventions, psychological interventions, environmental modifications,
49
50 184 assistive devices, and complementary and alternative therapies (CAM). Interventions may be
51
52 185 delivered in any manner such as in-person, or remotely using technology such as telehealth. The
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3 186 WHO defines rehabilitation as a set of interventions that assist individuals who experience, or
4
5 187 are likely to experience, disability to achieve and maintain optimal functioning when interacting
6
7 188 with their environments.²⁵ Rehabilitation interventions include rehabilitation medicine/therapy,
8
9
10 189 which aims to: 1) improve function through the diagnosis and treatment of health conditions,
11
12 190 reducing impairments, preventing or treating complications; and 2) restore and compensate loss
13
14 191 of functioning, and prevent or slow deterioration in functioning in every area of a person's life.²⁵
15
16 192 It may also include assistive devices, which refers to any item, piece of equipment, or product
17
18 193 used to increase, maintain, or improve functional capabilities.²⁵ Various healthcare providers
19
20 194 may provide interventions including, but not limited to, general practitioners, nurses,
21
22 195 physiotherapists, chiropractors, occupational therapists, psychologists, and registered massage
23
24 196 therapists (Table 1). We will exclude studies assessing surgical interventions, and interventions
25
26 197 solely conducted at the societal level, such as barrier removal initiatives (e.g., fitting a ramp to a
27
28 198 public building).
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35 200 ***Comparison***

37 201 The quantitative component of this review will consider comparisons including other
38
39 202 interventions, placebo or sham interventions, wait list, standard care, and no intervention.
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44 204 ***Outcomes***

46 205 Our primary outcome of interest is a child's functioning. Secondary health outcomes of interest
47
48 206 are pain (e.g., pain intensity, frequency, or duration), psychological outcomes (e.g., anxiety and
49
50 207 depression), health-related quality of life, adverse events, qualitative outcomes, and economic
51
52 208 outcomes (Table 2). We are interested in both short-term (<3 months) and long-term (≥3 months)
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209 outcomes. We selected these outcomes because they are important to children, their caregivers
210 and decision makers, and they are reflected in the WHO's framework for health and disability
211 (International Classification of Functioning, Disability and Health [ICF]).²⁶ The ICF provides a
212 standard language and framework for the description of health and health-related states, and
213 organizes information into two components – 'body functions and body structures' and
214 'activities and participation'.²⁶ Our primary outcome of interest, functioning, aligns with the
215 'activities and participation' component of the ICF. Examples of *activities* include walking,
216 running, jumping and lifting. *Participation* refers to involvement in life situations such as with
217 one's family, school and community. Common methods to measure *functioning* include the
218 Modified Oswestry Low Back Pain Disability Questionnaire,²⁷ Roland Morris Disability
219 Questionnaire (RMDQ),²⁸ return to school, and participation in sports or other recreational
220 activities. Pain and psychological outcomes fit within the 'body functions and body structures'
221 component of the ICF. Common methods to measure *pain* include the Visual Analogue Scale
222 (VAS),²⁹ Numerical Rating Scale (NRS),³⁰ and Faces Pain Scale – Revised.^{31 32} Common
223 methods to measure *psychological outcomes* (e.g., anxiety and depression) include Revised
224 Child Anxiety and Depression Scale,³³ and State-Trait Anxiety Inventory for Children.³⁴ We will
225 also assess *health-related quality of life*, which is not definable in the ICF framework.³⁵ It is
226 commonly measured with the KIDSCREEN-52,³⁶ Pediatric Quality of Life Inventory,³⁷ and
227 PROMIS Pediatric Self Report Scale.³⁸ We defined *adverse events or harms* as any
228 unfavourable sign, symptom, or disease temporarily associated with the treatment, whether or
229 not caused by the treatment.^{39 40} We will consider indirect harms (where the use of an
230 intervention delays a diagnosis or treatment, and such delay holds a potential harm),⁴¹ number of
231 adverse events, severity of adverse events (i.e., mild, moderate or severe), and number of

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2
3 232 participant withdrawals from the study due to adverse events. *Qualitative outcomes* include the
4
5 233 experiences, preferences, expectations, and valued outcomes (of children, caregivers, and
6
7
8 234 providers). Lastly, *economic outcomes* include direct costs (e.g., resources saved by an
9
10 235 intervention), indirect costs (e.g., time freed by an intervention), economic health outcomes (e.g.,
11
12 236 quality-adjusted life-year [QALY], incremental cost-effectiveness ratio [ICER], net monetary
13
14 237 benefit [NMB]), and intangible outcomes (e.g., pain or suffering saved by an intervention).
15
16
17 238

19 239 *Types of studies*

20
21 240 We will include randomized controlled trials of any type (e.g., superiority, non-inferiority and
22
23 241 equivalence), cohort studies, case-control studies, and mixed-methods studies (quantitative
24
25 242 component) including any secondary analyses of eligible studies for question 1 (effectiveness
26
27 243 and safety of interventions); qualitative and mixed-methods studies (qualitative component) for
28
29 244 question 2 (users' experiences, preferences, expectations and valued outcomes of interventions);
30
31 245 and trial- and model-based full economic evaluations for question 3 (cost-effectiveness of
32
33 246 interventions) (Table 2).
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40 248 We will exclude the following types of studies: cross-sectional studies, pilot studies assessing
41
42 249 feasibility, protocol studies, case reports, case series, studies assessing only prevention of back
43
44 250 pain and incidence outcomes, systematic reviews (although their reference lists will be searched
45
46 251 for potentially relevant studies) and other review papers, clinical practice guidelines,
47
48 252 biomechanical studies, laboratory studies, cadaveric or animal studies, conceptual papers, letters,
49
50 253 editorials, commentaries, books and book chapters, conference proceedings, meeting abstracts,
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3 254 lectures and addresses, consensus development statements, guideline statements, and studies
4
5 255 reviewing solely partial economic evaluations (e.g., cost of illness studies).
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10 257 ***Context and setting***

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12 258 We will consider rehabilitation interventions/programs of care delivered in any healthcare
13
14 259 system within an urban or rural area and in any healthcare setting (e.g., acute care, hospital,
15
16 260 primary health care, rehabilitation clinics), or in the community. Community-based rehabilitation
17
18 261 is implemented through the combined efforts of individuals with disabilities, their families and
19
20 262 communities, and relevant government and non-government health, education, social and other
21
22 263 services (e.g., advocacy programme).⁴²
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28 265 **Information sources**

29
30 266 We will develop the initial search strategy in MEDLINE, in consultation with an experienced
31
32 267 health sciences librarian. A second experienced health sciences librarian will review the search
33
34 268 strategy assessing its appropriateness and comprehensiveness using the Peer Review of
35
36 269 Electronic Search Strategies (PRESS) Checklist.^{43 44} We will conduct electronic searches of the
37
38 270 following databases from database inception to the present: MEDLINE (Ovid), Embase (Ovid),
39
40 271 PsycINFO (Ovid), CINAHL (Cumulative Index to Nursing and Allied Health Literature,
41
42 272 EBSCOhost), the Index to Chiropractic Literature (Chiropractic Library Collaboration), the
43
44 273 Cochrane Controlled Register of Trials (Ovid), and EconLit (EBSCOhost). We will augment our
45
46 274 search of the bibliographic electronic databases to identify additional relevant studies, and
47
48 275 mitigate the potential impact of publication bias and selective outcome reporting bias.⁴⁵ We will
49
50 276 search reference lists of included studies from the database searches and relevant systematic
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3 277 reviews; and we will consult with content experts. We will ask experts to suggest up to three
4
5 278 targeted websites that may contain relevant studies and other potentially relevant studies not
6
7
8 279 captured by our search strategy. Lastly, we will search the WHO International Clinical Trials
9
10 280 Registry Platform (<http://apps.who.int/trialsearch/>). For studies only reported in the registry, we
11
12 281 will contact first authors by email (with two reminders over one month) to obtain full study
13
14 282 reports, or additional study or outcome data. We will include studies in any language and will
15
16 283 use professional medical translation services where required. If 12 or more months elapse
17
18 284 between the search date and submission for publication, we will update the search.
19
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22 285

23 24 286 **Search strategy**

25
26 287 The searches will include a combination of subject headings specific to databases (e.g. MeSH in
27
28 288 MEDLINE) and free text words to capture the key concepts of rehabilitative management of
29
30 289 back pain in children (Additional file 2).
31
32

33 290

34 35 291 **Patient and public involvement**

36
37 292 Patients were not involved in the design of our study. However, we will seek patient and public
38
39 293 consultation during the development of clinical practice guidelines, which will be the next phase
40
41 294 of this project.
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45 46 296 **Data management**

47
48 297 We will download the electronic search results into Endnote X9 reference manager software
49
50 298 (Clarivate Analytics, PA, USA). We will remove duplicates and upload the remaining references
51
52 299 to the Evidence for Policy and Practice Information and Coordinating (EPPI) Centre Reviewer
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2
3 300 software for the data extraction stages (EPPI-Reviewer version 4, UCL Institute of Education,
4
5 301 University of London, UK). EPPI-Reviewer software stores references, manages and monitors
6
7 302 the data extraction process and provides an audit trail for the review.⁴⁶
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10 303

11 304 **Screening for eligibility**

12 305 Using the inclusion and exclusion criteria, pairs of reviewers will independently screen titles and
13
14 306 abstracts, and subsequently the full text of each selected article in order to confirm inclusion into
15
16 307 the study. Titles and abstracts will be classified as possibly relevant or irrelevant. Subsequently,
17
18 308 full-text articles of abstracts classified as possibly relevant will be retrieved, reviewed and
19
20 309 classified as relevant or irrelevant.
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27
28 311 We will conduct training exercises prior to initiating the screening process to ensure reliability
29
30 312 between reviewers. Reviewers will first screen a random sample of 50 records based on titles and
31
32 313 abstracts. Paired reviewers must reach 90% agreement before completing title and abstract
33
34 314 screening for the remaining studies.⁴⁷ If this threshold is not reached for all review teams, all
35
36 315 team members will discuss differences in classification to clarify and potentially modify the
37
38 316 eligibility criteria prior to completing title and abstract screening. Next, reviewers will screen a
39
40 317 random sample of 25 full-text articles. All paired reviewers must again reach 90% agreement
41
42 318 before completing full-text article screening for the remaining studies. If not, all team members
43
44 319 will discuss to clarify eligibility criteria and resolve disagreements prior to completing full-text
45
46 320 article screening. Upon completing full-text article screening, paired reviewers will discuss
47
48 321 disagreements and reach consensus related to the inclusion of any article, involving a third
49
50 322 reviewer if necessary.
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323

324 Risk of bias in individual studies

325 We will critically appraise studies according to study design using appropriate checklists
326 (Additional file 3). We will assess the quality of studies using the Scottish Intercollegiate
327 Guidelines Network (SIGN) criteria for randomized controlled trials (RCTs), cohort and case-
328 control studies;⁴⁸ the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for qualitative
329 studies;⁴⁹ the Mixed Methods Appraisal Tool (MMAT) for mixed methods studies;⁵⁰ and the
330 Drummond checklist for economic evaluations.⁵¹ The SIGN checklists allow reviewers to assess
331 internal validity by considering the impact of selection bias, information bias, and confounding
332 on study results. The JBI checklist allows reviewers to assess the possibility of bias in qualitative
333 studies' design, conduct and analysis. The MMAT allows reviewers to assess the interdependent
334 qualitative and quantitative components of the study and criteria to consider, such as justification
335 for mixing evidence, and appropriate ways of integrating the data. The Drummond checklist
336 allows reviewers to identify elements that demonstrate a sound economic evaluation such as the
337 assessment of both costs and effects of interventions, accurate measurements of costs and effects,
338 and allowances made for uncertainty in the estimates of costs and effects. We will contact the
339 authors of papers to request missing or additional data for clarification where required. Paired
340 reviewers will independently assess the eligible studies for quality. Any disagreements that arise
341 between the reviewers will be resolved through discussion, or with a third reviewer. Since some
342 of the reviewers have published within this area, the review coordinator will ensure that
343 reviewers will not be assigned their own studies for risk of bias assessment. Additionally,
344 reviewers will reclude themselves from any discussion and decision-making that involves their
345 paper. We will clearly describe this in our final systematic review report.

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5 347 Using these established checklists and notes to guide our assessment, we will categorize the
6
7 348 validity or credibility of each study as either high, low, or unclear risk of bias. We will not use a
8
9 349 quantitative cut-off score to determine study quality and will not pre-define weights for the
10
11 350 checklist items. Rather, we will make an overall quality judgement by considering the impact of
12
13 351 selection bias, information bias and confounding on study results throughout the conduct of each
14
15 352 study.⁵² We will report detailed results of the critical appraisal in a narrative form and in a 'risk
16
17 353 of bias' table. All studies, regardless of their methodological quality, will be extracted and
18
19 354 synthesized (where possible). The overall methodological quality of relevant studies will be
20
21 355 considered in the individual synthesis of quantitative, qualitative and economic data and the
22
23 356 integration of these findings. The results of the risk of bias assessment will be used in a
24
25 357 sensitivity analysis to ensure that studies judged to be at 'high risk of bias' do not affect the
26
27 358 robustness of our results.
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34 360 **Data items and data extraction process**

35 361 Paired reviewers will independently extract the data from all eligible studies. For the quantitative
36
37 362 studies, we will extract data on the study and participant characteristics; intervention and
38
39 363 comparator intervention characteristics using the Template for Intervention Description and
40
41 364 Replication (TIDieR) checklist;⁵³ all pre-determined outcomes including multiple measures if
42
43 365 used;; key findings; and methodological quality. The TIDieR checklist⁵³ consists of items to help
44
45 366 readers better understand the interventions and how they were delivered (i.e., name of
46
47 367 intervention, why, what (materials), what (procedure), who provided, how, where, when and how
48
49 368 much, tailoring, modifications, how well (planned), how well (actual)).⁵³ We will use the
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3 369 PerSPecTIF question formulation framework to guide data extraction for the qualitative studies
4
5 370 regarding the items: perspective, setting, phenomenon of interest, environment, timing, and
6
7 371 findings (e.g., themes).⁵⁴ We will also extract data describing the qualitative approach used and
8
9 372 methodological quality of studies. For both quantitative and qualitative studies, we will extract
10
11 373 data on the ICF categories ‘environmental factors’ (contextual factors that make up the physical,
12
13 374 social and attitudinal environment in which people live and conduct their lives) and ‘personal
14
15 375 factors’ (internal contextual factors that influence how disability is experienced by the
16
17 376 individual) to add context to the interventions and outcomes.²⁶ For the economic evaluations, we
18
19 377 will use the Consolidated Health Economic Evaluation Reporting Standards (CHEERS)
20
21 378 statement⁵⁵ and extract data on the analytic approach (trial- or model-based), evaluation type, the
22
23 379 analytic perspective, time horizon adopted for costs, main cost items, setting, key findings, and
24
25 380 methodological quality of studies.
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33 382 Paired reviewers will pretest the data extraction form and revise as needed. We will use EPPI-
34
35 383 Reviewer software to manage the data extraction process. Any disagreements that arise between
36
37 384 the reviewers will be resolved through discussion, or with a third reviewer. We will contact
38
39 385 authors of papers to request missing or additional data, if required.
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45 387 **DATA SYNTHESIS**

46
47 388 We will use a sequential approach at the review level to synthesize and integrate the data.⁵⁶ This
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49 389 will involve separate quantitative, economic, and qualitative findings synthesis followed by
50
51 390 integration of the resultant quantitative, economic, and qualitative evidence.
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392 ***Quantitative synthesis***

393 We will group studies by: 1) class of intervention (i.e., education and self-management
394 strategies, exercise, manual therapies, passive physical modalities, acupuncture, pharmacological
395 interventions, psychological interventions, environmental modifications, assistive devices, and
396 CAM); 2) comparator type, either inactive comparator (e.g., placebo, no treatment, standard care,
397 or waiting list control) or active comparator (e.g., different type of therapy); 3) outcome domain
398 (i.e., functioning, pain, psychological outcomes, health-related quality of life, and adverse
399 events) as well as subdomain (e.g., functioning could be further stratified into return to school
400 outcomes and participation in sports; psychological outcomes into depressive or anxiety
401 outcomes; pain outcomes into pain intensity or duration); and 4) methodological quality
402 assessment (i.e., high/low/unclear risk of bias). We may conduct further subgroup analyses
403 according to study design (i.e., RCT, cohort or case-control study); age group (e.g., youth,
404 adolescent); sex; back pain type (e.g., non-specific low back pain, disc herniation); specific
405 intervention within each intervention class outlined in Table 1 (e.g., type of exercise such as
406 aerobic or stretching); mode of intervention delivery (e.g., provider type, in-person or remotely);
407 specific measurements used in each outcome domain (e.g., VAS or Faces Pain Scale – Revised
408 for the pain domain); and time points of outcome measurement (short- or long-term). We will
409 use established minimal clinically important differences (MCID) to determine the clinical
410 importance of effect sizes when possible.

411
412 We will assess clinical, methodological, and statistical heterogeneity among studies. Differences
413 in populations, interventions, comparators, or outcomes across studies may result in clinical
414 heterogeneity. Methodological and statistical heterogeneity may result from differences in risk of

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3 415 bias and differences in outcomes across studies beyond what could be expected by chance alone.
4
5 416 We will assess the methodological heterogeneity across studies using our assessments from the
6
7 417 SIGN checklist as either high, low, or unclear risk of bias. We will assess statistical
8
9
10 418 heterogeneity using the I^2 statistic, whereby I^2 of <25-50% will be considered low to moderate
11
12 419 (homogeneous), and $\geq 50\%$ considered high (heterogeneous).⁵⁷ If two or more studies are
13
14 420 clinically homogeneous (i.e., similar populations, interventions, comparators and outcomes) and
15
16 421 statistically homogeneous (i.e., $I^2 < 25-50\%$), we will perform a random effects meta-analysis
17
18 422 using EPPI-Reviewer software using the relative risk (or odds ratio for rare events) effect
19
20 423 measure for dichotomous data, mean differences for continuous data, hazard rate ratios for time-
21
22 424 to-event data, and rates or rate ratios for count data. For studies that used multiple measures to
23
24 425 assess the same outcome and at multiple time points, we will select the most prevalent measure
25
26 426 and time point used across the studies to maximize comparability of the findings. For our
27
28 427 primary analysis, we will analyze the studies with low and unclear risk of bias. We will then
29
30 428 explore the impact of methodological heterogeneity through sensitivity analysis by analyzing all
31
32 429 studies together, including those with a high risk of bias, and comparing our primary analysis
33
34 430 with our sensitivity analysis. If the results of the primary and sensitivity analyses differ, we will
35
36 431 give precedence to the primary analysis because high risk of bias studies are known to be at risk
37
38 432 of overestimating effect sizes.⁵⁸
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45 434 If the studies are heterogeneous (i.e., if there is clinical, methodological, and statistical
46
47 435 heterogeneity), we will narratively summarize the characteristics and findings of all eligible
48
49 436 studies according to or the Synthesis Without Meta-analysis (SWiM) reporting guideline.⁵⁹ To
50
51 437 quantify the effectiveness of interventions, we will use the data provided in the studies to
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3 438 compute effect measures and 95% confidence intervals (i.e., odds ratio or relative risk for
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5 439 dichotomous outcomes, mean differences for continuous outcomes, hazard rate ratios for time-
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7
8 440 to-event outcomes, and rates or rate ratios for count outcomes).⁶⁰ We will interpret the evidence
9
10 441 on the effectiveness of interventions (i.e., whether an intervention was superior, equal or inferior
11
12 442 to a comparison intervention) by considering the direction, magnitude, and precision of effect
13
14 443 estimates across studies, impact of risk of bias in sensitivity analyses, and the generalizability of
15
16 444 findings. Similar to any meta-analysis we may conduct, we will give precedence to the primary
17
18 445 analysis consisting of studies with low and unclear risk of bias.
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22 446

23 24 447 *Economic synthesis*

25
26 448 We will report the main findings of economic studies, first stratified by high, low or unclear risk
27
28 449 of bias. We will further stratify findings by study design (i.e., cost-effectiveness, cost-utility,
29
30 450 cost-benefit, or cost-consequences). We will then stratify findings by type of intervention,
31
32 451 outcome, and cost measure.
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37 453 To indicate whether an intervention might be judged favourably (or unfavourably) from an
38
39 454 economic perspective,⁶¹ we will use the Dominance Ranking Matrix (DRM) to classify the
40
41 455 interventions into one of three options.⁶² *Strong dominance* for the intervention will be selected
42
43 456 when the incremental cost-effectiveness measure shows the intervention as: (i) more effective
44
45 457 and less costly than the comparator; or (ii) effective and less costly; or (iii) equal cost and more
46
47 458 effective. In this case, from an efficiency perspective, decision makers should favor the
48
49 459 intervention over the comparator (in circumstances similar to those of the evaluations). *Weak*
50
51 460 *dominance* for the intervention will be selected when the measure shows the interventions as: (i)
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3 461 equally costly and effective as the comparator; or (ii) more effective and more costly; or (iii) less
4
5 462 effective and less costly. In this case, no conclusion may be drawn about whether the
6
7 463 intervention is preferable from an efficiency perspective without further information on the
8
9 464 priorities or preferences of decision makers in a particular context. Decision makers must
10
11 465 determine whether the cost/benefit trade-offs are worth the implementing an intervention in their
12
13 466 particular context. Lastly, *non-dominance* for the intervention will be selected when the measure
14
15 467 shows the intervention as: (i) more costly and less effective; or (ii) equally as costly and less
16
17 468 effective; or (iii) more costly and as effective. In this case the evidence we will interpret the
18
19 469 evidence as suggesting the comparator is favourable from an efficiency perspective (in
20
21 470 circumstances similar to those of the evaluations).
22
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26 471

27 472 *Qualitative synthesis*

28
29 473 We will stratify the qualitative findings similarly to the quantitative and economic findings. We
30
31 474 will first stratify the findings by risk of bias (i.e., high/low/unclear), then by study approach or
32
33 475 design (e.g., qualitative descriptive, ethnography, grounded theory), and by intervention type and
34
35 476 outcome.
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42 478 Additionally, we will stratify findings according to individual perspective (i.e., patient (children),
43
44 479 caregivers (parents/guardians), healthcare providers, community service providers, or others
45
46 480 involved with the rehabilitation of back pain in children). We will use thematic synthesis to
47
48 481 synthesize the qualitative research findings.^{63 64} First, we will enter all the text labelled as
49
50 482 'results' or 'findings' of the primary studies verbatim into EPPI-Reviewer. Then, pairs of trained
51
52 483 reviewers will independently code each line of text according to its meaning and content, and
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3 484 group codes hierarchically into descriptive themes, including the *a priori* themes (intervention
4
5 485 type and outcomes). Reviewers will also generate themes *a posteriori* to answer our review
6
7 486 question (i.e., experiences, preferences, expectations and valued outcomes regarding
8
9 487 rehabilitation interventions for back pain in children). Reviewers will finalize the themes through
10
11 488 discussion. We will give precedence to studies with low or unclear risk of bias.⁶⁵
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15 489

17 490 ***Integration of quantitative, qualitative and economic evidence***

19 491 Various methods can be used to integrate diverse study types including: (1) juxtaposing findings
20
21 492 in a matrix, (2) using logic models/conceptual framework, (3) analyzing program theory, (4)
22
23 493 testing hypothesis derived using subgroup analysis, and (5) qualitative comparative analysis.⁵⁶
24
25 494 We will integrate the evidence by juxtaposing findings in a matrix to generate hypotheses
26
27 495 regarding the effectiveness, cost-effectiveness and safety of rehabilitation interventions for back
28
29 496 pain in children. We selected this methodology because it is suitable for comparing and
30
31 497 contrasting the findings across the individual quantitative, qualitative and economic evidence
32
33 498 syntheses in our review.⁵⁶ The use of a matrix will allow us to explore heterogeneity in the
34
35 499 findings of the quantitative studies and may indicate why some interventions may be effective,
36
37 500 cost-effective and safe, and some may not.⁵⁶ For example, we may list themes from the
38
39 501 qualitative synthesis along one side of the matrix, and then plot the interventions evaluated in the
40
41 502 quantitative synthesis against the themes as either a match (when the intervention matched a
42
43 503 theme) or a mismatch (when the intervention was the opposite of a theme). We will also plot the
44
45 504 economic evaluation findings against the corresponding intervention and theme. We will identify
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47 505 gaps in knowledge if a particular theme for an intervention does not match with any of the
48
49 506 interventions evaluated in the quantitative studies.
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507

508 DISSEMINATION

509 Knowledge translation activities will include presentations to clinicians and researchers at
510 national and international conferences; meetings with national and international decision makers
511 (clinicians, health managers/administrators, policy makers and patients); publications in peer-
512 reviewed journals; clinician and patient/caregiver resources; posts and lay language summaries
513 on organizations' websites (open access) and other social media platforms.

514

515 DISCUSSION

516 Findings from this mixed studies review will advance our knowledge of the effectiveness, safety,
517 user experience, and cost-effectiveness of a wide range of rehabilitation interventions for
518 children with back pain. This work will provide the evidentiary basis to develop clinical practice
519 guidelines and care pathways outlining the evidence-based management of back pain in children,
520 which can be adapted for specific settings (e.g., hospitals, rehabilitation clinics, and schools) and
521 geographical regions. Specifically, decision makers should consider interventions that are
522 identified as effective, safe, efficient, and positively experienced by patients and caregivers.
523 Mapping findings to the ICF framework will allow decision makers to use standardized language
524 in the assessment and management of children during their care program. This may further
525 facilitate improvements in functioning and health outcomes in this patient population.

526

527 A potential limitation of our review is that our search strategy may miss potentially relevant
528 studies, however, we have mitigated this by expanding our search strategy to include content
529 experts and searching relevant websites. A potential risk is that there may be too little evidence

530 available to answer our review questions. Another limitation is that we will not assess the
531 potential for publication bias in our review.

532
533 Findings from this review will guide future research by identifying methodological limitations
534 and knowledge gaps in the available literature. Future studies can be designed to address these
535 limitations and gaps. This novel interpretation of quantitative, qualitative and economic evidence
536 according to the ICF framework serves as a model for how outcomes related to functioning and
537 health can be prioritized in future research.

538

539

540 **ADDITIONAL FILES**

541 Additional file 1: PRISMA-P 2015 Checklist. Preferred Reporting Items for Systematic Review
542 and Meta-Analysis Protocols (PRISMA-P) 2015 statement

543 Additional file 2: Literature search strategies

544 Additional file 3: Risk of bias assessment

545

546 **DECLARATIONS**

547

548 **Ethics approval and consent to participate:** Not applicable

549

550 **Consent for publication:** Not applicable

551

552 **Availability of data and materials:** Not applicable

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3 5534
5 554 **Competing interests:** None declared.6
7
8 5559
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11
12 557 funding organization was not involved in the design or conduct of this systematic review
13
14 558 protocol.15
16
17 55918
19 560 **Author contributions:**20
21 561 All authors (CC, JJW, HY, SM, GB, HMS, DR, LH, EP, CC, MS, GC, LV, ATV, PC) assisted in
22
23 562 designing and planning the study, developing the research questions and systematic review
24
25 563 methodology. CC and JJW drafted the manuscript. All authors reviewed and revised the
26
27 564 manuscript, and approved the final manuscript.28
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51 574
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53
54
55
56
57
58
59
60

575 **REFERENCES**

- 576 1. Joergensen AC, Hestbaek L, Andersen PK, et al. Epidemiology of spinal pain in children: a
577 study within the Danish National Birth Cohort. *Eur J Pediatr* 2019;178(5):695-706. doi:
578 10.1007/s00431-019-03326-7 [published Online First: 2019/02/23]
- 579 2. Aartun E, Hartvigsen J, Wedderkopp N, et al. Spinal pain in adolescents: prevalence,
580 incidence, and course: a school-based two-year prospective cohort study in 1,300 Danes
581 aged 11-13. *BMC Musculoskelet Disord* 2014;15:187. doi: 10.1186/1471-2474-15-187
582 [published Online First: 2014/06/03]
- 583 3. Beynon AM, Hebert JJ, Lebouef-Yde C, et al. Potential risk factors and triggers for back pain
584 in children and young adults. A scoping review, part I: incident and episodic back pain.
585 *Chiropr Man Therap* 2019;27:58. doi: 10.1186/s12998-019-0280-9 [published Online
586 First: 2019/12/13]
- 587 4. Kamper SJ, Yamato TP, Williams CM. The prevalence, risk factors, prognosis and treatment
588 for back pain in children and adolescents: An overview of systematic reviews. *Best Pract*
589 *Res Clin Rheumatol* 2016;30(6):1021-36. doi: 10.1016/j.berh.2017.04.003 [published
590 Online First: 2017/11/07]
- 591 5. Calvo-Munoz I, Gomez-Conesa A, Sanchez-Meca J. Prevalence of low back pain in children
592 and adolescents: a meta-analysis. *BMC Pediatr* 2013;13:14. doi: 10.1186/1471-2431-13-
593 14 [published Online First: 2013/01/29]
- 594 6. King S, Chambers CT, Huguet A, et al. The epidemiology of chronic pain in children and
595 adolescents revisited: a systematic review. *Pain* 2011;152(12):2729-38. doi:
596 10.1016/j.pain.2011.07.016 [published Online First: 2011/11/15]

- 1
2
3 597 7. Jeffries LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain: a
4
5 598 systematic overview of the research literature. *Spine (Phila Pa 1976)* 2007;32(23):2630-
6
7 599 7. doi: 10.1097/BRS.0b013e318158d70b [published Online First: 2007/11/06]
8
9
10 600 8. Disease GBD, Injury I, Prevalence C. Global, regional, and national incidence, prevalence,
11
12 601 and years lived with disability for 354 diseases and injuries for 195 countries and
13
14 602 territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study
15
16 603 2017. *Lancet* 2018;392(10159):1789-858. doi: 10.1016/S0140-6736(18)32279-7
17
18 604 [published Online First: 2018/11/30]
19
20
21 605 9. Batley S, Aartun E, Boyle E, et al. The association between psychological and social factors
22
23 606 and spinal pain in adolescents. *Eur J Pediatr* 2019;178(3):275-86. doi: 10.1007/s00431-
24
25 607 018-3291-y [published Online First: 2018/11/23]
26
27
28 608 10. Kamper SJ, Henschke N, Hestbaek L, et al. Musculoskeletal pain in children and adolescents.
29
30 609 *Braz J Phys Ther* 2016;20(3):275-84. doi: 10.1590/bjpt-rbf.2014.0149 [published Online
31
32 610 First: 2016/07/22]
33
34
35 611 11. Stallknecht SE, Strandberg-Larsen K, Hestbaek L, et al. Spinal pain and co-occurrence with
36
37 612 stress and general well-being among young adolescents: a study within the Danish
38
39 613 National Birth Cohort. *Eur J Pediatr* 2017;176(6):807-14. doi: 10.1007/s00431-017-
40
41 614 2915-y [published Online First: 2017/05/05]
42
43
44 615 12. Dissing KB, Hestbaek L, Hartvigsen J, et al. Spinal pain in Danish school children - how
45
46 616 often and how long? The CHAMPS Study-DK. *BMC Musculoskelet Disord*
47
48 617 2017;18(1):67. doi: 10.1186/s12891-017-1424-5 [published Online First: 2017/03/28]
49
50
51 618 13. Driehuis F, Hoogeboom TJ, Nijhuis-van der Sanden MWG, et al. Spinal manual therapy in
52
53 619 infants, children and adolescents: A systematic review and meta-analysis on treatment
54
55
56
57
58
59
60

- 1
2
3 620 indication, technique and outcomes. *PLoS One* 2019;14(6):e0218940. doi:
4
5 621 10.1371/journal.pone.0218940 [published Online First: 2019/06/27]
6
7
8 622 14. Parnell Prevost C, Gleberzon B, Carleo B, et al. Manual therapy for the pediatric population:
9
10 623 a systematic review. *BMC Complement Altern Med* 2019;19(1):60. doi: 10.1186/s12906-
11
12 624 019-2447-2 [published Online First: 2019/03/15]
13
14
15 625 15. Michaleff ZA, Kamper SJ, Maher CG, et al. Low back pain in children and adolescents: a
16
17 626 systematic review and meta-analysis evaluating the effectiveness of conservative
18
19 627 interventions. *Eur Spine J* 2014;23(10):2046-58. doi: 10.1007/s00586-014-3461-1
20
21 628 [published Online First: 2014/07/30]
22
23
24 629 16. Harden A, Thomas J. Methodological issues in combining diverse study types in systematic
25
26 630 reviews. *International Journal of Social Research Methodology* 2005;8(3):257-71.
27
28
29 631 17. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and
30
31 632 meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews* 2015;4:1. doi:
32
33 633 10.1186/2046-4053-4-1 [published Online First: 2015/01/03]
34
35
36 634 18. National Institute for Health Research. International prospective register of systematic
37
38 635 reviews (PROSPERO). Available at: <https://www.crd.york.ac.uk/prospéro/> (accessed Jan
39
40 636 10, 2019).
41
42
43 637 19. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and
44
45 638 meta-analyses: the PRISMA statement. *Journal of clinical epidemiology*
46
47 639 2009;62(10):1006-12. doi: 10.1016/j.jclinepi.2009.06.005 [published Online First:
48
49 640 2009/07/28]
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 641 20. Tong A, Flemming K, McInnes E, et al. Enhancing transparency in reporting the synthesis of
4
5 642 qualitative research: ENTREQ. *BMC Med Res Methodol* 2012;12:181. doi:
6
7 643 10.1186/1471-2288-12-181 [published Online First: 2012/11/29]
8
9
10 644 21. World Health Organization. Definition of key terms. Age groups and population [Available
11
12 645 from: <https://www.who.int/hiv/pub/guidelines/arv2013/intro/keyterms/en/> accessed
13
14 646 January 15, 2020.
15
16
17 647 22. Amundsen PA, Evans DW, Rajendran D, et al. Inclusion and exclusion criteria used in non-
18
19 648 specific low back pain trials: a review of randomised controlled trials published between
20
21 649 2006 and 2012. *BMC Musculoskelet Disord* 2018;19(1):113. doi: 10.1186/s12891-018-
22
23 650 2034-6 [published Online First: 2018/04/14]
24
25
26 651 23. North American Spine Society. NASS Clinical Guidelines: Lumbar Disc Herniation with
27
28 652 Radiculopathy. Available at:
29
30 653 [https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf)
31
32 654 [on.pdf](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf) (accessed Dec 12, 2018).
33
34
35 655 24. Merskey H, Bogduk N, International Association for the Study of Pain, et al. Classification
36
37 656 of chronic pain: descriptions of chronic pain syndromes and definitions of pain terms.
38
39 657 2nd ed. Seattle: IASP Press 1994:xvi, 222 p. p.
40
41
42 658 25. The World Health Organization. World Report on Disability: Chapter 4 Rehabilitation.
43
44 659 Available at:
45
46 660 [https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf)
47
48 661 [on.pdf](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf) (access Dec 16, 2018).
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 662 26. World Health Organization. The International Classification of Functioning, Disability and
4
5 663 Health (ICF). Available at: <https://www.who.int/classifications/icf/icfbeginnersguide.pdf>
6
7
8 664 (accessed Dec 1, 2018).
9
- 10 665 27. Fairbank JC, Couper J, Davies JB, et al. The Oswestry low back pain disability
11
12 666 questionnaire. *Physiotherapy* 1980;66(8):271-3. [published Online First: 1980/08/01]
13
- 14 667 28. Roland M, Morris R. A study of the natural history of back pain. Part I: development of a
15
16 668 reliable and sensitive measure of disability in low-back pain. *Spine* 1983;8(2):141-4.
17
18 669 [published Online First: 1983/03/01]
19
- 20 670 29. McCormack HM, Horne DJ, Sheather S. Clinical applications of visual analogue scales: a
21
22 671 critical review. *Psychol Med* 1988;18(4):1007-19. doi: 10.1017/s0033291700009934
23
24 672 [published Online First: 1988/11/01]
25
- 26 673 30. Jensen MP, Turner JA, Romano JM, et al. Comparative reliability and validity of chronic
27
28 674 pain intensity measures. *Pain* 1999;83(2):157-62. doi: 10.1016/s0304-3959(99)00101-3
29
30 675 [published Online First: 1999/10/27]
31
32 676 31. Hicks CL, von Baeyer CL, Spafford PA, et al. The Faces Pain Scale-Revised: toward a
33
34 677 common metric in pediatric pain measurement. *Pain* 2001;93(2):173-83. doi:
35
36 678 10.1016/s0304-3959(01)00314-1 [published Online First: 2001/06/28]
37
38 679 32. Michaleff ZA, Kamper SJ, Stinson JN, et al. Measuring Musculoskeletal Pain in Infants,
39
40 680 Children, and Adolescents. *J Orthop Sports Phys Ther* 2017;47(10):712-30. doi:
41
42 681 10.2519/jospt.2017.7469 [published Online First: 2017/09/19]
43
44 682 33. Chorpita BF, Yim L, Moffitt C, et al. Assessment of symptoms of DSM-IV anxiety and
45
46 683 depression in children: a revised child anxiety and depression scale. *Behav Res Ther*
47
48
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 684 2000;38(8):835-55. doi: 10.1016/s0005-7967(99)00130-8 [published Online First:
4
5 685 2000/08/11]
6
7
8 686 34. Spielberger CD. Manual for the State-Trait Anxiety Inventory for Children. Palo Alto, Calif,
9
10 687 USA: Consulting Psychologists Press 1973.
11
12 688 35. Cieza A, Geyh S, Chatterji S, et al. ICF linking rules: an update based on lessons learned.
13
14 689 *Journal of rehabilitation medicine* 2005;37(4):212-8. doi: 10.1080/16501970510040263
15
16 [published Online First: 2005/07/19]
17 690
18
19 691 36. Ravens-Sieberer U, Gosch A, Rajmil L, et al. The KIDSCREEN-52 quality of life measure
20
21 692 for children and adolescents: psychometric results from a cross-cultural survey in 13
22
23 693 European countries. *Value Health* 2008;11(4):645-58. doi: 10.1111/j.1524-
24
25 694 4733.2007.00291.x [published Online First: 2008/01/09]
26
27
28 695 37. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of
29
30 696 Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med*
31
32 697 *Care* 2001;39(8):800-12. doi: 10.1097/00005650-200108000-00006 [published Online
33
34 698 First: 2001/07/27]
35
36
37 699 38. Health Measures, . [January 14, 2020]. Available from:
38
39 700 [http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
40
41 701 [promis/list-of-pediatric-measures.](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
42
43
44 702 39. Pohlman KA, O'Beirne M, Thiel H, et al. Development and validation of providers' and
45
46 703 patients' measurement instruments to evaluate adverse events after spinal manipulation
47
48 704 therapy. *European Journal of Integrative Medicine* 2014;6(4):451-66.
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 705 40. Ioannidis JP, Evans SJ, Gotzsche PC, et al. Better reporting of harms in randomized trials: an
4
5 706 extension of the CONSORT statement. *Ann Intern Med* 2004;141(10):781-8. doi:
6
7 707 10.7326/0003-4819-141-10-200411160-00009 [published Online First: 2004/11/17]
8
9
10 708 41. Zorzela L, Boon H, Mior S, et al. Serious adverse events associated with pediatric
11
12 709 complementary and alternative medicine. *European Journal of Integrative Medicine*
13
14 710 2014;6(4):467-72.
15
16
17 711 42. World Health Organization. Community-based rehabilitation. Available at:
18
19 712 <https://www.who.int/disabilities/cbr/en/> (accessed Dec. 1, 2018).
20
21
22 713 43. Sampson M, McGowan J, Cogo E, et al. An evidence-based practice guideline for the peer
23
24 714 review of electronic search strategies. *Journal of clinical epidemiology* 2009;62(9):944-
25
26 715 52. doi: 10.1016/j.jclinepi.2008.10.012 [published Online First: 2009/02/24]
27
28
29 716 44. McGowan J, Sampson M, Salzwedel DM, et al. PRESS Peer Review of Electronic Search
30
31 717 Strategies: 2015 Guideline Statement. *J Clin Epidemiol* 2016;75:40-6. doi:
32
33 718 10.1016/j.jclinepi.2016.01.021 [published Online First: 2016/03/24]
34
35
36 719 45. Godin K, Stapleton J, Kirkpatrick SI, et al. Applying systematic review search methods to the
37
38 720 grey literature: a case study examining guidelines for school-based breakfast programs in
39
40 721 Canada. *Syst Rev* 2015;4:138. doi: 10.1186/s13643-015-0125-0 [published Online First:
41
42 722 2015/10/27]
43
44
45 723 46. Centre EfPaPIaC. EPPI-Reviewer 4 software [Available from: eppi.ioe.ac.uk accessed
46
47 724 November 20, 2019].
48
49 725 47. Belur J, Tompson L, Thornton A, et al. Interrater reliability in systematic review
50
51 726 methodology: Exploring variation in coder decision-making. *Sociological Methods &*
52
53 727 *Research* 2018:1-29.
54
55
56
57
58
59
60

- 1
2
3 728 48. Scottish Intercollegiate Guidelines Network (SIGN). Critical appraisal notes and checklists,
4
5 729 2019. Available at: <https://www.sign.ac.uk/checklists-and-notes.html> (accessed Feb 1,
6
7 730 2019).
8
9
10 731 49. Lockwood C, Munn Z, Porritt K. Qualitative research synthesis: methodological guidance for
11
12 732 systematic reviewers utilizing meta-aggregation. *International journal of evidence-based*
13
14 733 *healthcare* 2015;13(3):179-87. doi: 10.1097/xeb.0000000000000062 [published Online
15
16 734 First: 2015/08/12]
17
18
19 735 50. Pluye P, Gagnon MP, Griffiths F, et al. A scoring system for appraising mixed methods
20
21 736 research, and concomitantly appraising qualitative, quantitative and mixed methods
22
23 737 primary studies in Mixed Studies Reviews. *International journal of nursing studies*
24
25 738 2009;46(4):529-46. doi: 10.1016/j.ijnurstu.2009.01.009 [published Online First:
26
27 739 2009/02/24]
28
29
30
31 740 51. Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic
32
33 741 submissions to the BMJ. The BMJ Economic Evaluation Working Party. *BMJ*
34
35 742 1996;313(7052):275-83. doi: 10.1136/bmj.313.7052.275 [published Online First:
36
37 743 1996/08/03]
38
39
40 744 52. Higgins JPT, Savovic J, Page MJ, et al. Chapter 8: Assessing risk of bias in a randomized
41
42 745 trial. In: Higgins JPT, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for*
43
44 746 *Systematic Reviews of Interventions* version 60 (updated July 2019): Cochrane, 2019.
45
46
47 747 53. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for
48
49 748 intervention description and replication (TIDieR) checklist and guide. *BMJ*
50
51 749 2014;348:g1687. doi: 10.1136/bmj.g1687 [published Online First: 2014/03/13]
52
53
54
55
56
57
58
59
60

- 1
2
3 750 54. Booth A, Noyes J, Flemming K, et al. Formulating questions to explore complex
4
5 751 interventions within qualitative evidence synthesis. *BMJ Glob Health* 2019;4(Suppl
6
7 752 1):e001107. doi: 10.1136/bmjgh-2018-001107 [published Online First: 2019/02/19]
8
9
10 753 55. Husereau D, Drummond M, Petrou S, et al. Consolidated Health Economic Evaluation
11
12 754 Reporting Standards (CHEERS) statement. *BMJ* 2013;346:f1049. doi:
13
14 755 10.1136/bmj.f1049 [published Online First: 2013/03/27]
15
16
17 756 56. Harden A, Thomas J, Cargo M, et al. Cochrane Qualitative and Implementation Methods
18
19 757 Group guidance series-paper 5: methods for integrating qualitative and implementation
20
21 758 evidence within intervention effectiveness reviews. *Journal of clinical epidemiology*
22
23 759 2018;97:70-78. doi: 10.1016/j.jclinepi.2017.11.029 [published Online First: 2017/12/16]
24
25
26 760 57. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Stat Med*
27
28 761 2002;21(11):1539-58. doi: 10.1002/sim.1186
29
30
31 762 58. Higgins JP, Altman DG, Gotzsche PC, et al. The Cochrane Collaboration's tool for assessing
32
33 763 risk of bias in randomised trials. *BMJ (Clinical research ed)* 2011;343:d5928. doi:
34
35 764 10.1136/bmj.d5928 [published Online First: 2011/10/20]
36
37
38 765 59. Campbell M, McKenzie JE, Sowden A, et al. Synthesis without meta-analysis (SWiM) in
39
40 766 systematic reviews: reporting guideline. *BMJ* 2020;368:l6890. doi: 10.1136/bmj.l6890
41
42 767 [published Online First: 2020/01/18]
43
44
45 768 60. McKenzie JE, Brennan SE. Chapter 12: Synthesizing and presenting findings using other
46
47 769 methods. In: Higgins JPT TJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA., ed.
48
49 770 Cochrane Handbook for Systematic Reviews of Interventions version 60 (updated July
50
51 771 2019): Cochrane, 2019.

- 1
2
3 772 61. Shemilt I, Aluko P, Graybill E, et al. Economic Evidence. In: Higgins JPT TJ, Chandler J,
4
5 773 Cumpston M, Li T, Page MJ, Welch VA., ed. Cochrane Handbook for Systematic
6
7 774 Reviews of Interventions version 60, 2019.
8
9
10 775 62. Joanna Briggs Institute. Chapter 6: Systematic reviews of economic evidence 2019
11
12 776 [Available from:
13
14 777 <https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of>
15
16
17 778 [+economic+evidence](https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of) accessed February 1, 2020.
18
19 779 63. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic
20
21 780 reviews. *BMC Med Res Methodol* 2008;8:45. doi: 10.1186/1471-2288-8-45 [published
22
23 781 Online First: 2008/07/12]
24
25
26 782 64. Noyes J, Booth A, Flemming K, et al. Cochrane Qualitative and Implementation Methods
27
28 783 Group guidance series-paper 3: methods for assessing methodological limitations, data
29
30 784 extraction and synthesis, and confidence in synthesized qualitative findings. *Journal of*
31
32 785 *clinical epidemiology* 2018;97:49-58. doi: 10.1016/j.jclinepi.2017.06.020 [published
33
34 786 Online First: 2017/12/17]
35
36
37 787 65. Slavin RE. Best evidence synthesis: an intelligent alternative to meta-analysis. *Journal of*
38
39 788 *clinical epidemiology* 1995;48(1):9-18. [published Online First: 1995/01/01]
40
41
42 789
43
44
45 790
46
47
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49
50
51
52
53
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791 **Table 1: Examples of rehabilitation interventions**

Intervention	Definition	Examples
Patient or caregiver education and self-management strategies (structured or unstructured)	Teaching patients skills that they can use to manage their health condition	<ul style="list-style-type: none"> • Learning disease-specific information • Learning general managing skills (e.g., problem-solving, finding and using community resources, working with healthcare team) • Learning strategies to increase confidence (i.e., self-efficacy) in ability to engage in behaviours that are needed to manage their condition on a daily basis • Adequate peer role models and support networks that facilitate the initiation and maintenance of desired behavioural changes
Exercise	A subcategory of physical activity that is planned, structured, repetitive, and purposeful; can be supervised (e.g., by a healthcare professional) or unsupervised	<ul style="list-style-type: none"> • Stretching • Strengthening • Range of motion exercises • Aerobic (e.g., swimming, cycling, walking, running) • Anaerobic (e.g., jumping, sprinting, weight lifting) • Yoga, Qigong
Manual therapies	<ul style="list-style-type: none"> - Manipulation: Techniques incorporating a high-velocity low-amplitude impulse or thrust applied at or near the end of a joint's passive range of motion - Mobilization: Techniques incorporating a low-velocity and small or large amplitude oscillatory movement, within a joint's passive range of motion - Traction: Manual or mechanically assisted application of an intermittent or continuous distractive force - Soft tissue therapy: A mechanical form of therapy where soft-tissue structures are pressed and kneaded, using physical contact with the hand or mechanical device 	<ul style="list-style-type: none"> • Lumbar manipulation, mobilization, or traction • Massage • Muscle energy technique • Strain-counterstrain
Passive physical modalities	A form of cold, heat, or light application affecting the body at the skin level or ultrasonic	<ul style="list-style-type: none"> • Heat application: heat pack, hydrotherapy

	<p>or electromagnetic radiation affecting structures beneath the skin surface:</p> <ul style="list-style-type: none"> - Passive assistive devices: Device to encourage immobilization in anatomic positions or actively inhibit or prevent movement 	<ul style="list-style-type: none"> • Cryotherapy: cold pack, vapocoolant spray • Low-level laser • Electrical muscle stimulation • Pulsed electromagnetic therapy
Acupuncture	Any body-needling, moxibustion, electric acupuncture, laser acupuncture, microsystem acupuncture, and acupressure	<ul style="list-style-type: none"> • Traditional needling • Dry needling • Burning of specific herbs • Electro-acupuncture • Photo-acupuncture
Pharmacological interventions	A substance used in treating disease or relieving pain	<ul style="list-style-type: none"> • Acetaminophen • Nonsteroidal anti-inflammatory drugs • Muscle relaxants • Antidepressants
Psychological interventions	Activities used to modify behaviour, emotional state, or feelings	<ul style="list-style-type: none"> • Cognitive behavioural therapy • Counselling • Social network and environment-based therapies • Psychoeducational interventions • Mindfulness meditation
Modifications to environment		<ul style="list-style-type: none"> • Ergonomic interventions at school or work
Assistive devices	Any item, piece of equipment or product system, used to increase, maintain, or improve the functional capabilities of people with disabilities	<ul style="list-style-type: none"> • Walking aids • Orthoses • Braces • Wheelchairs
Complementary and alternative therapies (CAM)	Medical products and practices that are not part of standard medical care	<ul style="list-style-type: none"> • Homeopathy • Traditional Chinese Medicine • Naturopathy • Products (e.g., herbs, dietary supplements, probiotics)

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794 **Table 2. Research questions, outcomes and study types**

Research Question	Outcomes	Study Types
What is the effectiveness and safety of rehabilitation interventions for improving functioning and other health outcomes in children with back pain?	<p><i>Primary:</i></p> <ol style="list-style-type: none"> Functioning: e.g., Modified Oswestry Low Back Pain Disability Questionnaire, Roland Morris Disability Questionnaire, return to school, participation in sports/other recreational activities <p><i>Secondary:</i></p> <ol style="list-style-type: none"> Pain (including pain intensity, frequency, duration): e.g., VAS, NRS, Faces Pain Scale - Revised Psychological outcomes (including anxiety and depression): e.g., Revised Child Anxiety and Depression Scale, State-Trait Anxiety Inventory for Children Health-related quality of life: e.g., KIDSCREEN-52, Pediatric Quality of Life Inventory, PROMIS Pediatric Self Report Scale Adverse events: any unfavorable sign, symptom, or disease temporarily associated with treatment, indirect harms (e.g., delayed diagnosis/treatment), number of adverse events, severity of adverse events (i.e., mild, moderate, severe), number of participant withdrawals from study due to adverse events. 	<p>Randomized controlled trials</p> <p>Cohort studies</p> <p>Case-control studies</p> <p>Mixed methods studies (quantitative component)</p>
What are the patients', caregivers' and providers' experiences, preferences, expectations and valued outcomes regarding rehabilitation interventions for back pain?	<ol style="list-style-type: none"> Qualitative outcomes: experiences, preferences, expectations, valued outcomes 	<p>Qualitative studies (e.g., phenomenology, grounded theory, ethnography, action research, descriptive qualitative studies)</p> <p>Mixed-methods studies (qualitative component)</p>
What is the cost-effectiveness of rehabilitation interventions for improving functioning and other health outcomes in children with back pain?	<ol style="list-style-type: none"> Economic outcomes: Direct costs: resources consumed or saved by an intervention Indirect costs: productivity gains or losses (e.g., time consumed or freed by the intervention) Economic health outcomes: QALY, ICER, NMB 	<p>Full economic evaluations (trial- and model-based): cost-effectiveness, cost-utility, cost-benefit, cost-consequences</p>

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	Intangible: e.g., pain or suffering saved or brought on by an intervention	
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795 ICER: incremental cost-effectiveness ratio; NMB: measure of net monetary benefit; NRS: Numerical
 796 Rating Scale; PROMIS: Patient-Reported Outcomes Measurement Information System; QALY: quality
 797 adjusted life years; VAS: Visual Analogue Scale

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For peer review only

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	(Page No.#)
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	4
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1-2
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	25
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial or other support for the review	25
Sponsor	5b	Provide name for the review funder and/or sponsor	
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	5-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	6
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	7-11
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	12-13
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits such that it could be repeated	Additional File 2

Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	13
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	14, 18-20
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently in duplicate), any processes for obtaining and confirming data from investigators	16-7
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	16-7
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	9-11
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	15-6
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	17-22
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I ² , Kendall's τ)	
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	15
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	20

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Additional file 2. Literatures search strategies**Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® 1946-Present**

- 1 exp Infant/
- 2 Child, Preschool/
- 3 Child/
- 4 Adolescent/
- 5 Pediatrics/
- 6 (baby or babies).ab,ti.
- 7 "newborn*".ab,ti.
- 8 (infant or infants).ab,ti.
- 9 (child or children*).ab,ti.
- 10 (adolescent* or adolescence).ab,ti.
- 11 (teen or teens or teenager).ab,ti.
- 12 (pediatric* or paediatric*).ab,ti.
- 13 (young adj3 (person* or people)).ab,ti.
- 14 emerging adult*.ab,ti.
- 15 "youth*".ab,ti.
- 16 or/1-15 [**pediatric population]
- 17 exp Back Injuries/
- 18 exp Back Pain/
- 19 Coccyx/in [Injuries]
- 20 Intervertebral Disc Degeneration/
- 21 Intervertebral Disc Displacement/
- 22 Lumbar Vertebrae/in [Injuries]
- 23 Lumbosacral Region/in [Injuries]
- 24 Osteoarthritis, Spine/
- 25 Piriformis Muscle Syndrome/
- 26 Radiculopathy/
- 27 Sciatica/
- 28 Spinal Diseases/

- 1 29 Spinal Stenosis/
2
3 30 Thoracic Injuries/
4
5 31 Thoracic Vertebrae/
6
7 32 (back adj3 (ache* or injur* or pain*)).ab,ti.
8
9 33 (backache* adj3 (injur* or pain*)).ab,ti.
10
11 34 (back pain or back-pain).ab,ti.
12
13 35 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
14
15 36 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
16
17 37 "low* back pain".ab,ti.
18
19 38 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or
20 zygapophys*)).ab,ti.
21
22 39 "Piriformis syndrome*".ab,ti.
23
24 40 radiculopathy.ab,ti.
25
26 41 (sacral adj2 pain*).ab,ti.
27
28 42 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
29
30 43 spondylosis.ab,ti.
31
32 44 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
33
34 45 (T-spine or T-spinal).ab,ti.
35
36 46 or/17-45 [**back pain]
37
38 47 Acupressure/
39
40 48 Acupuncture/
41
42 49 exp Acupuncture Therapy/
43
44 50 "Bedding and Linens"/
45
46 51 Behavior Therapy/
47
48 52 exp Biofeedback, Psychology/
49
50 53 exp Cognitive Behavioral Therapy/
51
52 54 Combined Modality Therapy/
53
54 55 Community-Based Participatory Research/
55
56 56 Community Health Services/
57
58 57 Community Participation/
59
60 58 Complementary Therapies/
59
60 59 Cryotherapy/

1 60 exp Diathermy/
2
3 61 exp Electric Stimulation Therapy/
4
5 62 Electroacupuncture/
6
7 63 Ergonomics/
8
9 64 exp Exercise/
10
11 65 exp Exercise Movement Techniques/
12
13 66 exp Exercise Therapy/
14
15 67 Fluid Therapy/
16
17 68 High-Energy Shock Waves/tu [Therapeutic Use]
18
19 69 Immobilization/
20
21 70 Hot Temperature/tu [Therapeutic Use]
22
23 71 exp Hydrotherapy/
24
25 72 Laser Therapy, Low-Level/
26
27 73 Low-Level Light Therapy/
28
29 74 Magnetic Field Therapy/
30
31 75 Magnetics/tu [Therapeutic Use]
32
33 76 Massage/
34
35 77 exp Medicine, Chinese Traditional/
36
37 78 exp Musculoskeletal Manipulations/
38
39 79 Patient Education as Topic/
40
41 80 Physical Therapy Modalities/
42
43 81 Self Care/
44
45 82 Self-Help Devices/
46
47 83 Physical Fitness/
48
49 84 Restraint, Physical/
50
51 85 Transcutaneous Electric Nerve Stimulation/
52
53 86 Vibration/tu [Therapeutic Use]
54
55 87 Wheelchairs/
56
57 88 acupressure.ab,ti.
58
59 89 "acupunctur*".ab,ti.
60 90 (advice or advise or advised).ab,ti.
91 alexander technique.ab,ti.

- 1 92 "assistive device*".ab,ti.
2
3 93 "back belt*".ab,ti.
4
5 94 "back school*".ab,ti.
6
7 95 (back adj2 work).ab,ti.
8
9 96 (braces or brace or bracing).ab,ti.
10
11 97 canes.ab,ti.
12
13 98 chiropract*.ab,ti.
14
15 99 "cognitive behavioral therap*".ab,ti.
16
17 100 "cognitive behavioural therap*".ab,ti.
18
19 101 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
20
21 102 "core stabili*".ab,ti.
22
23 103 (corset or corsets).ab,ti.
24
25 104 crutches.ab,ti.
26
27 105 cryotherap*.ab,ti.
28
29 106 "deep tissue therap*".ab,ti.
30
31 107 diathermy.ab,ti.
32
33 108 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
34
35 109 electro-acupuncture.ab,ti.
36
37 110 (electrogalvanic stimulation or EGS).ab,ti.
38
39 111 (electromagnet* and (radiation or therap*)).ab,ti.
40
41 112 electromodalit*.ab,ti.
42
43 113 electrotherapy.ab,ti.
44
45 114 (exercise or exercises or exercising).ab,ti.
46
47 115 (flexion-distraction or flexion distraction).ab,ti.
48
49 116 fluidotherap*.ab,ti.
50
51 117 galvanic stimulation.ab,ti.
52
53 118 (H-Wave Device Stimulation or HWDS).ab,ti.
54
55 119 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or
56 bottle or superficial or therapeutic)).ab,ti.
57
58 120 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
59
60 121 "hydrotherap*".ab,ti.
122 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.

- 1 123 "interferential current*".ab,ti.
2
3 124 infrared.ab,ti.
4
5 125 iontophoresis.ab,ti.
6
7 126 electroanalgesia.ab,ti.
8
9 127 ergonomic*.ab,ti.
10
11 128 kinesiostat*.ab,ti.
12 129 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
13
14 130 "low level laser*".ab,ti.
15
16 131 "lumbar support*".ab,ti.
17
18 132 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
19
20 133 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
21
22 134 "manual therap*".ab,ti.
23
24 135 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
25
26 136 microwave*.ab,ti.
27 137 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
28
29 138 "moist air bath*".ab,ti.
30
31 139 moxibustion.ab,ti.
32
33 140 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or
34 procedure* or package* or manage*)).ab,ti.
35
36 141 muscle activation.ab,ti.
37
38 142 "muscle energy technique*".ab,ti.
39
40 143 myofascial release.ab,ti.
41
42 144 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
43
44 145 orthotic*.ab,ti.
45
46 146 "passive modalit*".ab,ti.
47
48 147 (patient* adj3 (educat* or train*)).ab,ti.
49
50 148 "Percutaneous Electric* Nerve Stimulation".ab,ti.
51
52 149 (physical adj therap*).ab,ti.
53
54 150 physiotherap*.ab,ti.
55
56 151 photo-acupuncture.ab,ti.
57
58 152 pillow*.ab,ti.
59
60 153 pilates.ab,ti.

- 1 154 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
2
3 155 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
4
5 156 radiant light.ab,ti.
6
7 157 Russian stimulation.ab,ti.
8
9 158 "seat adj cushion*".ab,ti.
10
11 159 (self-manage* or self manage*).ab,ti.
12
13 160 (short wave* or short-wave*).ab,ti.
14
15 161 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
16
17 162 "soft tissue therap*".ab,ti.
18
19 163 "spray and stretch".ab,ti.
20
21 164 strain-counterstrain.ab,ti.
22
23 165 strengthen*.ab,ti.
24
25 166 stretching.ab,ti.
26
27 167 (tape or taping).ab,ti.
28
29 168 thoracolumbosacral orthosis.ab,ti.
30
31 169 traction.ab,ti.
32
33 170 traditional Chinese medicine.ab,ti.
34
35 171 (transcutaneous electrical stimulation or TENS).ab,ti.
36
37 172 ultrasound.ab,ti.
38
39 173 vapocoolant spray.ab,ti.
40
41 174 "vibration therap*".ab,ti.
42
43 175 walkers.ab,ti.
44
45 176 "walking adj3 aid*".ab,ti.
46
47 177 "warm compress*".ab,ti.
48
49 178 whirlpool*.ab,ti.
50
51 179 yoga.ab,ti.
52
53 180 or/47-179 [**interventions]
54
55 181 Case-Control Studies/
56
57 182 Cohort Studies/
58
59 183 Controlled Clinical Trials as Topic/
60
61 184 Epidemiologic Studies/
62
63 185 Epidemiology/

1 186 Follow-Up Studies/
2
3 187 Longitudinal Studies/
4
5 188 Prospective Studies/
6
7 189 Retrospective Studies/
8
9 190 Randomized Controlled Trials as Topic/
10
11 191 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
12
13 192 (cohort adj3 (stud* or design* or analysis)).ab,ti.
14
15 193 controlled clinical trial.pt.
16
17 194 "epidemiolog*".ab,ti.
18
19 195 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
20
21 196 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
22
23 197 (prospective adj3 (stud* or design* or analysis)).ab,ti.
24
25 198 (random* and (control* or clinical or allocat*)).ab,ti.
26
27 199 randomized controlled trial.pt.
28
29 200 (retrospective adj3 (stud* or design*)).ab,ti.
30
31 201 or/181-200 [**study designs_effectiveness]
32
33 202 16 and 46 and 180 and 201
34
35 203 Anthropology, Cultural/
36
37 204 Attitude/
38
39 205 Awareness/
40
41 206 Behavioral Research/
42
43 207 Diary as Topic/
44
45 208 Emotions/
46
47 209 Ethnology/
48
49 210 Ethnopsychology/
50
51 211 Focus Groups/
52
53 212 Grounded Theory/
54
55 213 Interview, Psychological/
56
57 214 Interviews as Topic/
58
59 215 Mindfulness/
60
216 Motivation/
217 Narration/

- 1 218 Observation/
2
3 219 Perception/
4
5 220 Personal Narratives as Topic/
6
7 221 Personal Satisfaction/
8
9 222 Qualitative Research/
10
11 223 Self Report/
12
13 224 "Surveys and Questionnaires"/
14
15 225 Tape Recording/
16
17 226 Thinking/
18
19 227 Video Recording/ or Videotape Recording/
20
21 228 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or
22 perception* or perspective*).ab,ti.
23
24 229 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
25
26 230 ((behavioral or behavioural) adj2 research).ab,ti.
27
28 231 biographical method*.ab,ti.
29
30 232 (constant adj2 (comparative or comparison)).ab,ti.
31
32 233 ((content or conversation or discourse) adj2 analys*).ab,ti.
33
34 234 descriptive research.ab,ti.
35
36 235 (diary or diaries).ab,ti.
37
38 236 emotions.ab,ti.
39
40 237 ethnograph*.ab,ti.
41
42 238 ethnology.ab,ti.
43
44 239 ethnopsychology.ab,ti.
45
46 240 feelings.ab,ti.
47
48 241 (field adj2 (notes or research or study or studies)).ab,ti.
49
50 242 (focus adj2 group*).ab,ti.
51
52 243 framework analysis.ab,ti.
53
54 244 grounded theory.ab,ti.
55
56 245 interview*.ab,ti.
57
58 246 life world.ab,ti.
59
60 247 lived experience.ab,ti.
248 (meaning or meanings).ab,ti.

- 1 249 (narrative* or narration*).ab,ti.
- 2
- 3 250 (observe* or observation*).ab,ti.
- 4
- 5 251 (open adj ended).ab,ti.
- 6
- 7 252 phenomenology.ab,ti.
- 8
- 9 253 purposive sampl*.ab,ti.
- 10
- 11 254 qualitative.ab,ti.
- 12
- 13 255 questionnaire*.ab,ti.
- 14
- 15 256 (realist adj3 (review* or research or synthesis)).ab,ti.
- 16
- 17 257 satisfaction.ab,ti.
- 18
- 19 258 self report*.ab,ti.
- 20
- 21 259 semantic analysis.ab,ti.
- 22
- 23 260 standpoint*.ab,ti.
- 24
- 25 261 (story or stories).ab,ti.
- 26
- 27 262 survey*.ab,ti.
- 28
- 29 263 (theme* or thematic).ab,ti.
- 30
- 31 264 (theoretical adj2 (sampl* or saturation)).ab,ti.
- 32
- 33 265 (thoughts or thinking).ab,ti.
- 34
- 35 266 ((video adj record*) or videorecord* or videotap*).ab,ti.
- 36
- 37 267 or/203-266 [**experience/qualitative]
- 38
- 39 268 "Costs and Cost Analysis"/
- 40
- 41 exp Cost-Benefit Analysis/
- 42
- 43 270 Quality-Adjusted Life Years/
- 44
- 45 271 Economics, Medical/
- 46
- 47 272 (economic* adj4 (evaluat* or stud*)).ab,ti.
- 48
- 49 273 (health economic* adj4 (evaluat* or stud*)).ab,ti.
- 50
- 51 274 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
- 52
- 53 275 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
- 54
- 55 276 (CEA or CUA or CBA).ab,ti.
- 56
- 57 277 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
- 58
- 59 278 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
- 60 279 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.

- 1 280 (decision adj1 (tree* or analy* or model*)).ab,ti.
- 2
- 3 281 economics.fs.
- 4
- 5 282 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
- 6
- 7 283 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or
- 8 quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
- 9
- 10 284 (markov* or monte carlo*).ab,ti.
- 11
- 12 285 or/268-284 [**cost effectiveness]
- 13
- 14 286 Delivery of Health Care/
- 15
- 16 287 Delivery of Health Care, Integrated/
- 17
- 18 288 Health Planning/
- 19
- 20 289 Health Promotion/
- 21
- 22 290 Health Services Administration/
- 23
- 24 291 Integrative Medicine/
- 25
- 26 292 Interprofessional Relations/
- 27
- 28 293 Patient Care Management/
- 29
- 30 294 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
- 31
- 32 295 barrier*.ab,ti.
- 33
- 34 296 facilitator*.ab,ti.
- 35
- 36 297 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention*
- 37 or model* or plan* or process* or program*or services or strateg* or system* or team*)).ab,ti.
- 38
- 39 298 implement*.ab,ti.
- 40
- 41 299 (innovate* adj3 (intervention* or model* or plan* or process* or program*or strateg* or system*)).ab,ti.
- 42
- 43 300 (model* adj care).ab,ti.
- 44
- 45 301 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
- 46 intervention* or model* or plan* or process* or program*or strateg* or system* or challenge* or benefit* or
- 47 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
- 48 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
- 49
- 50 302 (pathway* adj3 (clinical or care)).ab,ti.
- 51
- 52 303 (program* adj3 (assess* or evaluat*)).ab,ti.
- 53
- 54 304 or/286-303 [**implementation]
- 55
- 56 305 16 and 46 and 180 and (201 or 267 or 285 or 304)
- 57
- 58 306 16 and 46 and 180 [**pediatric, back pain, interventions]
- 59
- 60

Embase Classic+Embase 1947 to 2020

- 1 newborn/
- 2 infant/ or infancy/ or baby/
- 3 childhood/
- 4 child/
- 5 adolescent/ or adolescence/
- 6 juvenile/
- 7 (baby or babies).ab,ti.
- 8 "newborn*".ab,ti.
- 9 (infant or infants).ab,ti.
- 10 (child or children*).ab,ti.
- 11 (adolescent* or adolescence).ab,ti.
- 12 (teen or teens or teenager).ab,ti.
- 13 (pediatric* or paediatric*).ab,ti.
- 14 (young adj3 (person* or people)).ab,ti.
- 15 emerging adult*.ab,ti.
- 16 "youth*".ab,ti.
- 17 or/1-16 [**pediatric population]
- 18 backache/
- 19 low back pain/
- 20 intervertebral disc degeneration/
- 21 intervertebral disk hernia/
- 22 lumbar vertebra/
- 23 lumbosacral region/
- 24 piriformis syndrome/
- 25 radiculopathy/
- 26 sciatica/
- 27 spine disease/
- 28 vertebral canal stenosis/
- 29 spondylosis/
- 30 (back adj3 (ache* or injur* or pain*)).ab,ti.

- 1 31 (backache* adj3 (injur* or pain*)).ab,ti.
2
3 32 (back pain or back-pain).ab,ti.
4
5 33 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
6
7 34 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
8
9 35 "low* back pain".ab,ti.
10
11 36 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or
12 zygapophys*)).ab,ti.
13
14 37 "Piriformis syndrome*".ab,ti.
15
16 38 radiculopathy.ab,ti.
17
18 39 (sacral adj2 pain*).ab,ti.
19
20 40 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
21
22 41 spondylosis.ab,ti.
23
24 42 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
25
26 43 (T-spine or T-spinal).ab,ti.
27
28 44 or/18-43 [**back injuries]
29
30 45 acupressure/
31
32 46 acupuncture/
33
34 47 behavior therapy/
35
36 48 biofeedback/
37
38 49 cognitive behavioral therapy/
39
40 50 participatory research/
41
42 51 community care/
43
44 52 community participation/
45
46 53 alternative medicine/
47
48 54 cryotherapy/
49
50 55 diathermy/
51
52 56 electrostimulation therapy/
53
54 57 electroacupuncture/
55
56 58 ergonomics/
57
58 59 exp exercise/
59
60 60 exp kinesiotherapy/
61
62 61 fitness/

- 1 62 fluid therapy/
2
3 63 shock wave/
4
5 64 immobilization/
6
7 65 heat/
8
9 66 exp hydrotherapy/
10
11 67 low level laser therapy/
12
13 68 phototherapy/
14
15 69 exp magnetism/
16
17 70 magnetotherapy/
18
19 71 massage/
20
21 72 Chinese medicine/
22
23 73 manipulative medicine/
24
25 74 patient education/
26
27 75 physiotherapy/
28
29 76 self care/
30
31 77 transcutaneous nerve stimulation/
32
33 78 whole body vibration/
34
35 79 acupressure.ab,ti.
36
37 80 "acupunctur*".ab,ti.
38
39 81 (advice or advise or advised).ab,ti.
40
41 82 alexander technique.ab,ti.
42
43 83 "assistive device*".ab,ti.
44
45 84 "back belt*".ab,ti.
46
47 85 "back school*".ab,ti.
48
49 86 (back adj2 work).ab,ti.
50
51 87 (braces or brace or bracing).ab,ti.
52
53 88 chiropract*.ab,ti.
54
55 89 "cognitive behavioral therap*".ab,ti.
56
57 90 "cognitive behavioural therap*".ab,ti.
58
59 91 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
60
61 92 "core stabili*".ab,ti.
62
63 93 (corset or corsets).ab,ti.

- 1 94 crutches.ab,ti.
2
3 95 cryotherap*.ab,ti.
4
5 96 "deep tissue therap*".ab,ti.
6
7 97 diathermy.ab,ti.
8
9 98 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
10
11 99 electro-acupuncture.ab,ti.
12
13 100 (electrogalvanic stimulation or EGS).ab,ti.
14
15 101 (electromagnet* and (radiation or therap*)).ab,ti.
16
17 102 electromodalit*.ab,ti.
18
19 103 electrotherapy.ab,ti.
20
21 104 (exercise or exercises or exercising).ab,ti.
22
23 105 (flexion-distraction or flexion distraction).ab,ti.
24
25 106 fluidotherap*.ab,ti.
26
27 107 galvanic stimulation.ab,ti.
28
29 108 (H-Wave Device Stimulation or HWDS).ab,ti.
30
31 109 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
32 superficial or therapeutic)).ab,ti.
33
34 110 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
35
36 111 "hydrotherap*".ab,ti.
37
38 112 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
39
40 113 "interferential current*".ab,ti.
41
42 114 infrared.ab,ti.
43
44 115 iontophoresis.ab,ti.
45
46 116 electroanalgesia.ab,ti.
47
48 117 ergonomic*.ab,ti.
49
50 118 kinesiopat*.ab,ti.
51
52 119 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
53
54 120 "low level laser*".ab,ti.
55
56 121 "lumbar support*".ab,ti.
57
58 122 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
59
60 123 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
124 "manual therap*".ab,ti.

- 1 125 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
- 2
- 3 126 microwave*.ab,ti.
- 4
- 5 127 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
- 6
- 7 128 "moist air bath*".ab,ti.
- 8
- 9 129 moxibustion.ab,ti.
- 10
- 11 130 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or
- 12 package* or manage*)).ab,ti.
- 13
- 14 131 muscle activation.ab,ti.
- 15
- 16 132 "muscle energy technique*".ab,ti.
- 17
- 18 133 myofascial release.ab,ti.
- 19
- 20 134 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
- 21
- 22 135 orthotic*.ab,ti.
- 23
- 24 136 "passive modalit*".ab,ti.
- 25
- 26 137 (patient* adj3 (educat* or train*)).ab,ti.
- 27
- 28 138 "Percutaneous Electric* Nerve Stimulation".ab,ti.
- 29
- 30 139 (physical adj therap*).ab,ti.
- 31
- 32 140 physiotherap*.ab,ti.
- 33
- 34 141 photo-acupuncture.ab,ti.
- 35
- 36 142 pillow*.ab,ti.
- 37
- 38 143 pilates.ab,ti.
- 39
- 40 144 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
- 41
- 42 145 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
- 43
- 44 146 radiant light.ab,ti.
- 45
- 46 147 Russian stimulation.ab,ti.
- 47
- 48 148 "seat adj cushion*".ab,ti.
- 49
- 50 149 (self-manage* or self manage*).ab,ti.
- 51
- 52 150 (short wave* or short-wave*).ab,ti.
- 53
- 54 151 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
- 55
- 56 152 "soft tissue therap*".ab,ti.
- 57
- 58 153 "spray and stretch".ab,ti.
- 59
- 60 154 strain-counterstrain.ab,ti.
- 155 strengthen*.ab,ti.

1 156 stretching.ab,ti.
2
3 157 (tape or taping).ab,ti.
4
5 158 thoracolumbosacral orthosis.ab,ti.
6
7 159 traction.ab,ti.
8
9 160 traditional Chinese medicine.ab,ti.
10
11 161 (transcutaneous electrical stimulation or TENS).ab,ti.
12
13 162 ultrasound.ab,ti.
14
15 163 vapocoolant spray.ab,ti.
16
17 164 "vibration therap*".ab,ti.
18
19 165 walkers.ab,ti.
20
21 166 "walking adj3 aid*".ab,ti.
22
23 167 "warm compress*".ab,ti.
24
25 168 whirlpool*.ab,ti.
26
27 169 yoga.ab,ti.
28
29 170 or/45-169 [**interventions]
30
31 171 case control study/
32
33 172 cohort analysis/
34
35 173 "controlled clinical trial (topic)"/
36
37 174 longitudinal study/
38
39 175 "randomized controlled trial (topic)"/
40
41 176 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
42
43 177 (cohort adj3 (stud* or design* or analysis)).ab,ti.
44
45 178 "epidemiolog*".ab,ti.
46
47 179 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
48
49 180 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
50
51 181 (prospective adj3 (stud* or design* or analysis)).ab,ti.
52
53 182 (random* and (control* or clinical or allocat* or trial*)).ab,ti.
54
55 183 (retrospective adj3 (stud* or design*)).ab,ti.
56
57 184 or/171-183 [**effectiveness]
58
59 185 attitude to health/
60
61 186 patient attitude/
62
63 187 awareness/

- 1 188 behavioral research/
 2
 3 189 writing/
 4
 5 190 emotion/
 6
 7 191 ethnology/
 8
 9 192 cultural psychology/
 10
 11 193 information processing/
 12
 13 194 grounded theory/
 14
 15 195 interview/
 16
 17 196 mindfulness/
 18
 19 197 motivation/
 20
 21 198 exp verbal communication/
 22
 23 199 observation/ or participant observation/
 24
 25 200 perception/
 26
 27 201 satisfaction/ or patient satisfaction/
 28
 29 202 qualitative research/
 30
 31 203 self report/
 32
 33 204 health survey/
 34
 35 205 questionnaire/
 36
 37 206 exp recording/
 38
 39 207 exp thinking/
 40
 41 208 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception*
 42 or perspective*).ab,ti.
 43
 44 209 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
 45
 46 210 ((behavioral or behavioural) adj2 research).ab,ti.
 47
 48 211 biographical method*.ab,ti.
 49
 50 212 (constant adj2 (comparative or comparison)).ab,ti.
 51
 52 213 ((content or conversation or discourse) adj2 analys*).ab,ti.
 53
 54 214 descriptive research.ab,ti.
 55
 56 215 (diary or diaries).ab,ti.
 57
 58 216 emotions.ab,ti.
 59
 60 217 ethnograph*.ab,ti.
 218 ethnology.ab,ti.

1 219 ethnopsychology.ab,ti.
2
3 220 feelings.ab,ti.
4
5 221 (field adj2 (notes or research or study or studies)).ab,ti.
6
7 222 (focus adj2 group*).ab,ti.
8
9 223 framework analysis.ab,ti.
10
11 224 grounded theory.ab,ti.
12
13 225 interview*.ab,ti.
14
15 226 life world.ab,ti.
16
17 227 lived experience.ab,ti.
18
19 228 (meaning or meanings).ab,ti.
20
21 229 (narrative* or narration*).ab,ti.
22
23 230 (observe* or observation*).ab,ti.
24
25 231 (open adj ended).ab,ti.
26
27 232 phenomenology.ab,ti.
28
29 233 purposive sampl*.ab,ti.
30
31 234 qualitative.ab,ti.
32
33 235 questionnaire*.ab,ti.
34
35 236 (realist adj3 (review* or research or synthesis)).ab,ti.
36
37 237 satisfaction.ab,ti.
38
39 238 self report*.ab,ti.
40
41 239 semantic analysis.ab,ti.
42
43 240 standpoint*.ab,ti.
44
45 241 (story or stories).ab,ti.
46
47 242 survey*.ab,ti.
48
49 243 (theme* or thematic).ab,ti.
50
51 244 (theoretical adj2 (sampl* or saturation)).ab,ti.
52
53 245 (thoughts or thinking).ab,ti.
54
55 246 ((video adj record*) or videorecord* or videotap*).ab,ti.
56
57 247 or/185-246 [**qualitative_experience]
58
59 248 "cost effectiveness analysis"/
60 249 "cost benefit analysis"/
250 quality adjusted life year/

- 1 251 health economics/
2
3 252 (economic* adj4 (evaluat* or stud*)).ab,ti.
4
5 253 (health economic* adj4 (evaluat* or stud*)).ab,ti.
6
7 254 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
8
9 255 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
10
11 256 (CEA or CUA or CBA).ab,ti.
12
13 257 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
14
15 258 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
16
17 259 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit*
18 or consequence* or unit*)).ab,ti.
19
20 260 (decision adj1 (tree* or analy* or model*)).ab,ti.
21
22 261 economics.fs.
23
24 262 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
25
26 263 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-
27 adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
28
29 264 (markov* or monte carlo*).ab,ti.
30
31 265 or/248-264 [**cost effectiveness]
32
33 266 health care delivery/
34
35 267 integrated health care system/
36
37 268 health care planning/
38
39 269 health promotion/
40
41 270 health service/
42
43 271 integrative medicine/
44
45 272 case management/
46
47 273 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
48
49 274 barrier*.ab,ti.
50
51 275 facilitator*.ab,ti.
52
53 276 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or
54 model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
55
56 277 implement*.ab,ti.
57
58 278 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
59
60 279 (model* adj care).ab,ti.

1 280 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
2 intervention* or model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or
3 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
4 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
5
6

7 281 (pathway* adj3 (clinical or care)).ab,ti.
8

9 282 (program* adj3 (assess* or evaluat*)).ab,ti.
10

11 283 or/266-282 [**implementation]
12

13 284 17 and 44 and 170
14

15 285 284 and (184 or 247 or 265 or 283)
16

17 286 limit 285 to (conference abstract or conference paper or "conference review" or editorial or letter)
18

19 287 285 not 286
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PsycINFO 1806

- 1
- 2
- 3 1 (baby or babies).ab,ti.
- 4
- 5 2 "newborn".ab,ti.
- 6
- 7 3 (infant or infants).ab,ti.
- 8
- 9 4 (child or children*).ab,ti.
- 10
- 11 5 (adolescent* or adolescence).ab,ti.
- 12
- 13 6 (teen or teens or teenager).ab,ti.
- 14
- 15 7 (pediatric* or paediatric*).ab,ti.
- 16
- 17 8 (young adj3 (person* or people)).ab,ti.
- 18
- 19 9 emerging adult*.ab,ti.
- 20
- 21 10 "youth".ab,ti.
- 22
- 23 11 or/1-10 [**pediatric population]
- 24
- 25 12 exp Back Pain/
- 26
- 27 13 Lumbar Spinal Cord/
- 28
- 29 14 Spinal Cord Injuries/
- 30
- 31 15 Spinal Column/
- 32
- 33 16 (back adj3 (ache* or injur* or pain*)).ab,ti.
- 34
- 35 17 (backache* adj3 (injur* or pain*)).ab,ti.
- 36
- 37 18 (back pain or back-pain).ab,ti.
- 38
- 39 19 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 40
- 41 20 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 42
- 43 21 "low* back pain".ab,ti.
- 44
- 45 22 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or zygapophys*)).ab,ti.
- 46
- 47 23 "Piriformis syndrome".ab,ti.
- 48
- 49 24 radiculopathy.ab,ti.
- 50
- 51 25 (sacral adj2 pain*).ab,ti.
- 52
- 53 26 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
- 54
- 55 27 spondylosis.ab,ti.
- 56
- 57 28 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
- 58
- 59 29 (T-spine or T-spinal).ab,ti.
- 60
- 30 or/12-29 [**back injuries]

1	31	Acupuncture/
2		
3	32	exp Behavior Therapy/
4		
5	33	exp Biofeedback/
6		
7	34	exp Cognitive Behavior Therapy/
8		
9	35	Alternative Medicine/
10		
11	36	Electrical Stimulation/
12		
13	37	Human Factors Engineering/
14		
15	38	exp Exercise/
16		
17	39	Movement Therapy/
18		
19	40	Shock Therapy/
20		
21	41	Heat/
22		
23	42	exp Hydrotherapy/
24		
25	43	Laser Irradiation/
26		
27	44	exp Magnetism/
28		
29	45	Massage/
30		
31	46	Client Education/
32		
33	47	Self-Care Skills/
34		
35	48	Physical Therapy/
36		
37	49	Self-Help Techniques/
38		
39	50	Physical Fitness/
40		
41	51	Vibration/
42		
43	52	acupressure.ab,ti.
44		
45	53	"acupunctur*".ab,ti.
46		
47	54	(advice or advise or advised).ab,ti.
48		
49	55	alexander technique.ab,ti.
50		
51	56	"assistive device*".ab,ti.
52		
53	57	"back belt*".ab,ti.
54		
55	58	"back school*".ab,ti.
56		
57	59	(back adj2 work).ab,ti.
58		
59	60	(braces or brace or bracing).ab,ti.
60		
	61	canes.ab,ti.
	62	chiropract*.ab,ti.

- 1 63 "cognitive behavioral therap*".ab,ti.
2
3 64 "cognitive behavioural therap*".ab,ti.
4
5 65 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
6
7 66 "core stabili*".ab,ti.
8
9 67 (corset or corsets).ab,ti.
10
11 68 crutches.ab,ti.
12
13 69 cryotherap*.ab,ti.
14
15 70 "deep tissue therap*".ab,ti.
16
17 71 diathermy.ab,ti.
18
19 72 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
20
21 73 electro-acupuncture.ab,ti.
22
23 74 (electrogalvanic stimulation or EGS).ab,ti.
24
25 75 (electromagnet* and (radiation or therap*)).ab,ti.
26
27 76 electromodalit*.ab,ti.
28
29 77 electrotherapy.ab,ti.
30
31 78 (exercise or exercises or exercising).ab,ti.
32
33 79 (flexion-distraction or flexion distraction).ab,ti.
34
35 80 fluidotherap*.ab,ti.
36
37 81 galvanic stimulation.ab,ti.
38
39 82 (H-Wave Device Stimulation or HWDS).ab,ti.
40
41 83 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
42 superficial or therapeutic)).ab,ti.
43
44 84 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
45
46 85 "hydrotherap*".ab,ti.
47
48 86 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
49
50 87 "interferential current*".ab,ti.
51
52 88 infrared.ab,ti.
53
54 89 iontophoresis.ab,ti.
55
56 90 electroanalgesia.ab,ti.
57
58 91 ergonomic*.ab,ti.
59
60 92 kinesiotap*.ab,ti.
93 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.

1	94	"low level laser*".ab,ti.
2		
3	95	"lumbar support*".ab,ti.
4		
5	96	(magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
6		
7	97	(manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
8		
9	98	"manual therap*".ab,ti.
10		
11	99	Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
12		
13	100	microwave*.ab,ti.
14		
15	101	((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
16		
17	102	"moist air bath*".ab,ti.
18		
19	103	moxibustion.ab,ti.
20		
21	104	((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or package* or manage*)).ab,ti.
22		
23	105	muscle activation.ab,ti.
24		
25	106	"muscle energy technique*".ab,ti.
26		
27	107	myofascial release.ab,ti.
28		
29	108	(Neuromuscular Electrical Stimulation or NMES).ab,ti.
30		
31	109	orthotic*.ab,ti.
32		
33	110	"passive modalit*".ab,ti.
34		
35	111	(patient* adj3 (educat* or train*)).ab,ti.
36		
37	112	"Percutaneous Electric* Nerve Stimulation".ab,ti.
38		
39	113	(physical adj therap*).ab,ti.
40		
41	114	physiotherap*.ab,ti.
42		
43	115	photo-acupuncture.ab,ti.
44		
45	116	pillow*.ab,ti.
46		
47	117	pilates.ab,ti.
48		
49	118	(postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
50		
51	119	(pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
52		
53	120	radiant light.ab,ti.
54		
55	121	Russian stimulation.ab,ti.
56		
57	122	"seat adj cushion*".ab,ti.
58		
59	123	(self-manage* or self manage*).ab,ti.
60		
	124	(short wave* or short-wave*).ab,ti.

- 1 125 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
- 2
- 3 126 "soft tissue therap*".ab,ti.
- 4
- 5 127 "spray and stretch".ab,ti.
- 6
- 7 128 strain-counterstrain.ab,ti.
- 8
- 9 129 strengthen*.ab,ti.
- 10
- 11 130 stretching.ab,ti.
- 12
- 13 131 (tape or taping).ab,ti.
- 14
- 15 132 thoracolumbosacral orthosis.ab,ti.
- 16
- 17 133 traction.ab,ti.
- 18
- 19 134 traditional Chinese medicine.ab,ti.
- 20
- 21 135 (transcutaneous electrical stimulation or TENS).ab,ti.
- 22
- 23 136 ultrasound.ab,ti.
- 24
- 25 137 vapocoolant spray.ab,ti.
- 26
- 27 138 "vibration therap*".ab,ti.
- 28
- 29 139 walkers.ab,ti.
- 30
- 31 140 "walking adj3 aid*".ab,ti.
- 32
- 33 141 "warm compress*".ab,ti.
- 34
- 35 142 whirlpool*.ab,ti.
- 36
- 37 143 yoga.ab,ti.
- 38
- 39 144 or/31-143 [**interventions]
- 40
- 41 145 Cohort Analysis/
- 42
- 43 146 Clinical Trials/
- 44
- 45 147 Longitudinal Studies/
- 46
- 47 148 exp Randomized Controlled Trials/
- 48
- 49 149 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
- 50
- 51 150 (cohort adj3 (stud* or design* or analysis)).ab,ti.
- 52
- 53 151 controlled clinical trial.pt.
- 54
- 55 152 "epidemiolog*".ab,ti.
- 56
- 57 153 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
- 58
- 59 154 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
- 60 155 (prospective adj3 (stud* or design* or analysis)).ab,ti.
- 156 (random* and (control* or clinical or allocat*)).ab,ti.

1	157	(retrospective adj3 (stud* or design*)).ab,ti.
2		
3	158	or/145-157 [**effectiveness]
4		
5	159	exp Attitudes/
6		
7	160	Awareness/
8		
9	161	Journal Writing/
10		
11	162	Emotions/
12		
13	163	Ethnology/
14		
15	164	Focus Group/
16		
17	165	Grounded Theory/
18		
19	166	Interviews/
20		
21	167	Mindfulness/ or Mindfulness-Based Interventions/
22		
23	168	Motivation/
24		
25	169	Narratives/
26		
27	170	exp Observation Methods/
28		
29	171	Perception/
30		
31	172	Preferences/
32		
33	173	Satisfaction/
34		
35	174	Qualitative Methods/
36		
37	175	Self-Report/
38		
39	176	Surveys/ or Questionnaires/
40		
41	177	exp Tape Recorders/
42		
43	178	Thinking/
44		
45	179	Digital Video/
46		
47	180	(attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception* or perspective*).ab,ti.
48		
49	181	((audio adj record*) or audiorecord* or audiotap*).ab,ti.
50		
51	182	((behavioral or behavioural) adj2 research).ab,ti.
52		
53	183	biographical method*.ab,ti.
54		
55	184	(constant adj2 (comparative or comparison)).ab,ti.
56		
57	185	((content or conversation or discourse) adj2 analys*).ab,ti.
58		
59	186	descriptive research.ab,ti.
60		
	187	(diary or diaries).ab,ti.

1	188	emotions.ab,ti.
2		
3	189	ethnograph*.ab,ti.
4		
5	190	ethnology.ab,ti.
6		
7	191	ethnopsychology.ab,ti.
8		
9	192	feelings.ab,ti.
10		
11	193	(field adj2 (notes or research or study or studies)).ab,ti.
12		
13	194	(focus adj2 group*).ab,ti.
14		
15	195	framework analysis.ab,ti.
16		
17	196	grounded theory.ab,ti.
18		
19	197	interview*.ab,ti.
20		
21	198	life world.ab,ti.
22		
23	199	lived experience.ab,ti.
24		
25	200	(meaning or meanings).ab,ti.
26		
27	201	(narrative* or narration*).ab,ti.
28		
29	202	(observe* or observation*).ab,ti.
30		
31	203	(open adj ended).ab,ti.
32		
33	204	phenomenology.ab,ti.
34		
35	205	purposive sampl*.ab,ti.
36		
37	206	qualitative.ab,ti.
38		
39	207	questionnaire*.ab,ti.
40		
41	208	(realist adj3 (review* or research or synthesis)).ab,ti.
42		
43	209	satisfaction.ab,ti.
44		
45	210	self report*.ab,ti.
46		
47	211	semantic analysis.ab,ti.
48		
49	212	standpoint*.ab,ti.
50		
51	213	(story or stories).ab,ti.
52		
53	214	survey*.ab,ti.
54		
55	215	(theme* or thematic).ab,ti.
56		
57	216	(theoretical adj2 (sampl* or saturation)).ab,ti.
58		
59	217	(thoughts or thinking).ab,ti.
60		
	218	((video adj record* or videorecord* or videotap*).ab,ti.
	219	or/159-218 [*** qualitative_experience]

1	220	"Costs and Cost Analysis"/
2		
3	221	Health Care Costs/
4		
5	222	Quality of Life Measures/
6		
7	223	Health Care Economics/
8		
9	224	(economic* adj4 (evaluat* or stud*)).ab,ti.
10		
11	225	(health economic* adj4 (evaluat* or stud*)).ab,ti.
12		
13	226	((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
14		
15	227	((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
16		
17	228	(CEA or CUA or CBA).ab,ti.
18		
19	229	((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
20		
21	230	(economic* adj4 (impact or value or factor* or analys*)).ab,ti.
22		
23	231	(cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.
24		
25	232	(decision adj1 (tree* or analy* or model*)).ab,ti.
26		
27	233	[economics.fs.]
28		
29	234	(qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
30		
31	235	(sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
32		
33		
34	236	(markov* or monte carlo*).ab,ti.
35		
36	237	or/220-236 [**cost effectiveness]
37		
38	238	Health Care Delivery/
39		
40	239	Health Care Administration/
41		
42	240	Health Promotion/
43		
44	241	Integrated Services/
45		
46	242	Interdisciplinary Treatment Approach/
47		
48	243	Case Management/
49		
50	244	(approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
51		
52	245	barrier*.ab,ti.
53		
54	246	facilitator*.ab,ti.
55		
56	247	((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
57		
58	248	implement*.ab,ti.
59		
60		

- 1 249 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
- 2
- 3 250 (model* adj care).ab,ti.
- 4
- 5 251 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or intervention* or
- 6 model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or success* or constrain* or
- 7 difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or promot* or restrain* or restrict* or
- 8 disincentive* or factor* or capacity or enabler*)).ab,ti.
- 9
- 10
- 11 252 (pathway* adj3 (clinical or care)).ab,ti.
- 12
- 13 253 (program* adj3 (assess* or evaluat*)).ab,ti.
- 14
- 15 254 or/238-253 [**implementation]
- 16
- 17 255 11 and 30 and 144
- 18
- 19 256 limit 255 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 20 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 21 adolescence <age 13 to 17 yrs>))
- 22
- 23 257 255 and (158 or 219 or 237 or 254)
- 24
- 25 258 limit 257 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 26 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 27 adolescence <age 13 to 17 yrs>))
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Additional file 3: Risk of bias assessment according to study design

Quantitative studies (SIGN checklists)		
Randomized controlled trials	Cohort studies	Case-control studies
1. The study addresses an appropriate and clearly focused question.	1. The study addresses an appropriate and clearly focused question.	1. The study addresses an appropriate and clearly focused question.
2. The assignment of subjects to treatment groups is randomised.	2. The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.	2. The cases and controls are taken from comparable populations.
3. An adequate concealment method is used.	3. The study indicates how many of the people asked to take part did so, in each of the groups being studied.	3. The same exclusion criteria are used for both cases and controls.
4. The design keeps subjects and investigators 'blind' about treatment allocation.	4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.	4. What percentage of each group (cases and controls) participated in the study?
5. The treatment and control groups are similar at the start of the trial.	5. What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed.	5. Comparison is made between participants and non-participants to establish their similarities or differences.
6. The only difference between groups is the treatment under investigation.	6. Comparison is made between full participants and those lost to follow up, by exposure status.	6. Cases are clearly defined and differentiated from controls.
7. All relevant outcomes are measured in a standard, valid and reliable way.	7. The outcomes are clearly defined.	7. It is clearly established that controls are non-cases
8. What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	8. The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable.	8. Measures will have been taken to prevent knowledge of primary exposure influencing case ascertainment
9. All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	9. Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome.	9. Exposure status is measured in a standard, valid and reliable way
10. Where the study is carried out at more than one site, results are comparable for all sites.	10. The method of assessment of exposure is reliable.	10. The main potential confounders are identified and taken into account in the design and analysis
	11. Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable.	11. Confidence intervals are provided
	12. Exposure level or prognostic factor is assessed more than once.	
	13. The main potential confounders are identified and taken into account in the design and analysis.	

	14. Have confidence intervals been provided?	
Mixed methods studies (MMAT)		
Qualitative:		
1. Is the qualitative approach appropriate to answer the research question?		
2. Are the qualitative data collection methods adequate to address the research question?		
3. Are the findings adequately derived from the data?		
4. Is the interpretation of results sufficiently substantiated by data?		
5. Is there coherence between qualitative data sources, collection, analysis and interpretation?		
Quantitative randomized controlled trials:		
1. Is randomization appropriately performed?		
2. Are the groups comparable at baseline?		
3. Are there complete outcome data?		
4. Are outcome assessors blinded to the intervention provided?		
5. Did the participants adhere to the assigned intervention?		
Quantitative non-randomized:		
1. Are the participants representative of the target population?		
2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?		
3. Are there complete outcome data?		
4. Are the confounders accounted for in the design and analysis?		
5. During the study period, is the intervention administered (or exposure occurred) as intended?		
Quantitative descriptive:		
1. Is the sampling strategy relevant to address the research question?		
2. Is the sample representative of the target population?		
3. Are the measurements appropriate?		
4. Is the risk of nonresponse bias low?		
5. Is the statistical analysis appropriate to answer the research question?		
Mixed methods:		
1. Is there adequate rationale for using a mixed methods design to address the research question?		
2. Are the different components of the study effectively integrated to answer the research question?		
3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?		
4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?		
5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?		
Qualitative studies (JBI)		
1. Is there congruity between the stated philosophical perspective and the research methodology?		
2. Is there congruity between the research methodology and the research question or objectives?		
3. Is there congruity between the research methodology and the methods used to collect data?		
4. Is there congruity between the research methodology and the representation and analysis of data?		
5. Is there congruity between the research methodology and the interpretation of results?		
6. Is there a statement locating the researcher culturally or theoretically?		
7. Is the influence of the researcher on the research, and vice-versa, addressed?		
8. Are participants, and their voices, adequately represented?		
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?		
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?		
Economic evaluations (Drummond checklist)		
1. Was a well-defined question posed in an answerable form?		
2. Was a comprehensive description of the competing alternatives given?		
3. Was the effectiveness of the programmes or services established?		
4. Were all the important and relevant costs and consequences for each alternative identified?		
5. Were cost and effects measured accurately in appropriate physical units (e.g., QALYs)?		
6. Were costs and effects valued credibly?		
7. Were cost and effects adjusted for differential timing?		
8. Was an incremental analysis of cost and effects of alternatives performed?		

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| 9. Were allowances made for uncertainty in the estimates of cost and effects?
10. Did the presentation and discussion of study results include all issues of concern to users? |
|---|

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Drummond checklist: (Drummond M et al. Methods for the economic evaluation of health care programmes. Oxford: Oxford University Press, 2015). **JBI checklist:** Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research (JBI Manual for Evidence Synthesis. Appendix 2.1: <https://wiki.joannabriggs.org/display/MANUAL/Appendix+2.1%3A+JBI+Critical+Appraisal+Checklist+for+Qualitative+Research>). **MMAT:** Mixed Methods Appraisal Tool, version 18 (Hong QN, Pluye P, Fàbreques S, Bartlett G, Boardman F, Cargo M, Dagenais P, Gagnon M-P, Griffiths F, Nicolau B, O’Cathain A, Rousseau M-C, Vedel I. Mixed Methods Appraisal Tool (MMAT), version 2018. Registration of Copyright (#1148552, Canadian Intellectual Property Office, Industry Canada). **SIGN checklists:** Scottish Intercollegiate Guidelines Network checklists <https://www.sign.ac.uk/checklists-and-notes>

BMJ Open

Rehabilitative management of back pain in children: Protocol for a mixed studies systematic review

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1 **Title:** Rehabilitative management of back pain in children: Protocol for a mixed studies

2 systematic review

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48 ABSTRACT

49 **Introduction:** Little is known about effective, efficient and acceptable management of back pain
50 in children. A comprehensive and updated evidence synthesis can help to inform clinical
51 practice.

52 **Objective:** To inform clinical practice, we aim to conduct a systematic review of the literature
53 and synthesize the evidence regarding effective, cost-effective and safe rehabilitation
54 interventions for children with back pain to improve their functioning and other health outcomes.

55 **Methods and analysis:** We will search MEDLINE, Embase, PsycINFO, CINAHL, the Index to
56 Chiropractic Literature, the Cochrane Controlled Register of Trials, and EconLit for primary
57 studies published from inception in all languages. We will include quantitative studies
58 (randomized controlled trials, cohort and case-control studies), qualitative studies, mixed
59 methods studies, and full economic evaluations. To augment our search of the bibliographic
60 electronic databases, we will search reference lists of included studies and relevant systematic
61 reviews, the WHO International Clinical Trials Registry Platform, and consult with content
62 experts. We will assess risk of bias using appropriate critical appraisal tools. We will extract data
63 about study and participant characteristics, intervention type and comparators, context and
64 setting, outcomes, themes and methodological quality assessment. We will use a sequential
65 approach at the review level to integrate data from the quantitative, qualitative and economic
66 evidence syntheses.

67 **Ethics and dissemination:** Ethics approval is not required. We will disseminate findings
68 through activities including: (1) presentations in national and international conferences; (2)
69 meetings with national and international decision makers; (3) publications in peer-reviewed
70 journals; and (4) posts on organizational websites and social media.

1
2
3 71 **Systematic review registration number:** PROSPERO CRD42019135009
4

5 72 **Key words:** systematic review, back pain, child, adolescent
6
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8 73
9

10 74 **Article Summary**

11
12 75 Strengths and limitations of this study
13

- 14
15 76 • A systematic review integrating quantitative, qualitative and economic evidence to
16
17 77 examine the rehabilitative management of back pain in children.
18
19 78 • Includes studies with a broad range of rehabilitation interventions as described by the
20
21 79 World Health Organization (WHO), and outcomes as described by the International
22
23 80 Classification of Functioning, Disability and Health (ICF) framework.
24
25 81 • Implements the Preferred Reporting Items for Systematic Review and Meta-Analysis
26
27 82 Protocols guidelines.
28
29 83 • There is no language restriction in articles.
30
31 84 • Our search strategies, while comprehensive, may miss relevant studies.
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36 85 **Word count:** 4,872
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94 INTRODUCTION

95 Rationale

96 A significant proportion of children over 10 years of age suffer from back pain.¹⁻⁵ The
97 prevalence of back pain in children ranges between 4% and 74%; the wide range is due to
98 heterogeneous populations studied, outcome measurements and methodologies used.^{6,7} Data
99 from the World Health Organization (WHO) Global Burden of Disease study in 2017 shows that
100 low back pain is the leading cause of global years lived with disability.⁸ Back pain begins early
101 in life with physical, mental and social consequences (e.g., impact on school-related and sporting
102 activities, general physical activity and well-being) that extend into adulthood.⁹⁻¹¹ Most episodes
103 of spinal pain are brief; however, in a three-year prospective cohort study of 1,465 school
104 children in Denmark, up to 25% of children had three or more episodes over one year, and
105 approximately 13% of children reported episodes lasting five or more weeks.¹²

106
107 Two recent systematic reviews assessed the effectiveness of manual therapy to treat a number of
108 conditions including back pain in children, but low-quality evidence precludes drawing
109 conclusions.^{13,14} A previous systematic review and meta-analysis which evaluated the
110 effectiveness of conservative interventions for low back pain in children under 18 years of age
111 reported that exercise interventions may be promising for improving pain scores in children
112 compared to no treatment; however, the evidence was very limited and of low-quality.¹⁵ This
113 evidence also needs updating. Additionally, to our knowledge, no integrative systematic review –
114 one that incorporates both quantitative and qualitative studies – has been conducted regarding the
115 rehabilitative management of back pain in children. Compared to traditional systematic reviews
116 of quantitative studies, combining evidence of the effectiveness and efficiency of interventions

1
2
3 117 with qualitative understanding from people's lived experiences can better inform clinical practice
4
5 118 guidelines and policy.¹⁶
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10 120 This comprehensive knowledge synthesis can inform clinical practice for decision makers
11
12 121 involved with caring for children with back pain including healthcare professionals in a variety
13
14 122 of clinical, rehabilitation or community settings (e.g., physicians, nurses, physiotherapists,
15
16 123 chiropractors, psychologists, occupational therapists, registered massage therapists). Moreover,
17
18 124 the knowledge gaps that we identify can inform future research agendas.
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22 125

23 24 126 **Objectives**

25
26 127 To support clinical practice for children with back pain, we aim to conduct an integrative
27
28 128 systematic review of quantitative, qualitative and economic evidence regarding the rehabilitative
29
30 129 management of back pain (including mid-back and low back pain) in children aged 19 years and
31
32
33 130 under. Our review will address the following questions:

- 34
35 131 1) What is the effectiveness and safety of rehabilitation interventions for improving
36
37 132 functioning and other health outcomes in children with back pain?
38
39 133 2) What are the patients', caregivers' and providers' experiences, preferences, expectations
40
41 134 and valued outcomes regarding rehabilitation interventions for back pain?
42
43 135 3) What is the cost-effectiveness of rehabilitation interventions for improving functioning
44
45 136 and other health outcomes in children with back pain?
46
47 137 4) What can be hypothesized from the integration of the quantitative, qualitative and
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49 138 economic evidence about the effectiveness, cost-effectiveness and safety of rehabilitation
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51 139 interventions for low back pain in children?
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3 140 We are targeting decision makers (clinicians, health managers/administrators, policy makers,
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5 141 patients, and caregivers) involved in implementing, delivering or receiving rehabilitation
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7 142 interventions or programs of care. We aim to provide them with knowledge regarding effective,
8
9 143 acceptable and positively experienced interventions for children with back pain and their
10
11 144 caregivers.
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17 146 **METHODS**

18
19 147 We developed this systematic review protocol using the Preferred Reporting Items for
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21 148 Systematic Reviews and Meta-Analyses for Protocols (PRISMA-P)¹⁷ (Additional file 1). We
22
23 149 registered our protocol on the International Prospective Register of Systematic Reviews
24
25 150 (PROSPERO) (registration # CRD42019135009).¹⁸ We will report our systematic review
26
27 151 according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses
28
29 152 (PRISMA) statement,¹⁹ and the Enhancing Transparency in Reporting the Synthesis of
30
31 153 Qualitative Research (ENTREQ) reporting guideline.²⁰
32
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35 154

36 155 **Eligibility criteria**

37 156 *Population*

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39
40 157 We will target studies including children (aged 19 years or younger)²¹ with non-specific low
41
42 158 back or thoracic spine pain of any duration and severity. We define LBP as pain and discomfort
43
44 159 below the costal margin and above the inferior gluteal folds, with or without radiculopathy
45
46 160 (referred leg pain).²² Radiculopathy refers to inflammation, injury/dysfunction, or compression
47
48 161 of spinal nerve roots that can present as pain, weakness, or altered sensation in a myotomal or
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50 162 dermatomal distribution. Lumbar radiculopathy is commonly attributed to lumbar disc herniation
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3 163 (localized displacement of disc material beyond the normal margins of the intervertebral disc
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5 164 space).²³ We define thoracic spine pain as pain within the region bounded superiorly by the first
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8 165 thoracic spinous process, inferiorly by the last thoracic spinous process, and laterally by the most
9
10 166 lateral margins of the erector spinae muscles.²⁴ We will include studies investigating diagnoses
11
12 167 including low back pain, mid-back pain, mechanical back pain, lumbago, lumbar sprain or strain,
13
14 168 back sprain or strain, lumbopelvic pain, lumbar radiculopathy, lumbar disc herniation, sacroiliac
15
16 169 syndrome, sciatica, dysplastic or isthmic spondylolisthesis or spondylolysis, musculoskeletal or
17
18
19 170 non-specific chest wall pain (pain referred to the chest wall from the thoracic spine).
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24 172 We will exclude studies of children with back pain attributed to major structural or systemic
25
26 173 pathology (e.g., fracture, acute traumatic or pathological spondylolisthesis or spondylolysis,
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28 174 infection, tumour, osteoporosis, inflammatory arthritides, cauda equina syndrome,
29
30 175 neuromuscular disease, myelopathy, and scoliosis); (2) studies of children with back pain
31
32 176 attributed to a non-spine-related condition that might refer pain to the chest wall (e.g., heart, lung
33
34 177 or esophagus conditions); and (3) studies that target asymptomatic children at baseline and assess
35
36 178 interventions that aim to prevent the incidence of back pain.
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41 42 180 ***Intervention***

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44 181 We will include studies that investigate the effectiveness and safety of rehabilitation
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46 182 interventions or programs of care for children with back pain, including education and self-
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48 183 management strategies, exercise, manual therapies, passive physical modalities, acupuncture,
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50 184 pharmacological interventions, psychological interventions, environmental modifications,
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53 185 assistive devices, and complementary and alternative therapies (CAM). Interventions may be
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3 186 delivered in any manner such as in-person, or remotely using technology such as telehealth. The
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5 187 WHO defines rehabilitation as a set of interventions that assist individuals who experience, or
6
7 188 are likely to experience, disability to achieve and maintain optimal functioning when interacting
8
9
10 189 with their environments.²⁵ Rehabilitation interventions include rehabilitation medicine/therapy,
11
12 190 which aims to: 1) improve function through the diagnosis and treatment of health conditions,
13
14 191 reducing impairments, preventing or treating complications; and 2) restore and compensate loss
15
16 192 of functioning, and prevent or slow deterioration in functioning in every area of a person's life.²⁵
17
18 193 It may also include assistive devices, which refers to any item, piece of equipment, or product
19
20 194 used to increase, maintain, or improve functional capabilities.²⁵ Various healthcare providers
21
22 195 may provide interventions including, but not limited to, general practitioners, nurses,
23
24 196 physiotherapists, chiropractors, occupational therapists, psychologists, and registered massage
25
26 197 therapists (Table 1). We will exclude studies assessing surgical interventions, and interventions
27
28 198 solely conducted at the societal level, such as barrier removal initiatives (e.g., fitting a ramp to a
29
30 199 public building).

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36 37 201 **Comparison**

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39 202 The quantitative component of this review will consider comparisons including other
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41 203 interventions, placebo or sham interventions, wait list, standard care, and no intervention.
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46 47 205 **Outcomes**

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49 206 Our primary outcome of interest is a child's functioning. Secondary health outcomes of interest
50
51 207 are pain (e.g., pain intensity, frequency, or duration), psychological outcomes (e.g., anxiety and
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53 208 depression), health-related quality of life, adverse events, qualitative outcomes, and economic
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209 outcomes (Table 2). We are interested in both short-term (<3 months) and long-term (≥3 months)
210 outcomes. We selected these outcomes because they are important to children, their caregivers
211 and decision makers, and they are reflected in the WHO's framework for health and disability
212 (International Classification of Functioning, Disability and Health [ICF]).²⁶ The ICF provides a
213 standard language and framework for the description of health and health-related states, and
214 organizes information into two components – 'body functions and body structures' and
215 'activities and participation'.²⁶ Our primary outcome of interest, functioning, aligns with the
216 'activities and participation' component of the ICF. Examples of *activities* include walking,
217 running, jumping and lifting. *Participation* refers to involvement in life situations such as with
218 one's family, school and community. Common methods to measure **functioning** include the
219 Modified Oswestry Low Back Pain Disability Questionnaire,²⁷ Roland Morris Disability
220 Questionnaire (RMDQ),²⁸ return to school, and participation in sports or other recreational
221 activities. Pain and psychological outcomes fit within the 'body functions and body structures'
222 component of the ICF. Common methods to measure **pain** include the Visual Analogue Scale
223 (VAS),²⁹ Numerical Rating Scale (NRS),³⁰ and Faces Pain Scale – Revised.^{31 32} Common
224 methods to measure **psychological outcomes** (e.g., anxiety and depression) include Revised
225 Child Anxiety and Depression Scale,³³ and State-Trait Anxiety Inventory for Children.³⁴ We will
226 also assess **health-related quality of life**, which is not definable in the ICF framework.³⁵ It is
227 commonly measured with the KIDSCREEN-52,³⁶ Pediatric Quality of Life Inventory,³⁷ and
228 PROMIS Pediatric Self Report Scale.³⁸ We defined **adverse events or harms** as any
229 unfavourable sign, symptom, or disease temporarily associated with the treatment, whether or
230 not caused by the treatment.^{39 40} We will consider indirect harms (where the use of an
231 intervention delays a diagnosis or treatment, and such delay holds a potential harm),⁴¹ number of

232 adverse events, severity of adverse events (i.e., mild, moderate or severe), and number of
233 participant withdrawals from the study due to adverse events. *Qualitative outcomes* include the
234 experiences, preferences, expectations, and valued outcomes (of children, caregivers, and
235 providers). Lastly, *economic outcomes* include direct costs (e.g., resources saved by an
236 intervention), indirect costs (e.g., time freed by an intervention), economic health outcomes (e.g.,
237 quality-adjusted life-year [QALY], incremental cost-effectiveness ratio [ICER], net monetary
238 benefit [NMB]), and intangible outcomes (e.g., pain or suffering saved by an intervention).

239

240 *Types of studies*

241 We will include randomized controlled trials of any type (e.g., superiority, non-inferiority and
242 equivalence), cohort studies, case-control studies, and mixed-methods studies (quantitative
243 component) including any secondary analyses of eligible studies for question 1 (effectiveness
244 and safety of interventions); qualitative and mixed-methods studies (qualitative component) for
245 question 2 (users' experiences, preferences, expectations and valued outcomes of interventions);
246 and trial- and model-based full economic evaluations for question 3 (cost-effectiveness of
247 interventions) (Table 2).

248

249 We will exclude the following types of studies: cross-sectional studies, pilot studies assessing
250 feasibility, protocol studies, case reports, case series, studies assessing only prevention of back
251 pain and incidence outcomes, systematic reviews (although their reference lists will be searched
252 for potentially relevant studies) and other review papers, clinical practice guidelines,
253 biomechanical studies, laboratory studies, cadaveric or animal studies, conceptual papers, letters,
254 editorials, commentaries, books and book chapters, conference proceedings, meeting abstracts,

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3 255 lectures and addresses, consensus development statements, guideline statements, and studies
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5 256 reviewing solely partial economic evaluations (e.g., cost of illness studies).
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10 258 ***Context and setting***

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12 259 We will consider rehabilitation interventions/programs of care delivered in any healthcare
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14 260 system within an urban or rural area and in any healthcare setting (e.g., acute care, hospital,
15
16 261 primary health care, rehabilitation clinics), or in the community. Community-based rehabilitation
17
18 262 is implemented through the combined efforts of individuals with disabilities, their families and
19
20 263 communities, and relevant government and non-government health, education, social and other
21
22 264 services (e.g., advocacy programme).⁴²
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28 266 **Information sources**

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30 267 We will develop the initial search strategy in MEDLINE, in consultation with an experienced
31
32 268 health sciences librarian. A second experienced health sciences librarian will review the search
33
34 269 strategy assessing its appropriateness and comprehensiveness using the Peer Review of
35
36 270 Electronic Search Strategies (PRESS) Checklist.^{43 44} We will conduct electronic searches of the
37
38 271 following databases from database inception to the present: MEDLINE (Ovid), Embase (Ovid),
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40 272 PsycINFO (Ovid), CINAHL (Cumulative Index to Nursing and Allied Health Literature,
41
42 273 EBSCOhost), the Index to Chiropractic Literature (Chiropractic Library Collaboration), the
43
44 274 Cochrane Controlled Register of Trials (Ovid), and EconLit (EBSCOhost). We will augment our
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46 275 search of the bibliographic electronic databases to identify additional relevant studies, and
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48 276 mitigate the potential impact of publication bias and selective outcome reporting bias.⁴⁵ We will
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50 277 search reference lists of included studies from the database searches and relevant systematic
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3 278 reviews; and we will consult with content experts. We will ask experts to suggest up to three
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5 279 targeted websites that may contain relevant studies and other potentially relevant studies not
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7
8 280 captured by our search strategy. Lastly, we will search the WHO International Clinical Trials
9
10 281 Registry Platform (<http://apps.who.int/trialsearch/>). For studies only reported in the registry, we
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12 282 will contact first authors by email (with two reminders over one month) to obtain full study
13
14 283 reports, or additional study or outcome data. We will include studies in any language and will
15
16 284 use professional medical translation services where required. If 12 or more months elapse
17
18 285 between the search date and submission for publication, we will update the search.
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22 286

23 24 287 **Search strategy**

25
26 288 The searches will include a combination of subject headings specific to databases (e.g. MeSH in
27
28 289 MEDLINE) and free text words to capture the key concepts of rehabilitative management of
29
30 290 back pain in children (Additional file 2).
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34 35 292 **Patient and public involvement**

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37 293 Patients were not involved in the design of our study. However, we will seek patient and public
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39 294 consultation during the development of clinical practice guidelines, which will be the next phase
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41 295 of this project.
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45 46 47 297 **Data management**

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49 298 We will download the electronic search results into Endnote X9 reference manager software
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51 299 (Clarivate Analytics, PA, USA). We will remove duplicates and upload the remaining references
52
53 300 to the Evidence for Policy and Practice Information and Coordinating (EPPI) Centre Reviewer
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3 301 software for the data extraction stages (EPPI-Reviewer version 4, UCL Institute of Education,
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5 302 University of London, UK). EPPI-Reviewer software stores references, manages and monitors
6
7 303 the data extraction process and provides an audit trail for the review.⁴⁶
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10 304

11 305 **Screening for eligibility**

12 306 Using the inclusion and exclusion criteria, pairs of reviewers will independently screen titles and
13
14 307 abstracts, and subsequently the full text of each selected article in order to confirm inclusion into
15
16 308 the study. Titles and abstracts will be classified as possibly relevant or irrelevant. Subsequently,
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18 309 full-text articles of abstracts classified as possibly relevant will be retrieved, reviewed and
19
20 310 classified as relevant or irrelevant.
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28 312 We will conduct training exercises prior to initiating the screening process to ensure reliability
29
30 313 between reviewers. Reviewers will first screen a random sample of 50 records based on titles and
31
32 314 abstracts. Paired reviewers must reach 90% agreement before completing title and abstract
33
34 315 screening for the remaining studies.⁴⁷ If this threshold is not reached for all review teams, all
35
36 316 team members will discuss differences in classification to clarify and potentially modify the
37
38 317 eligibility criteria prior to completing title and abstract screening. Next, reviewers will screen a
39
40 318 random sample of 25 full-text articles. All paired reviewers must again reach 90% agreement
41
42 319 before completing full-text article screening for the remaining studies. If not, all team members
43
44 320 will discuss to clarify eligibility criteria and resolve disagreements prior to completing full-text
45
46 321 article screening. Upon completing full-text article screening, paired reviewers will discuss
47
48 322 disagreements and reach consensus related to the inclusion of any article, involving a third
49
50 323 reviewer if necessary.
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325 Risk of bias in individual studies

326 We will critically appraise studies according to study design using appropriate checklists
327 (Additional file 3). We will assess the quality of studies using the Scottish Intercollegiate
328 Guidelines Network (SIGN) criteria for randomized controlled trials (RCTs), cohort and case-
329 control studies;⁴⁸ the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for qualitative
330 studies;⁴⁹ the Mixed Methods Appraisal Tool (MMAT) for mixed methods studies;⁵⁰ and the
331 Drummond checklist for economic evaluations.⁵¹ The SIGN checklists allow reviewers to assess
332 internal validity by considering the impact of selection bias, information bias, and confounding
333 on study results. The JBI checklist allows reviewers to assess the possibility of bias in qualitative
334 studies' design, conduct and analysis. The MMAT allows reviewers to assess the interdependent
335 qualitative and quantitative components of the study and criteria to consider, such as justification
336 for mixing evidence, and appropriate ways of integrating the data. The Drummond checklist
337 allows reviewers to identify elements that demonstrate a sound economic evaluation such as the
338 assessment of both costs and effects of interventions, accurate measurements of costs and effects,
339 and allowances made for uncertainty in the estimates of costs and effects. We will contact the
340 authors of papers to request missing or additional data for clarification where required. Paired
341 reviewers will independently assess the eligible studies for quality. Any disagreements that arise
342 between the reviewers will be resolved through discussion, or with a third reviewer. Since some
343 of the reviewers have published within this area, the review coordinator will ensure that
344 reviewers will not be assigned their own studies for risk of bias assessment. Additionally,
345 reviewers will reclude themselves from any discussion and decision-making that involves their
346 paper. We will clearly describe this in our final systematic review report.

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5 348 Using these established checklists and notes to guide our assessment, we will categorize the
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7 349 validity or credibility of each study as either high, low, or unclear risk of bias. We will not use a
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9 350 quantitative cut-off score to determine study quality and will not pre-define weights for the
10
11 351 checklist items. Rather, we will make an overall quality judgement by considering the impact of
12
13 352 selection bias, information bias and confounding on study results throughout the conduct of each
14
15 353 study.⁵² We will report detailed results of the critical appraisal in a narrative form and in a ‘risk
16
17 354 of bias’ table. All studies, regardless of their methodological quality, will be extracted and
18
19 355 synthesized (where possible). The overall methodological quality of relevant studies will be
20
21 356 considered in the individual synthesis of quantitative, qualitative and economic data and the
22
23 357 integration of these findings. The results of the risk of bias assessment will be used in a
24
25 358 sensitivity analysis to ensure that studies judged to be at ‘high risk of bias’ do not affect the
26
27 359 robustness of our results.
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35 361 **Data items and data extraction process**

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37 362 Paired reviewers will independently extract the data from all eligible studies. For the quantitative
38
39 363 studies, we will extract data on the study and participant characteristics; intervention and
40
41 364 comparator intervention characteristics using the Template for Intervention Description and
42
43 365 Replication (TIDieR) checklist;⁵³ all pre-determined outcomes including multiple measures if
44
45 366 used;; key findings; and methodological quality. The TIDieR checklist⁵³ consists of items to help
46
47 367 readers better understand the interventions and how they were delivered (i.e., name of
48
49 368 intervention, why, what (materials), what (procedure), who provided, how, where, when and how
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51 369 much, tailoring, modifications, how well (planned), how well (actual)).⁵³ We will use the
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3 370 PerSPecTIF question formulation framework to guide data extraction for the qualitative studies
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5 371 regarding the items: perspective, setting, phenomenon of interest, environment, timing, and
6
7 372 findings (e.g., themes).⁵⁴ We will also extract data describing the qualitative approach used and
8
9 373 methodological quality of studies. For both quantitative and qualitative studies, we will extract
10
11 374 data on the ICF categories ‘environmental factors’ (contextual factors that make up the physical,
12
13 375 social and attitudinal environment in which people live and conduct their lives) and ‘personal
14
15 376 factors’ (internal contextual factors that influence how disability is experienced by the
16
17 377 individual) to add context to the interventions and outcomes.²⁶ For the economic evaluations, we
18
19 378 will use the Consolidated Health Economic Evaluation Reporting Standards (CHEERS)
20
21 379 statement⁵⁵ and extract data on the analytic approach (trial- or model-based), evaluation type, the
22
23 380 analytic perspective, time horizon adopted for costs, main cost items, setting, key findings, and
24
25 381 methodological quality of studies.
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33 383 Paired reviewers will pretest the data extraction form and revise as needed. We will use EPPI-
34
35 384 Reviewer software to manage the data extraction process. Any disagreements that arise between
36
37 385 the reviewers will be resolved through discussion, or with a third reviewer. We will contact
38
39 386 authors of papers to request missing or additional data, if required.
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44 388 **DATA SYNTHESIS**

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46
47 389 We will use a sequential approach at the review level to synthesize and integrate the data.⁵⁶ This
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49 390 will involve separate quantitative, economic, and qualitative findings synthesis followed by
50
51 391 integration of the resultant quantitative, economic, and qualitative evidence.
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3 393 **Quantitative synthesis**
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5 394 We will stratify the study results by: 1) population, 2) intervention, 3) comparator type, 4)
6
7 395 outcomes, 5) study design, and 6) methodological quality (Table 3). More specifically, regarding
8
9 396 **population**, we will stratify the results by age range (i.e., infants [aged < 1 year], children [aged
10
11 397 1-9 years], or adolescents [aged 10-19 years]);²¹ type of back pain (i.e., thoracic spine pain
12
13 398 with/without radiculopathy, low back pain with/without radiculopathy, musculoskeletal chest
14
15 399 wall pain, or spondylolisthesis/spondylolysis); duration of pain (i.e., acute/subacute [<12 weeks'
16
17 400 duration], or persistent [\geq 12 weeks' duration]); and severity of pain (i.e., mild, moderate, or
18
19 401 severe as classified according to the outcome measures used). For example, scores and categories
20
21 402 of pain for the Faces Pain Scale-Revised (FPS-R) are no pain (0 and 2), mild pain (4), moderate
22
23 403 pain (6) and severe pain (8 and 10). For the Color Analogue Scale (CAS), these are no pain (0 to
24
25 404 1), mild pain (1.25 to 2.75), moderate pain (3 to 5.75), and severe pain (6 to 10).⁵⁷ We will
26
27 405 stratify the results by **intervention type** (i.e., education and self-management strategies, exercise,
28
29 406 manual therapies, passive physical modalities, acupuncture, pharmacological interventions,
30
31 407 psychological interventions, multimodal care, environmental modifications, assistive devices,
32
33 408 and CAM). We will conduct subgroup analyses by stratifying the interventions further such as
34
35 409 type of exercise (e.g., stretching vs. aerobic) and manual therapy (e.g., mobilization vs. soft
36
37 410 tissue therapy), and mode of intervention delivery (e.g., provider type, in-person or remotely).
38
39 411 We will stratify the results by **comparator type** (i.e., active vs. inactive comparator), and conduct
40
41 412 subgroup analyses by stratifying the comparators further such as type of inactive comparator
42
43 413 (e.g., placebo/sham intervention, wait list, standard or usual care, or no intervention). We will
44
45 414 stratify **outcome** results by type (i.e., functioning, pain, psychological, health-related quality of
46
47 415 life, or adverse events); and effect estimate (i.e., mean difference, relative risk, odds ratio, or
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3 416 hazard ratio). We will conduct subgroup analyses by stratifying the outcome types further such
4
5 417 as type of outcome measure used (e.g., Oswestry Disability Index [ODI] vs. return to school to
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7 418 measure functioning; and depressive vs. anxiety outcomes to measure psychological outcomes),
8
9
10 419 and time points of outcome measurement (short- or long-term). We will stratify results by **study**
11
12 420 **design** (i.e., RCTs, cohort or case-control studies) and conduct subgroup analyses by stratifying
13
14 421 the study designs further (e.g., superiority, non-inferiority, and equivalence RCTs). Finally, we
15
16 422 will stratify results by **methodological quality assessment** (i.e., high/low/unclear risk of bias) to
17
18 423 aid in our subsequent meta-analysis and narrative synthesis of results.
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24 425 We will use established minimal clinically important differences (MCID) to determine the
25
26 426 clinical importance of effect sizes when possible.
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31 428 We will assess clinical, methodological, and statistical heterogeneity among studies. Differences
32
33 429 in populations, interventions, comparators, or outcomes across studies may result in clinical
34
35 430 heterogeneity. Methodological and statistical heterogeneity may result from differences in risk of
36
37 431 bias and differences in outcomes across studies beyond what could be expected by chance alone.
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40 432 We will assess the methodological heterogeneity across studies using our assessments from the
41
42 433 SIGN checklist as either high, low, or unclear risk of bias. We will assess statistical
43
44 434 heterogeneity using the I^2 statistic, whereby I^2 of <25-50% will be considered low to moderate
45
46 435 (homogeneous), and $\geq 50\%$ considered high (heterogeneous).⁵⁸ If two or more studies are
47
48 436 clinically homogeneous (i.e., similar populations, interventions, comparators and outcomes) and
49
50 437 statistically homogeneous (i.e., $I^2 < 25-50\%$), we will perform a random effects meta-analysis
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53 438 using EPPI-Reviewer software using the relative risk (or odds ratio for rare events) effect
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3 439 measure for dichotomous data, mean differences for continuous data, hazard rate ratios for time-
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5 440 to-event data, and rates or rate ratios for count data. For studies that used multiple measures to
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7 441 assess the same outcome and at multiple time points, we will select the most prevalent measure
8
9 442 and time point used across the studies to maximize comparability of the findings. We will
10
11 443 attempt to summarize the results in a similar way if possible. We will contact study investigators
12
13 444 to obtain the data if it is not reported. If the data are unavailable, we will summarize the data in
14
15 445 three ways: by entering the means as continuous outcomes, the counts as dichotomous outcomes
16
17 446 and by entering all of the data in text form as ‘other data’ outcomes.⁵⁹ We may also use statistical
18
19 447 approaches to re-express odds ratios as standardized mean differences (and vice versa), allowing
20
21 448 us to combine dichotomous and continuous data.⁵⁹ For our primary analysis, we will analyze the
22
23 449 studies with low and unclear risk of bias. We will then explore the impact of methodological
24
25 450 heterogeneity through sensitivity analysis by analyzing all studies together, including those with
26
27 451 a high risk of bias, and comparing our primary analysis with our sensitivity analysis. If the
28
29 452 results of the primary and sensitivity analyses differ, we will give precedence to the primary
30
31 453 analysis because high risk of bias studies are known to be at risk of overestimating effect sizes.⁶⁰
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33 454
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35 455 If the studies are heterogeneous (i.e., if there is clinical, methodological, and statistical
36
37 456 heterogeneity), we will narratively summarize the characteristics and findings of all eligible
38
39 457 studies according to or the Synthesis Without Meta-analysis (SWiM) reporting guideline.⁶¹ To
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41 458 quantify the effectiveness of interventions, we will use the data provided in the studies to
42
43 459 compute effect measures and 95% confidence intervals (i.e., odds ratio or relative risk for
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45 460 dichotomous outcomes, mean differences for continuous outcomes, hazard rate ratios for time-
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47 461 to-event outcomes, and rates or rate ratios for count outcomes).⁶²
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5 463 We will assess the potential impact of reporting biases on the results of our review or meta-
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7 464 analysis by attempting to identify study protocols through the trials registry (WHO International
8
9 465 Clinical Trials Registry Platform <http://apps.who.int/trialsearch/>), and through the use of funnel
10
11 466 plots. After results are stratified (Table 3), outcomes that are reported in at least 10 studies will
12
13 467 be assessed for publication bias by visually inspecting funnel plots for asymmetry.^{63 64}
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19 469 We will interpret the evidence on the effectiveness of interventions (i.e., whether an intervention
20
21 470 was superior, equal or inferior to a comparison intervention) by considering the direction,
22
23 471 magnitude, and precision of effect estimates across studies, impact of risk of bias in sensitivity
24
25 472 analyses, potential for publication bias, and the generalizability of findings. Similar to any meta-
26
27 473 analysis we may conduct, we will give precedence to the primary analysis consisting of studies
28
29 474 with low and unclear risk of bias.
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35 476 *Economic synthesis*

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37 477 We will report the main findings of economic studies, first stratified by high, low or unclear risk
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39 478 of bias. We will further stratify findings by study design (i.e., cost-effectiveness, cost-utility,
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41 479 cost-benefit, or cost-consequences). We will then stratify findings by type of intervention,
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43 480 outcome, and cost measure.
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49 482 To indicate whether an intervention might be judged favourably (or unfavourably) from an
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51 483 economic perspective,⁶⁵ we will use the Dominance Ranking Matrix (DRM) to classify the
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53 484 interventions into one of three options.⁶⁶ *Strong dominance* for the intervention will be selected
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3 485 when the incremental cost-effectiveness measure shows the intervention as: (i) more effective
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5 486 and less costly than the comparator; or (ii) effective and less costly; or (iii) equal cost and more
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7 487 effective. In this case, from an efficiency perspective, decision makers should favor the
8
9
10 488 intervention over the comparator (in circumstances similar to those of the evaluations). *Weak*
11
12 489 *dominance* for the intervention will be selected when the measure shows the interventions as: (i)
13
14 490 equally costly and effective as the comparator; or (ii) more effective and more costly; or (iii) less
15
16 491 effective and less costly. In this case, no conclusion may be drawn about whether the
17
18
19 492 intervention is preferable from an efficiency perspective without further information on the
20
21 493 priorities or preferences of decision makers in a particular context. Decision makers must
22
23 494 determine whether the cost/benefit trade-offs are worth the implementing an intervention in their
24
25 495 particular context. Lastly, *non-dominance* for the intervention will be selected when the measure
26
27 496 shows the intervention as: (i) more costly and less effective; or (ii) equally as costly and less
28
29 497 effective; or (iii) more costly and as effective. In this case the evidence we will interpret the
30
31 498 evidence as suggesting the comparator is favourable from an efficiency perspective (in
32
33 499 circumstances similar to those of the evaluations).
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40 501 *Qualitative synthesis*

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42 502 We will stratify the qualitative findings similarly to the quantitative and economic findings. We
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44 503 will first stratify the findings by risk of bias (i.e., high/low/unclear), then by study approach or
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46 504 design (e.g., qualitative descriptive, ethnography, grounded theory), and by intervention type and
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48 505 outcome.
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3 507 Additionally, we will stratify findings according to individual perspective (i.e., patient (children),
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5 508 caregivers (parents/guardians), healthcare providers, community service providers, or others
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8 509 involved with the rehabilitation of back pain in children). We will use thematic synthesis to
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10 510 synthesize the qualitative research findings.^{67 68} First, we will enter all the text labelled as
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12 511 ‘results’ or ‘findings’ of the primary studies verbatim into EPPI-Reviewer. Then, pairs of trained
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14 512 reviewers will independently code each line of text according to its meaning and content, and
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16 513 group codes hierarchically into descriptive themes, including the *a priori* themes (intervention
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18 514 type and outcomes). Reviewers will also generate themes *a posteriori* to answer our review
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20 515 question (i.e., experiences, preferences, expectations and valued outcomes regarding
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22 516 rehabilitation interventions for back pain in children). Reviewers will finalize the themes through
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24 517 discussion. We will give precedence to studies with low or unclear risk of bias.⁶⁹
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31 ***Integration of quantitative, qualitative and economic evidence***

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33 520 Various methods can be used to integrate diverse study types including: (1) juxtaposing findings
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35 521 in a matrix, (2) using logic models/conceptual framework, (3) analyzing program theory, (4)
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37 522 testing hypothesis derived using subgroup analysis, and (5) qualitative comparative analysis.⁵⁶
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39 523 We will integrate the evidence by juxtaposing findings in a matrix to generate hypotheses
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41 524 regarding the effectiveness, cost-effectiveness and safety of rehabilitation interventions for back
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43 525 pain in children. We selected this methodology because it is suitable for comparing and
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45 526 contrasting the findings across the individual quantitative, qualitative and economic evidence
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47 527 syntheses in our review.⁵⁶ The use of a matrix will allow us to explore heterogeneity in the
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49 528 findings of the quantitative studies and may indicate why some interventions may be effective,
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51 529 cost-effective and safe, and some may not.⁵⁶ For example, we may list themes from the
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3 530 qualitative synthesis along one side of the matrix, and then plot the interventions evaluated in the
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5 531 quantitative synthesis against the themes as either a match (when the intervention matched a
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7 532 theme) or a mismatch (when the intervention was the opposite of a theme). We will also plot the
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9 533 economic evaluation findings against the corresponding intervention and theme. We will identify
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11 534 gaps in knowledge if a particular theme for an intervention does not match with any of the
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13 535 interventions evaluated in the quantitative studies.
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19 537 **DISSEMINATION**

21 538 Knowledge translation activities will include presentations to clinicians and researchers at
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23 539 national and international conferences; meetings with national and international decision makers
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25 540 (clinicians, health managers/administrators, policy makers and patients); publications in peer-
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27 541 reviewed journals; clinician and patient/caregiver resources; posts and lay language summaries
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29 542 on organizations' websites (open access) and other social media platforms.
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35 544 **DISCUSSION**

37 545 Findings from this mixed studies review will advance our knowledge of the effectiveness, safety,
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39 546 user experience, and cost-effectiveness of a wide range of rehabilitation interventions for
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41 547 children with back pain. This work will provide the evidentiary basis to develop clinical practice
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43 548 guidelines and care pathways outlining the evidence-based management of back pain in children,
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45 549 which can be adapted for specific settings (e.g., hospitals, rehabilitation clinics, and schools) and
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47 550 geographical regions. Specifically, decision makers should consider interventions that are
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49 551 identified as effective, safe, efficient, and positively experienced by patients and caregivers.
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52 552 Mapping findings to the ICF framework will allow decision makers to use standardized language
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553 in the assessment and management of children during their care program. This may further
554 facilitate improvements in functioning and health outcomes in this patient population.

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556 A potential limitation of our review is that our search strategy may miss potentially relevant
557 studies, however, we have mitigated this by expanding our search strategy to include content
558 experts and searching relevant websites. A potential risk is that there may be too little evidence
559 available to answer our review questions.

560

561 Findings from this review will guide future research by identifying methodological limitations
562 and knowledge gaps in the available literature. Future studies can be designed to address these
563 limitations and gaps. This novel interpretation of quantitative, qualitative and economic evidence
564 according to the ICF framework serves as a model for how outcomes related to functioning and
565 health can be prioritized in future research.

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568 **ADDITIONAL FILES**

569 Additional file 1: PRISMA-P 2015 Checklist. Preferred Reporting Items for Systematic Review
570 and Meta-Analysis Protocols (PRISMA-P) 2015 statement

571 Additional file 2: Literature search strategies

572 Additional file 3: Risk of bias assessment

573

574 **DECLARATIONS**

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3 576 **Ethics approval and consent to participate:** Not applicable
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8 578 **Consent for publication:** Not applicable
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12 580 **Availability of data and materials:** Not applicable
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20

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23
24 585 protocol.
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31 588 **Author contributions:**
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35 590 methodology. CC and JJW drafted the manuscript. All authors reviewed and revised the
36
37 591 manuscript, and approved the final manuscript.
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46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

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603 **REFERENCES**

- 604 1. Joergensen AC, Hestbaek L, Andersen PK, et al. Epidemiology of spinal pain in children: a
605 study within the Danish National Birth Cohort. *Eur J Pediatr* 2019;178(5):695-706. doi:
606 10.1007/s00431-019-03326-7 [published Online First: 2019/02/23]
- 607 2. Aartun E, Hartvigsen J, Wedderkopp N, et al. Spinal pain in adolescents: prevalence,
608 incidence, and course: a school-based two-year prospective cohort study in 1,300 Danes
609 aged 11-13. *BMC Musculoskelet Disord* 2014;15:187. doi: 10.1186/1471-2474-15-187
610 [published Online First: 2014/06/03]
- 611 3. Beynon AM, Hebert JJ, Lebouef-Yde C, et al. Potential risk factors and triggers for back pain
612 in children and young adults. A scoping review, part I: incident and episodic back pain.
613 *Chiropr Man Therap* 2019;27:58. doi: 10.1186/s12998-019-0280-9 [published Online
614 First: 2019/12/13]
- 615 4. Kamper SJ, Yamato TP, Williams CM. The prevalence, risk factors, prognosis and treatment
616 for back pain in children and adolescents: An overview of systematic reviews. *Best Pract
617 Res Clin Rheumatol* 2016;30(6):1021-36. doi: 10.1016/j.berh.2017.04.003 [published
618 Online First: 2017/11/07]
- 619 5. Calvo-Munoz I, Gomez-Conesa A, Sanchez-Meca J. Prevalence of low back pain in children
620 and adolescents: a meta-analysis. *BMC Pediatr* 2013;13:14. doi: 10.1186/1471-2431-13-
621 14 [published Online First: 2013/01/29]
- 622 6. King S, Chambers CT, Huguet A, et al. The epidemiology of chronic pain in children and
623 adolescents revisited: a systematic review. *Pain* 2011;152(12):2729-38. doi:
624 10.1016/j.pain.2011.07.016 [published Online First: 2011/11/15]

- 1
2
3 625 7. Jeffries LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain: a
4
5 626 systematic overview of the research literature. *Spine (Phila Pa 1976)* 2007;32(23):2630-
6
7 627 7. doi: 10.1097/BRS.0b013e318158d70b [published Online First: 2007/11/06]
8
9
10 628 8. Disease GBD, Injury I, Prevalence C. Global, regional, and national incidence, prevalence,
11
12 629 and years lived with disability for 354 diseases and injuries for 195 countries and
13
14 630 territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study
15
16 631 2017. *Lancet* 2018;392(10159):1789-858. doi: 10.1016/S0140-6736(18)32279-7
17
18 632 [published Online First: 2018/11/30]
19
20
21 633 9. Batley S, Aartun E, Boyle E, et al. The association between psychological and social factors
22
23 634 and spinal pain in adolescents. *Eur J Pediatr* 2019;178(3):275-86. doi: 10.1007/s00431-
24
25 635 018-3291-y [published Online First: 2018/11/23]
26
27
28 636 10. Kamper SJ, Henschke N, Hestbaek L, et al. Musculoskeletal pain in children and adolescents.
29
30 637 *Braz J Phys Ther* 2016;20(3):275-84. doi: 10.1590/bjpt-rbf.2014.0149 [published Online
31
32 638 First: 2016/07/22]
33
34
35 639 11. Stallknecht SE, Strandberg-Larsen K, Hestbaek L, et al. Spinal pain and co-occurrence with
36
37 640 stress and general well-being among young adolescents: a study within the Danish
38
39 641 National Birth Cohort. *Eur J Pediatr* 2017;176(6):807-14. doi: 10.1007/s00431-017-
40
41 642 2915-y [published Online First: 2017/05/05]
42
43
44 643 12. Dissing KB, Hestbaek L, Hartvigsen J, et al. Spinal pain in Danish school children - how
45
46 644 often and how long? The CHAMPS Study-DK. *BMC Musculoskelet Disord*
47
48 645 2017;18(1):67. doi: 10.1186/s12891-017-1424-5 [published Online First: 2017/03/28]
49
50
51 646 13. Driehuis F, Hoogeboom TJ, Nijhuis-van der Sanden MWG, et al. Spinal manual therapy in
52
53 647 infants, children and adolescents: A systematic review and meta-analysis on treatment
54
55
56
57
58
59
60

- 1
2
3 648 indication, technique and outcomes. *PLoS One* 2019;14(6):e0218940. doi:
4
5 649 10.1371/journal.pone.0218940 [published Online First: 2019/06/27]
6
7
8 650 14. Parnell Prevost C, Gleberzon B, Carleo B, et al. Manual therapy for the pediatric population:
9
10 651 a systematic review. *BMC Complement Altern Med* 2019;19(1):60. doi: 10.1186/s12906-
11
12 652 019-2447-2 [published Online First: 2019/03/15]
13
14
15 653 15. Michaleff ZA, Kamper SJ, Maher CG, et al. Low back pain in children and adolescents: a
16
17 654 systematic review and meta-analysis evaluating the effectiveness of conservative
18
19 655 interventions. *Eur Spine J* 2014;23(10):2046-58. doi: 10.1007/s00586-014-3461-1
20
21 656 [published Online First: 2014/07/30]
22
23
24 657 16. Harden A, Thomas J. Methodological issues in combining diverse study types in systematic
25
26 658 reviews. *International Journal of Social Research Methodology* 2005;8(3):257-71.
27
28
29 659 17. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and
30
31 660 meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews* 2015;4:1. doi:
32
33 661 10.1186/2046-4053-4-1 [published Online First: 2015/01/03]
34
35
36 662 18. National Institute for Health Research. International prospective register of systematic
37
38 663 reviews (PROSPERO). Available at: <https://www.crd.york.ac.uk/prospero/> (accessed Jan
39
40 664 10, 2019).
41
42
43 665 19. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and
44
45 666 meta-analyses: the PRISMA statement. *Journal of clinical epidemiology*
46
47 667 2009;62(10):1006-12. doi: 10.1016/j.jclinepi.2009.06.005 [published Online First:
48
49 668 2009/07/28]
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 669 20. Tong A, Flemming K, McInnes E, et al. Enhancing transparency in reporting the synthesis of
4
5 670 qualitative research: ENTREQ. *BMC Med Res Methodol* 2012;12:181. doi:
6
7 671 10.1186/1471-2288-12-181 [published Online First: 2012/11/29]
8
9
10 672 21. World Health Organization. Definition of key terms. Age groups and population [Available
11
12 673 from: <https://www.who.int/hiv/pub/guidelines/arv2013/intro/keyterms/en/> accessed
13
14 674 January 15, 2020.
15
16
17 675 22. Amundsen PA, Evans DW, Rajendran D, et al. Inclusion and exclusion criteria used in non-
18
19 676 specific low back pain trials: a review of randomised controlled trials published between
20
21 677 2006 and 2012. *BMC Musculoskelet Disord* 2018;19(1):113. doi: 10.1186/s12891-018-
22
23 678 2034-6 [published Online First: 2018/04/14]
24
25
26 679 23. North American Spine Society. NASS Clinical Guidelines: Lumbar Disc Herniation with
27
28 680 Radiculopathy. Available at:
29
30 681 [https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf)
31
32 682 [on.pdf](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf) (accessed Dec 12, 2018).
33
34
35 683 24. Merskey H, Bogduk N, International Association for the Study of Pain, et al. Classification
36
37 684 of chronic pain: descriptions of chronic pain syndromes and definitions of pain terms.
38
39 685 2nd ed. Seattle: IASP Press 1994:xvi, 222 p. p.
40
41
42 686 25. The World Health Organization. World Report on Disability: Chapter 4 Rehabilitation.
43
44 687 Available at:
45
46 688 [https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf)
47
48 689 [on.pdf](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf) (access Dec 16, 2018).
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 690 26. World Health Organization. The International Classification of Functioning, Disability and
4
5 691 Health (ICF). Available at: <https://www.who.int/classifications/icf/icfbeginnersguide.pdf>
6
7
8 692 (accessed Dec 1, 2018).
9
- 10 693 27. Fairbank JC, Couper J, Davies JB, et al. The Oswestry low back pain disability
11
12 694 questionnaire. *Physiotherapy* 1980;66(8):271-3. [published Online First: 1980/08/01]
13
14
- 15 695 28. Roland M, Morris R. A study of the natural history of back pain. Part I: development of a
16
17 696 reliable and sensitive measure of disability in low-back pain. *Spine* 1983;8(2):141-4.
18
19 697 [published Online First: 1983/03/01]
20
- 21 698 29. McCormack HM, Horne DJ, Sheather S. Clinical applications of visual analogue scales: a
22
23 699 critical review. *Psychol Med* 1988;18(4):1007-19. doi: 10.1017/s0033291700009934
24
25 700 [published Online First: 1988/11/01]
26
27
- 28 701 30. Jensen MP, Turner JA, Romano JM, et al. Comparative reliability and validity of chronic
29
30 702 pain intensity measures. *Pain* 1999;83(2):157-62. doi: 10.1016/s0304-3959(99)00101-3
31
32 703 [published Online First: 1999/10/27]
33
34
- 35 704 31. Hicks CL, von Baeyer CL, Spafford PA, et al. The Faces Pain Scale-Revised: toward a
36
37 705 common metric in pediatric pain measurement. *Pain* 2001;93(2):173-83. doi:
38
39 706 10.1016/s0304-3959(01)00314-1 [published Online First: 2001/06/28]
40
41
- 42 707 32. Michaleff ZA, Kamper SJ, Stinson JN, et al. Measuring Musculoskeletal Pain in Infants,
43
44 708 Children, and Adolescents. *J Orthop Sports Phys Ther* 2017;47(10):712-30. doi:
45
46 709 10.2519/jospt.2017.7469 [published Online First: 2017/09/19]
47
48
- 49 710 33. Chorpita BF, Yim L, Moffitt C, et al. Assessment of symptoms of DSM-IV anxiety and
50
51 711 depression in children: a revised child anxiety and depression scale. *Behav Res Ther*
52
53
54
55
56
57
58
59

- 1
2
3 712 2000;38(8):835-55. doi: 10.1016/s0005-7967(99)00130-8 [published Online First:
4
5 713 2000/08/11]
6
7
8 714 34. Spielberger CD. Manual for the State-Trait Anxiety Inventory for Children. Palo Alto, Calif,
9
10 715 USA: Consulting Psychologists Press 1973.
11
12 716 35. Cieza A, Geyh S, Chatterji S, et al. ICF linking rules: an update based on lessons learned.
13
14 717 *Journal of rehabilitation medicine* 2005;37(4):212-8. doi: 10.1080/16501970510040263
15
16 718 [published Online First: 2005/07/19]
17
18
19 719 36. Ravens-Sieberer U, Gosch A, Rajmil L, et al. The KIDSCREEN-52 quality of life measure
20
21 720 for children and adolescents: psychometric results from a cross-cultural survey in 13
22
23 721 European countries. *Value Health* 2008;11(4):645-58. doi: 10.1111/j.1524-
24
25 722 4733.2007.00291.x [published Online First: 2008/01/09]
26
27
28 723 37. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of
29
30 724 Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med*
31
32 725 *Care* 2001;39(8):800-12. doi: 10.1097/00005650-200108000-00006 [published Online
33
34 726 First: 2001/07/27]
35
36
37 727 38. Health Measures, . [January 14, 2020]. Available from:
38
39 728 [http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
40
41 729 [promis/list-of-pediatric-measures.](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
42
43
44 730 39. Pohlman KA, O'Beirne M, Thiel H, et al. Development and validation of providers' and
45
46 731 patients' measurement instruments to evaluate adverse events after spinal manipulation
47
48 732 therapy. *European Journal of Integrative Medicine* 2014;6(4):451-66.
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 733 40. Ioannidis JP, Evans SJ, Gotzsche PC, et al. Better reporting of harms in randomized trials: an
4
5 734 extension of the CONSORT statement. *Ann Intern Med* 2004;141(10):781-8. doi:
6
7 735 10.7326/0003-4819-141-10-200411160-00009 [published Online First: 2004/11/17]
8
9
10 736 41. Zorzela L, Boon H, Mior S, et al. Serious adverse events associated with pediatric
11
12 737 complementary and alternative medicine. *European Journal of Integrative Medicine*
13
14 738 2014;6(4):467-72.
15
16
17 739 42. World Health Organization. Community-based rehabilitation. Available at:
18
19 740 <https://www.who.int/disabilities/cbr/en/> (accessed Dec. 1, 2018).
20
21
22 741 43. Sampson M, McGowan J, Cogo E, et al. An evidence-based practice guideline for the peer
23
24 742 review of electronic search strategies. *Journal of clinical epidemiology* 2009;62(9):944-
25
26 743 52. doi: 10.1016/j.jclinepi.2008.10.012 [published Online First: 2009/02/24]
27
28
29 744 44. McGowan J, Sampson M, Salzwedel DM, et al. PRESS Peer Review of Electronic Search
30
31 745 Strategies: 2015 Guideline Statement. *J Clin Epidemiol* 2016;75:40-6. doi:
32
33 746 10.1016/j.jclinepi.2016.01.021 [published Online First: 2016/03/24]
34
35
36 747 45. Godin K, Stapleton J, Kirkpatrick SI, et al. Applying systematic review search methods to the
37
38 748 grey literature: a case study examining guidelines for school-based breakfast programs in
39
40 749 Canada. *Syst Rev* 2015;4:138. doi: 10.1186/s13643-015-0125-0 [published Online First:
41
42 750 2015/10/27]
43
44
45 751 46. Centre EfPaPIaC. EPPI-Reviewer 4 software [Available from: eppi.ioe.ac.uk accessed
46
47 752 November 20, 2019].
48
49 753 47. Belur J, Tompson L, Thornton A, et al. Interrater reliability in systematic review
50
51 754 methodology: Exploring variation in coder decision-making. *Sociological Methods &*
52
53 755 *Research* 2018:1-29.
54
55
56
57
58
59
60

- 1
2
3 756 48. Scottish Intercollegiate Guidelines Network (SIGN). Critical appraisal notes and checklists,
4
5 757 2019. Available at: <https://www.sign.ac.uk/checklists-and-notes.html> (accessed Feb 1,
6
7 758 2019).
8
9
10 759 49. Lockwood C, Munn Z, Porritt K. Qualitative research synthesis: methodological guidance for
11
12 760 systematic reviewers utilizing meta-aggregation. *International journal of evidence-based*
13
14 761 *healthcare* 2015;13(3):179-87. doi: 10.1097/xeb.0000000000000062 [published Online
15
16 762 First: 2015/08/12]
17
18
19 763 50. Pluye P, Gagnon MP, Griffiths F, et al. A scoring system for appraising mixed methods
20
21 764 research, and concomitantly appraising qualitative, quantitative and mixed methods
22
23 765 primary studies in Mixed Studies Reviews. *International journal of nursing studies*
24
25 766 2009;46(4):529-46. doi: 10.1016/j.ijnurstu.2009.01.009 [published Online First:
26
27 767 2009/02/24]
28
29
30
31 768 51. Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic
32
33 769 submissions to the BMJ. The BMJ Economic Evaluation Working Party. *BMJ*
34
35 770 1996;313(7052):275-83. doi: 10.1136/bmj.313.7052.275 [published Online First:
36
37 771 1996/08/03]
38
39
40 772 52. Higgins JPT, Savovic J, Page MJ, et al. Chapter 8: Assessing risk of bias in a randomized
41
42 773 trial. In: Higgins JPT, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for*
43
44 774 *Systematic Reviews of Interventions* version 60 (updated July 2019): Cochrane, 2019.
45
46
47 775 53. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for
48
49 776 intervention description and replication (TIDieR) checklist and guide. *BMJ*
50
51 777 2014;348:g1687. doi: 10.1136/bmj.g1687 [published Online First: 2014/03/13]
52
53
54
55
56
57
58
59
60

- 1
2
3 778 54. Booth A, Noyes J, Flemming K, et al. Formulating questions to explore complex
4
5 779 interventions within qualitative evidence synthesis. *BMJ Glob Health* 2019;4(Suppl
6
7 780 1):e001107. doi: 10.1136/bmjgh-2018-001107 [published Online First: 2019/02/19]
8
9
10 781 55. Husereau D, Drummond M, Petrou S, et al. Consolidated Health Economic Evaluation
11
12 782 Reporting Standards (CHEERS) statement. *BMJ* 2013;346:f1049. doi:
13
14 783 10.1136/bmj.f1049 [published Online First: 2013/03/27]
15
16
17 784 56. Harden A, Thomas J, Cargo M, et al. Cochrane Qualitative and Implementation Methods
18
19 785 Group guidance series-paper 5: methods for integrating qualitative and implementation
20
21 786 evidence within intervention effectiveness reviews. *Journal of clinical epidemiology*
22
23 787 2018;97:70-78. doi: 10.1016/j.jclinepi.2017.11.029 [published Online First: 2017/12/16]
24
25
26 788 57. Tsze DS, Hirschfeld G, Dayan PS, et al. Defining No Pain, Mild, Moderate, and Severe Pain
27
28 789 Based on the Faces Pain Scale-Revised and Color Analog Scale in Children With Acute
29
30 790 Pain. *Pediatr Emerg Care* 2018;34(8):537-44. doi: 10.1097/PEC.0000000000000791
31
32 791 [published Online First: 2016/05/27]
33
34
35 792 58. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Stat Med*
36
37 793 2002;21(11):1539-58. doi: 10.1002/sim.1186
38
39
40 794 59. Deeks JJ, Higgins JPT, Altman DG. Chapter 10: Analysing data and undertaking meta-
41
42 795 analyses. In: Higgins JPT, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for*
43
44 796 *Systematic Reviews of Interventions* version 60 (updated July 2019): Cochrane, 2019.
45
46
47 797 60. Higgins JP, Altman DG, Gotzsche PC, et al. The Cochrane Collaboration's tool for assessing
48
49 798 risk of bias in randomised trials. *BMJ (Clinical research ed)* 2011;343:d5928. doi:
50
51 799 10.1136/bmj.d5928 [published Online First: 2011/10/20]
52
53
54
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59

- 1
2
3 800 61. Campbell M, McKenzie JE, Sowden A, et al. Synthesis without meta-analysis (SWiM) in
4
5 801 systematic reviews: reporting guideline. *BMJ* 2020;368:l6890. doi: 10.1136/bmj.l6890
6
7 802 [published Online First: 2020/01/18]
8
9
10 803 62. McKenzie JE, Brennan SE. Chapter 12: Synthesizing and presenting findings using other
11
12 804 methods. In: Higgins JPT TJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA., ed.
13
14 805 Cochrane Handbook for Systematic Reviews of Interventions version 60 (updated July
15
16 806 2019): Cochrane, 2019.
17
18
19 807 63. Page MJ, Higgins JPT, Sterne JAC. Chapter 13. Assessing risk of bias due to missing results
20
21 808 in a synthesis. In: Higgins JPT, Thomas J, Chandler J, et al., eds. Handbook for
22
23 809 Systematic Reviews of Interventions version 60 (updated July 2019): Cochrane, 2019.
24
25
26 810 64. Egger M, Davey Smith G, Schneider M, et al. Bias in meta-analysis detected by a simple,
27
28 811 graphical test. *BMJ (Clinical research ed)* 1997;315(7109):629-34. doi:
29
30 812 10.1136/bmj.315.7109.629 [published Online First: 1997/10/06]
31
32
33 813 65. Shemilt I, Aluko P, Graybill E, et al. Economic Evidence. In: Higgins JPT TJ, Chandler J,
34
35 814 Cumpston M, Li T, Page MJ, Welch VA., ed. Cochrane Handbook for Systematic
36
37 815 Reviews of Interventions version 60, 2019.
38
39
40 816 66. Joanna Briggs Institute. Chapter 6: Systematic reviews of economic evidence 2019
41
42 817 [Available from:
43
44 818 <https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of>
45
46 819 [+economic+evidence](https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of) accessed February 1, 2020.
47
48
49 820 67. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic
50
51 821 reviews. *BMC Med Res Methodol* 2008;8:45. doi: 10.1186/1471-2288-8-45 [published
52
53 822 Online First: 2008/07/12]
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3 823 68. Noyes J, Booth A, Flemming K, et al. Cochrane Qualitative and Implementation Methods
4
5 824 Group guidance series-paper 3: methods for assessing methodological limitations, data
6
7 825 extraction and synthesis, and confidence in synthesized qualitative findings. *Journal of*
8
9 826 *clinical epidemiology* 2018;97:49-58. doi: 10.1016/j.jclinepi.2017.06.020 [published
10
11 827 Online First: 2017/12/17]
12
13
14 828 69. Slavin RE. Best evidence synthesis: an intelligent alternative to meta-analysis. *Journal of*
15
16 829 *clinical epidemiology* 1995;48(1):9-18. [published Online First: 1995/01/01]
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832 **Table 1: Examples of rehabilitation interventions**

Intervention	Definition	Examples
Patient or caregiver education and self-management strategies (structured or unstructured)	Teaching patients skills that they can use to manage their health condition	<ul style="list-style-type: none"> • Learning disease-specific information • Learning general managing skills (e.g., problem-solving, finding and using community resources, working with healthcare team) • Learning strategies to increase confidence (i.e., self-efficacy) in ability to engage in behaviours that are needed to manage their condition on a daily basis • Adequate peer role models and support networks that facilitate the initiation and maintenance of desired behavioural changes
Exercise	A subcategory of physical activity that is planned, structured, repetitive, and purposeful; can be supervised (e.g., by a healthcare professional) or unsupervised	<ul style="list-style-type: none"> • Stretching • Strengthening • Range of motion exercises • Aerobic (e.g., swimming, cycling, walking, running) • Anaerobic (e.g., jumping, sprinting, weight lifting) • Yoga, Qigong
Manual therapies	<ul style="list-style-type: none"> - Manipulation: Techniques incorporating a high-velocity low-amplitude impulse or thrust applied at or near the end of a joint's passive range of motion - Mobilization: Techniques incorporating a low-velocity and small or large amplitude oscillatory movement, within a joint's passive range of motion - Traction: Manual or mechanically assisted application of an intermittent or continuous distractive force - Soft tissue therapy: A mechanical form of therapy where soft-tissue structures are pressed and kneaded, using physical contact with the hand or mechanical device 	<ul style="list-style-type: none"> • Lumbar manipulation, mobilization, or traction • Massage • Muscle energy technique • Strain-counterstrain
Passive physical modalities	A form of cold, heat, or light application affecting the body at the skin level or ultrasonic	<ul style="list-style-type: none"> • Heat application: heat pack, hydrotherapy

	<p>or electromagnetic radiation affecting structures beneath the skin surface:</p> <ul style="list-style-type: none"> - Passive assistive devices: Device to encourage immobilization in anatomic positions or actively inhibit or prevent movement 	<ul style="list-style-type: none"> • Cryotherapy: cold pack, vapocoolant spray • Low-level laser • Electrical muscle stimulation • Pulsed electromagnetic therapy
Acupuncture	Any body-needling, moxibustion, electric acupuncture, laser acupuncture, microsystem acupuncture, and acupressure	<ul style="list-style-type: none"> • Traditional needling • Dry needling • Burning of specific herbs • Electro-acupuncture • Photo-acupuncture
Pharmacological interventions	A substance used in treating disease or relieving pain	<ul style="list-style-type: none"> • Acetaminophen • Nonsteroidal anti-inflammatory drugs • Muscle relaxants • Antidepressants
Psychological interventions	Activities used to modify behaviour, emotional state, or feelings	<ul style="list-style-type: none"> • Cognitive behavioural therapy • Counselling • Social network and environment-based therapies • Psychoeducational interventions • Mindfulness meditation
Modifications to environment		<ul style="list-style-type: none"> • Ergonomic interventions at school or work
Assistive devices	Any item, piece of equipment or product system, used to increase, maintain, or improve the functional capabilities of people with disabilities	<ul style="list-style-type: none"> • Walking aids • Orthoses • Braces • Wheelchairs
Complementary and alternative therapies (CAM)	Medical products and practices that are not part of standard medical care	<ul style="list-style-type: none"> • Homeopathy • Traditional Chinese Medicine • Naturopathy • Products (e.g., herbs, dietary supplements, probiotics)

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835 **Table 2. Research questions, outcomes and study types**

Research Question	Outcomes	Study Types
<p>What is the effectiveness and safety of rehabilitation interventions for improving functioning and other health outcomes in children with back pain?</p>	<p><i>Primary:</i></p> <ol style="list-style-type: none"> 1. Functioning: e.g., Modified Oswestry Low Back Pain Disability Questionnaire, Roland Morris Disability Questionnaire, return to school, participation in sports/other recreational activities <p><i>Secondary:</i></p> <ol style="list-style-type: none"> 2. Pain (including pain intensity, frequency, duration): e.g., VAS, NRS, Faces Pain Scale - Revised 3. Psychological outcomes (including anxiety and depression): e.g., Revised Child Anxiety and Depression Scale, State-Trait Anxiety Inventory for Children 4. Health-related quality of life: e.g., KIDSCREEN-52, Pediatric Quality of Life Inventory, PROMIS Pediatric Self Report Scale 5. Adverse events: any unfavorable sign, symptom, or disease temporarily associated with treatment, indirect harms (e.g., delayed diagnosis/treatment), number of adverse events, severity of adverse events (i.e., mild, moderate, severe), number of participant withdrawals from study due to adverse events. 	<p>Randomized controlled trials</p> <p>Cohort studies</p> <p>Case-control studies</p> <p>Mixed methods studies (quantitative component)</p>
<p>What are the patients', caregivers' and providers' experiences, preferences, expectations and valued outcomes regarding rehabilitation interventions for back pain?</p>	<ol style="list-style-type: none"> 6. Qualitative outcomes: experiences, preferences, expectations, valued outcomes 	<p>Qualitative studies (e.g., phenomenology, grounded theory, ethnography, action research, descriptive qualitative studies)</p> <p>Mixed-methods studies (qualitative component)</p>
<p>What is the cost-effectiveness of rehabilitation interventions for improving functioning and other health outcomes in children with back pain?</p>	<ol style="list-style-type: none"> 7. Economic outcomes: Direct costs: resources consumed or saved by an intervention Indirect costs: productivity gains or losses (e.g., time consumed or freed by the intervention) Economic health outcomes: QALY, ICER, NMB 	<p>Full economic evaluations (trial- and model-based): cost-effectiveness, cost-utility, cost-benefit, cost-consequences</p>

	Intangible: e.g., pain or suffering saved or brought on by an intervention	
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836 ICER: incremental cost-effectiveness ratio; NMB: measure of net monetary benefit; NRS: Numerical
 837 Rating Scale; PROMIS: Patient-Reported Outcomes Measurement Information System; QALY: quality
 838 adjusted life years; VAS: Visual Analogue Scale

839 **Table 3. Categories to guide the assessment of homogeneity and stratification of results**

Category	Description*
1A	Population: age range <ul style="list-style-type: none"> - Infants (aged <1 year) - Children (aged 1-9 years) - Adolescents (aged 10-19 years)
1B	Population: type of back pain <ul style="list-style-type: none"> - Thoracic spine pain without radiculopathy - Thoracic spine pain with radiculopathy - Low back pain without radiculopathy - Low back pain with radiculopathy - Musculoskeletal chest wall pain - Spondylolisthesis/spondylolysis
1C	Population: duration of pain <ul style="list-style-type: none"> - Acute/subacute (<12 weeks' duration) - Persistent (≥12 weeks' duration)
1D	Population: severity of pain <ul style="list-style-type: none"> - Mild - Moderate - Severe
2	Intervention: type <ul style="list-style-type: none"> - Education and self-management strategies - Exercise - Manual therapy: manipulation, mobilization, traction, soft tissue therapy - Passive physical modalities - Acupuncture - Pharmacological intervention - Psychological intervention - Multimodal care - Environmental modifications - Assistive devices - Complementary and alternative medicine (CAM)
3	Comparator: type Active: <ul style="list-style-type: none"> - Other intervention Inactive: <ul style="list-style-type: none"> - Placebo/sham intervention - Wait list - Standard or usual care - No intervention
4A	Outcome: type <ul style="list-style-type: none"> - Functioning - Pain

	<ul style="list-style-type: none"> - Psychological - Health-related quality of life - Adverse events
4B	<p>Outcome: effect estimate**</p> <ul style="list-style-type: none"> - Mean difference - Relative risk - Odds ratio - Hazard ratio
5	<p>Study design: type</p> <ul style="list-style-type: none"> - Randomized trials - Cohort studies - Case-control studies
6	<p>Methodological quality assessment:</p> <ul style="list-style-type: none"> - Low risk of bias - High risk of bias - Unclear risk of bias

840 *Describes how study results will be stratified by the listed categories to guide the assessment of
 841 homogeneity (e.g., results would be reported separately for studies targeting 1) adolescents with persistent
 842 low back pain without radiculopathy as the population; 2) education as the intervention; 3) no
 843 intervention as the comparator; 4) mean difference of pain intensity as the outcome; 5) randomized trial as
 844 the study design)

845 **Unadjusted estimates will be analyzed separately from adjusted estimates

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	(Page No.#)
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	4
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1-2
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	25
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial or other support for the review	25
Sponsor	5b	Provide name for the review funder and/or sponsor	
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	5-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	6
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	7-11
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	12-13
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits such that it could be repeated	Additional File 2

Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	13
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	14, 18-20
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently in duplicate), any processes for obtaining and confirming data from investigators	16-7
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	16-7
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	9-11
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	15-6
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	17-22
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I ² , Kendall's τ)	
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	15
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	20

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Additional file 2. Literatures search strategies**Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® 1946-Present**

- 1 exp Infant/
- 2 Child, Preschool/
- 3 Child/
- 4 Adolescent/
- 5 Pediatrics/
- 6 (baby or babies).ab,ti.
- 7 "newborn*".ab,ti.
- 8 (infant or infants).ab,ti.
- 9 (child or children*).ab,ti.
- 10 (adolescent* or adolescence).ab,ti.
- 11 (teen or teens or teenager).ab,ti.
- 12 (pediatric* or paediatric*).ab,ti.
- 13 (young adj3 (person* or people)).ab,ti.
- 14 emerging adult*.ab,ti.
- 15 "youth*".ab,ti.
- 16 or/1-15 [**pediatric population]
- 17 exp Back Injuries/
- 18 exp Back Pain/
- 19 Coccyx/in [Injuries]
- 20 Intervertebral Disc Degeneration/
- 21 Intervertebral Disc Displacement/
- 22 Lumbar Vertebrae/in [Injuries]
- 23 Lumbosacral Region/in [Injuries]
- 24 Osteoarthritis, Spine/
- 25 Piriformis Muscle Syndrome/
- 26 Radiculopathy/
- 27 Sciatica/
- 28 Spinal Diseases/

- 1 29 Spinal Stenosis/
2
3 30 Thoracic Injuries/
4
5 31 Thoracic Vertebrae/
6
7 32 (back adj3 (ache* or injur* or pain*)).ab,ti.
8
9 33 (backache* adj3 (injur* or pain*)).ab,ti.
10
11 34 (back pain or back-pain).ab,ti.
12
13 35 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
14
15 36 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
16
17 37 "low* back pain".ab,ti.
18
19 38 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or
20 zygapophys*)).ab,ti.
21
22 39 "Piriformis syndrome*".ab,ti.
23
24 40 radiculopathy.ab,ti.
25
26 41 (sacral adj2 pain*).ab,ti.
27
28 42 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
29
30 43 spondylosis.ab,ti.
31
32 44 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
33
34 45 (T-spine or T-spinal).ab,ti.
35
36 46 or/17-45 [**back pain]
37
38 47 Acupressure/
39
40 48 Acupuncture/
41
42 49 exp Acupuncture Therapy/
43
44 50 "Bedding and Linens"/
45
46 51 Behavior Therapy/
47
48 52 exp Biofeedback, Psychology/
49
50 53 exp Cognitive Behavioral Therapy/
51
52 54 Combined Modality Therapy/
53
54 55 Community-Based Participatory Research/
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56 56 Community Health Services/
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58 57 Community Participation/
59
60 58 Complementary Therapies/
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60 59 Cryotherapy/

1 60 exp Diathermy/
2
3 61 exp Electric Stimulation Therapy/
4
5 62 Electroacupuncture/
6
7 63 Ergonomics/
8
9 64 exp Exercise/
10
11 65 exp Exercise Movement Techniques/
12
13 66 exp Exercise Therapy/
14
15 67 Fluid Therapy/
16
17 68 High-Energy Shock Waves/tu [Therapeutic Use]
18
19 69 Immobilization/
20
21 70 Hot Temperature/tu [Therapeutic Use]
22
23 71 exp Hydrotherapy/
24
25 72 Laser Therapy, Low-Level/
26
27 73 Low-Level Light Therapy/
28
29 74 Magnetic Field Therapy/
30
31 75 Magnetics/tu [Therapeutic Use]
32
33 76 Massage/
34
35 77 exp Medicine, Chinese Traditional/
36
37 78 exp Musculoskeletal Manipulations/
38
39 79 Patient Education as Topic/
40
41 80 Physical Therapy Modalities/
42
43 81 Self Care/
44
45 82 Self-Help Devices/
46
47 83 Physical Fitness/
48
49 84 Restraint, Physical/
50
51 85 Transcutaneous Electric Nerve Stimulation/
52
53 86 Vibration/tu [Therapeutic Use]
54
55 87 Wheelchairs/
56
57 88 acupressure.ab,ti.
58
59 89 "acupunctur*".ab,ti.
60 90 (advice or advise or advised).ab,ti.
91 alexander technique.ab,ti.

- 1 92 "assistive device*".ab,ti.
2
3 93 "back belt*".ab,ti.
4
5 94 "back school*".ab,ti.
6
7 95 (back adj2 work).ab,ti.
8
9 96 (braces or brace or bracing).ab,ti.
10
11 97 canes.ab,ti.
12
13 98 chiropract*.ab,ti.
14
15 99 "cognitive behavioral therap*".ab,ti.
16
17 100 "cognitive behavioural therap*".ab,ti.
18
19 101 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
20
21 102 "core stabili*".ab,ti.
22
23 103 (corset or corsets).ab,ti.
24
25 104 crutches.ab,ti.
26
27 105 cryotherap*.ab,ti.
28
29 106 "deep tissue therap*".ab,ti.
30
31 107 diathermy.ab,ti.
32
33 108 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
34
35 109 electro-acupuncture.ab,ti.
36
37 110 (electrogalvanic stimulation or EGS).ab,ti.
38
39 111 (electromagnet* and (radiation or therap*)).ab,ti.
40
41 112 electromodalit*.ab,ti.
42
43 113 electrotherapy.ab,ti.
44
45 114 (exercise or exercises or exercising).ab,ti.
46
47 115 (flexion-distraction or flexion distraction).ab,ti.
48
49 116 fluidotherap*.ab,ti.
50
51 117 galvanic stimulation.ab,ti.
52
53 118 (H-Wave Device Stimulation or HWDS).ab,ti.
54
55 119 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or
56 bottle or superficial or therapeutic)).ab,ti.
57
58 120 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
59
60 121 "hydrotherap*".ab,ti.
122 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.

- 1 123 "interferential current*".ab,ti.
2
3 124 infrared.ab,ti.
4
5 125 iontophoresis.ab,ti.
6
7 126 electroanalgesia.ab,ti.
8
9 127 ergonomic*.ab,ti.
10
11 128 kinesiostat*.ab,ti.
12 129 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
13
14 130 "low level laser*".ab,ti.
15
16 131 "lumbar support*".ab,ti.
17
18 132 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
19
20 133 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
21
22 134 "manual therap*".ab,ti.
23
24 135 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
25
26 136 microwave*.ab,ti.
27 137 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
28
29 138 "moist air bath*".ab,ti.
30
31 139 moxibustion.ab,ti.
32
33 140 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or
34 procedure* or package* or manage*)).ab,ti.
35
36 141 muscle activation.ab,ti.
37
38 142 "muscle energy technique*".ab,ti.
39
40 143 myofascial release.ab,ti.
41
42 144 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
43
44 145 orthotic*.ab,ti.
45
46 146 "passive modalit*".ab,ti.
47
48 147 (patient* adj3 (educat* or train*)).ab,ti.
49
50 148 "Percutaneous Electric* Nerve Stimulation".ab,ti.
51
52 149 (physical adj therap*).ab,ti.
53
54 150 physiotherap*.ab,ti.
55
56 151 photo-acupuncture.ab,ti.
57
58 152 pillow*.ab,ti.
59
60 153 pilates.ab,ti.

- 1 154 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
2
3 155 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
4
5 156 radiant light.ab,ti.
6
7 157 Russian stimulation.ab,ti.
8
9 158 "seat adj cushion*".ab,ti.
10
11 159 (self-manage* or self manage*).ab,ti.
12
13 160 (short wave* or short-wave*).ab,ti.
14
15 161 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
16
17 162 "soft tissue therap*".ab,ti.
18
19 163 "spray and stretch".ab,ti.
20
21 164 strain-counterstrain.ab,ti.
22
23 165 strengthen*.ab,ti.
24
25 166 stretching.ab,ti.
26
27 167 (tape or taping).ab,ti.
28
29 168 thoracolumbosacral orthosis.ab,ti.
30
31 169 traction.ab,ti.
32
33 170 traditional Chinese medicine.ab,ti.
34
35 171 (transcutaneous electrical stimulation or TENS).ab,ti.
36
37 172 ultrasound.ab,ti.
38
39 173 vapocoolant spray.ab,ti.
40
41 174 "vibration therap*".ab,ti.
42
43 175 walkers.ab,ti.
44
45 176 "walking adj3 aid*".ab,ti.
46
47 177 "warm compress*".ab,ti.
48
49 178 whirlpool*.ab,ti.
50
51 179 yoga.ab,ti.
52
53 180 or/47-179 [**interventions]
54
55 181 Case-Control Studies/
56
57 182 Cohort Studies/
58
59 183 Controlled Clinical Trials as Topic/
60
61 184 Epidemiologic Studies/
62
63 185 Epidemiology/

1 186 Follow-Up Studies/
2
3 187 Longitudinal Studies/
4
5 188 Prospective Studies/
6
7 189 Retrospective Studies/
8
9 190 Randomized Controlled Trials as Topic/
10
11 191 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
12
13 192 (cohort adj3 (stud* or design* or analysis)).ab,ti.
14
15 193 controlled clinical trial.pt.
16
17 194 "epidemiolog*".ab,ti.
18
19 195 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
20
21 196 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
22
23 197 (prospective adj3 (stud* or design* or analysis)).ab,ti.
24
25 198 (random* and (control* or clinical or allocat*)).ab,ti.
26
27 199 randomized controlled trial.pt.
28
29 200 (retrospective adj3 (stud* or design*)).ab,ti.
30
31 201 or/181-200 [**study designs_effectiveness]
32
33 202 16 and 46 and 180 and 201
34
35 203 Anthropology, Cultural/
36
37 204 Attitude/
38
39 205 Awareness/
40
41 206 Behavioral Research/
42
43 207 Diary as Topic/
44
45 208 Emotions/
46
47 209 Ethnology/
48
49 210 Ethnopsychology/
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51 211 Focus Groups/
52
53 212 Grounded Theory/
54
55 213 Interview, Psychological/
56
57 214 Interviews as Topic/
58
59 215 Mindfulness/
60
216 Motivation/
217 Narration/

- 1 218 Observation/
2
3 219 Perception/
4
5 220 Personal Narratives as Topic/
6
7 221 Personal Satisfaction/
8
9 222 Qualitative Research/
10
11 223 Self Report/
12
13 224 "Surveys and Questionnaires"/
14
15 225 Tape Recording/
16
17 226 Thinking/
18
19 227 Video Recording/ or Videotape Recording/
20
21 228 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or
22 perception* or perspective*).ab,ti.
23
24 229 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
25
26 230 ((behavioral or behavioural) adj2 research).ab,ti.
27
28 231 biographical method*.ab,ti.
29
30 232 (constant adj2 (comparative or comparison)).ab,ti.
31
32 233 ((content or conversation or discourse) adj2 analys*).ab,ti.
33
34 234 descriptive research.ab,ti.
35
36 235 (diary or diaries).ab,ti.
37
38 236 emotions.ab,ti.
39
40 237 ethnograph*.ab,ti.
41
42 238 ethnology.ab,ti.
43
44 239 ethnopsychology.ab,ti.
45
46 240 feelings.ab,ti.
47
48 241 (field adj2 (notes or research or study or studies)).ab,ti.
49
50 242 (focus adj2 group*).ab,ti.
51
52 243 framework analysis.ab,ti.
53
54 244 grounded theory.ab,ti.
55
56 245 interview*.ab,ti.
57
58 246 life world.ab,ti.
59
60 247 lived experience.ab,ti.
248 (meaning or meanings).ab,ti.

- 1 249 (narrative* or narration*).ab,ti.
- 2
- 3 250 (observe* or observation*).ab,ti.
- 4
- 5 251 (open adj ended).ab,ti.
- 6
- 7 252 phenomenology.ab,ti.
- 8
- 9 253 purposive sampl*.ab,ti.
- 10
- 11 254 qualitative.ab,ti.
- 12
- 13 255 questionnaire*.ab,ti.
- 14
- 15 256 (realist adj3 (review* or research or synthesis)).ab,ti.
- 16
- 17 257 satisfaction.ab,ti.
- 18
- 19 258 self report*.ab,ti.
- 20
- 21 259 semantic analysis.ab,ti.
- 22
- 23 260 standpoint*.ab,ti.
- 24
- 25 261 (story or stories).ab,ti.
- 26
- 27 262 survey*.ab,ti.
- 28
- 29 263 (theme* or thematic).ab,ti.
- 30
- 31 264 (theoretical adj2 (sampl* or saturation)).ab,ti.
- 32
- 33 265 (thoughts or thinking).ab,ti.
- 34
- 35 266 ((video adj record*) or videorecord* or videotap*).ab,ti.
- 36
- 37 267 or/203-266 [**experience/qualitative]
- 38
- 39 268 "Costs and Cost Analysis"/
- 40
- 41 exp Cost-Benefit Analysis/
- 42
- 43 270 Quality-Adjusted Life Years/
- 44
- 45 271 Economics, Medical/
- 46
- 47 272 (economic* adj4 (evaluat* or stud*)).ab,ti.
- 48
- 49 273 (health economic* adj4 (evaluat* or stud*)).ab,ti.
- 50
- 51 274 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
- 52
- 53 275 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
- 54
- 55 276 (CEA or CUA or CBA).ab,ti.
- 56
- 57 277 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
- 58
- 59 278 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
- 60 279 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.

- 1 280 (decision adj1 (tree* or analy* or model*)).ab,ti.
- 2
- 3 281 economics.fs.
- 4
- 5 282 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
- 6
- 7 283 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or
- 8 quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
- 9
- 10 284 (markov* or monte carlo*).ab,ti.
- 11
- 12 285 or/268-284 [**cost effectiveness]
- 13
- 14 286 Delivery of Health Care/
- 15
- 16 287 Delivery of Health Care, Integrated/
- 17
- 18 288 Health Planning/
- 19
- 20 289 Health Promotion/
- 21
- 22 290 Health Services Administration/
- 23
- 24 291 Integrative Medicine/
- 25
- 26 292 Interprofessional Relations/
- 27
- 28 293 Patient Care Management/
- 29
- 30 294 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
- 31
- 32 295 barrier*.ab,ti.
- 33
- 34 296 facilitator*.ab,ti.
- 35
- 36 297 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention*
- 37 or model* or plan* or process* or program*or services or strateg* or system* or team*)).ab,ti.
- 38
- 39 298 implement*.ab,ti.
- 40
- 41 299 (innovate* adj3 (intervention* or model* or plan* or process* or program*or strateg* or system*)).ab,ti.
- 42
- 43 300 (model* adj care).ab,ti.
- 44
- 45 301 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
- 46 intervention* or model* or plan* or process* or program*or strateg* or system* or challenge* or benefit* or
- 47 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
- 48 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
- 49
- 50 302 (pathway* adj3 (clinical or care)).ab,ti.
- 51
- 52 303 (program* adj3 (assess* or evaluat*)).ab,ti.
- 53
- 54 304 or/286-303 [**implementation]
- 55
- 56 305 16 and 46 and 180 and (201 or 267 or 285 or 304)
- 57
- 58 306 16 and 46 and 180 [**pediatric, back pain, interventions]
- 59
- 60

Embase Classic+Embase 1947 to 2020

- 1 newborn/
- 2 infant/ or infancy/ or baby/
- 3 childhood/
- 4 child/
- 5 adolescent/ or adolescence/
- 6 juvenile/
- 7 (baby or babies).ab,ti.
- 8 "newborn*".ab,ti.
- 9 (infant or infants).ab,ti.
- 10 (child or children*).ab,ti.
- 11 (adolescent* or adolescence).ab,ti.
- 12 (teen or teens or teenager).ab,ti.
- 13 (pediatric* or paediatric*).ab,ti.
- 14 (young adj3 (person* or people)).ab,ti.
- 15 emerging adult*.ab,ti.
- 16 "youth*".ab,ti.
- 17 or/1-16 [**pediatric population]
- 18 backache/
- 19 low back pain/
- 20 intervertebral disc degeneration/
- 21 intervertebral disk hernia/
- 22 lumbar vertebra/
- 23 lumbosacral region/
- 24 piriformis syndrome/
- 25 radiculopathy/
- 26 sciatica/
- 27 spine disease/
- 28 vertebral canal stenosis/
- 29 spondylosis/
- 30 (back adj3 (ache* or injur* or pain*)).ab,ti.

- 1 31 (backache* adj3 (injur* or pain*)).ab,ti.
2
3 32 (back pain or back-pain).ab,ti.
4
5 33 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
6
7 34 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
8
9 35 "low* back pain".ab,ti.
10
11 36 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or
12 zygapophys*)).ab,ti.
13
14 37 "Piriformis syndrome*".ab,ti.
15
16 38 radiculopathy.ab,ti.
17
18 39 (sacral adj2 pain*).ab,ti.
19
20 40 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
21
22 41 spondylosis.ab,ti.
23
24 42 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
25
26 43 (T-spine or T-spinal).ab,ti.
27
28 44 or/18-43 [**back injuries]
29
30 45 acupressure/
31
32 46 acupuncture/
33
34 47 behavior therapy/
35
36 48 biofeedback/
37
38 49 cognitive behavioral therapy/
39
40 50 participatory research/
41
42 51 community care/
43
44 52 community participation/
45
46 53 alternative medicine/
47
48 54 cryotherapy/
49
50 55 diathermy/
51
52 56 electrostimulation therapy/
53
54 57 electroacupuncture/
55
56 58 ergonomics/
57
58 59 exp exercise/
59
60 60 exp kinesiotherapy/
61
62 61 fitness/

- 1 62 fluid therapy/
- 2
- 3 63 shock wave/
- 4
- 5 64 immobilization/
- 6
- 7 65 heat/
- 8
- 9 66 exp hydrotherapy/
- 10
- 11 67 low level laser therapy/
- 12
- 13 68 phototherapy/
- 14
- 15 69 exp magnetism/
- 16
- 17 70 magnetotherapy/
- 18
- 19 71 massage/
- 20
- 21 72 Chinese medicine/
- 22
- 23 73 manipulative medicine/
- 24
- 25 74 patient education/
- 26
- 27 75 physiotherapy/
- 28
- 29 76 self care/
- 30
- 31 77 transcutaneous nerve stimulation/
- 32
- 33 78 whole body vibration/
- 34
- 35 79 acupressure.ab,ti.
- 36
- 37 80 "acupunctur*".ab,ti.
- 38
- 39 81 (advice or advise or advised).ab,ti.
- 40
- 41 82 alexander technique.ab,ti.
- 42
- 43 83 "assistive device*".ab,ti.
- 44
- 45 84 "back belt*".ab,ti.
- 46
- 47 85 "back school*".ab,ti.
- 48
- 49 86 (back adj2 work).ab,ti.
- 50
- 51 87 (braces or brace or bracing).ab,ti.
- 52
- 53 88 chiropract*.ab,ti.
- 54
- 55 89 "cognitive behavioral therap*".ab,ti.
- 56
- 57 90 "cognitive behavioural therap*".ab,ti.
- 58
- 59 91 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
- 60
- 92 "core stabili*".ab,ti.
- 93 (corset or corsets).ab,ti.

- 1 94 crutches.ab,ti.
2
3 95 cryotherap*.ab,ti.
4
5 96 "deep tissue therap*".ab,ti.
6
7 97 diathermy.ab,ti.
8
9 98 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
10
11 99 electro-acupuncture.ab,ti.
12
13 100 (electrogalvanic stimulation or EGS).ab,ti.
14
15 101 (electromagnet* and (radiation or therap*)).ab,ti.
16
17 102 electromodalit*.ab,ti.
18
19 103 electrotherapy.ab,ti.
20
21 104 (exercise or exercises or exercising).ab,ti.
22
23 105 (flexion-distraction or flexion distraction).ab,ti.
24
25 106 fluidotherap*.ab,ti.
26
27 107 galvanic stimulation.ab,ti.
28
29 108 (H-Wave Device Stimulation or HWDS).ab,ti.
30
31 109 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
32 superficial or therapeutic)).ab,ti.
33
34 110 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
35
36 111 "hydrotherap*".ab,ti.
37
38 112 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
39
40 113 "interferential current*".ab,ti.
41
42 114 infrared.ab,ti.
43
44 115 iontophoresis.ab,ti.
45
46 116 electroanalgesia.ab,ti.
47
48 117 ergonomic*.ab,ti.
49
50 118 kinesiopat*.ab,ti.
51
52 119 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
53
54 120 "low level laser*".ab,ti.
55
56 121 "lumbar support*".ab,ti.
57
58 122 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
59
60 123 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
124 "manual therap*".ab,ti.

- 1 125 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
- 2
- 3 126 microwave*.ab,ti.
- 4
- 5 127 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
- 6
- 7 128 "moist air bath*".ab,ti.
- 8
- 9 129 moxibustion.ab,ti.
- 10
- 11 130 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or
- 12 package* or manage*)).ab,ti.
- 13
- 14 131 muscle activation.ab,ti.
- 15
- 16 132 "muscle energy technique*".ab,ti.
- 17
- 18 133 myofascial release.ab,ti.
- 19
- 20 134 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
- 21
- 22 135 orthotic*.ab,ti.
- 23
- 24 136 "passive modalit*".ab,ti.
- 25
- 26 137 (patient* adj3 (educat* or train*)).ab,ti.
- 27
- 28 138 "Percutaneous Electric* Nerve Stimulation".ab,ti.
- 29
- 30 139 (physical adj therap*).ab,ti.
- 31
- 32 140 physiotherap*.ab,ti.
- 33
- 34 141 photo-acupuncture.ab,ti.
- 35
- 36 142 pillow*.ab,ti.
- 37
- 38 143 pilates.ab,ti.
- 39
- 40 144 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
- 41
- 42 145 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
- 43
- 44 146 radiant light.ab,ti.
- 45
- 46 147 Russian stimulation.ab,ti.
- 47
- 48 148 "seat adj cushion*".ab,ti.
- 49
- 50 149 (self-manage* or self manage*).ab,ti.
- 51
- 52 150 (short wave* or short-wave*).ab,ti.
- 53
- 54 151 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
- 55
- 56 152 "soft tissue therap*".ab,ti.
- 57
- 58 153 "spray and stretch".ab,ti.
- 59
- 60 154 strain-counterstrain.ab,ti.
- 155 strengthen*.ab,ti.

1 156 stretching.ab,ti.
2
3 157 (tape or taping).ab,ti.
4
5 158 thoracolumbosacral orthosis.ab,ti.
6
7 159 traction.ab,ti.
8
9 160 traditional Chinese medicine.ab,ti.
10
11 161 (transcutaneous electrical stimulation or TENS).ab,ti.
12
13 162 ultrasound.ab,ti.
14
15 163 vapocoolant spray.ab,ti.
16
17 164 "vibration therap*".ab,ti.
18
19 165 walkers.ab,ti.
20
21 166 "walking adj3 aid*".ab,ti.
22
23 167 "warm compress*".ab,ti.
24
25 168 whirlpool*.ab,ti.
26
27 169 yoga.ab,ti.
28
29 170 or/45-169 [**interventions]
30
31 171 case control study/
32
33 172 cohort analysis/
34
35 173 "controlled clinical trial (topic)"/
36
37 174 longitudinal study/
38
39 175 "randomized controlled trial (topic)"/
40
41 176 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
42
43 177 (cohort adj3 (stud* or design* or analysis)).ab,ti.
44
45 178 "epidemiolog*".ab,ti.
46
47 179 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
48
49 180 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
50
51 181 (prospective adj3 (stud* or design* or analysis)).ab,ti.
52
53 182 (random* and (control* or clinical or allocat* or trial*)).ab,ti.
54
55 183 (retrospective adj3 (stud* or design*)).ab,ti.
56
57 184 or/171-183 [**effectiveness]
58
59 185 attitude to health/
60
61 186 patient attitude/
62
63 187 awareness/

- 1 188 behavioral research/
 2
 3 189 writing/
 4
 5 190 emotion/
 6
 7 191 ethnology/
 8
 9 192 cultural psychology/
 10
 11 193 information processing/
 12
 13 194 grounded theory/
 14
 15 195 interview/
 16
 17 196 mindfulness/
 18
 19 197 motivation/
 20
 21 198 exp verbal communication/
 22
 23 199 observation/ or participant observation/
 24
 25 200 perception/
 26
 27 201 satisfaction/ or patient satisfaction/
 28
 29 202 qualitative research/
 30
 31 203 self report/
 32
 33 204 health survey/
 34
 35 205 questionnaire/
 36
 37 206 exp recording/
 38
 39 207 exp thinking/
 40
 41 208 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception*
 42 or perspective*).ab,ti.
 43
 44 209 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
 45
 46 210 ((behavioral or behavioural) adj2 research).ab,ti.
 47
 48 211 biographical method*.ab,ti.
 49
 50 212 (constant adj2 (comparative or comparison)).ab,ti.
 51
 52 213 ((content or conversation or discourse) adj2 analys*).ab,ti.
 53
 54 214 descriptive research.ab,ti.
 55
 56 215 (diary or diaries).ab,ti.
 57
 58 216 emotions.ab,ti.
 59
 60 217 ethnograph*.ab,ti.
 218 ethnology.ab,ti.

1 219 ethnopsychology.ab,ti.
2
3 220 feelings.ab,ti.
4
5 221 (field adj2 (notes or research or study or studies)).ab,ti.
6
7 222 (focus adj2 group*).ab,ti.
8
9 223 framework analysis.ab,ti.
10
11 224 grounded theory.ab,ti.
12
13 225 interview*.ab,ti.
14
15 226 life world.ab,ti.
16
17 227 lived experience.ab,ti.
18
19 228 (meaning or meanings).ab,ti.
20
21 229 (narrative* or narration*).ab,ti.
22
23 230 (observe* or observation*).ab,ti.
24
25 231 (open adj ended).ab,ti.
26
27 232 phenomenology.ab,ti.
28
29 233 purposive sampl*.ab,ti.
30
31 234 qualitative.ab,ti.
32
33 235 questionnaire*.ab,ti.
34
35 236 (realist adj3 (review* or research or synthesis)).ab,ti.
36
37 237 satisfaction.ab,ti.
38
39 238 self report*.ab,ti.
40
41 239 semantic analysis.ab,ti.
42
43 240 standpoint*.ab,ti.
44
45 241 (story or stories).ab,ti.
46
47 242 survey*.ab,ti.
48
49 243 (theme* or thematic).ab,ti.
50
51 244 (theoretical adj2 (sampl* or saturation)).ab,ti.
52
53 245 (thoughts or thinking).ab,ti.
54
55 246 ((video adj record*) or videorecord* or videotap*).ab,ti.
56
57 247 or/185-246 [**qualitative_experience]
58
59 248 "cost effectiveness analysis"/
60 249 "cost benefit analysis"/
250 quality adjusted life year/

- 1 251 health economics/
 2
 3 252 (economic* adj4 (evaluat* or stud*)).ab,ti.
 4
 5 253 (health economic* adj4 (evaluat* or stud*)).ab,ti.
 6
 7 254 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
 8
 9 255 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
 10
 11 256 (CEA or CUA or CBA).ab,ti.
 12
 13 257 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
 14
 15 258 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
 16
 17 259 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit*
 18 or consequence* or unit*)).ab,ti.
 19
 20 260 (decision adj1 (tree* or analy* or model*)).ab,ti.
 21
 22 261 economics.fs.
 23
 24 262 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
 25
 26 263 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-
 27 adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
 28
 29 264 (markov* or monte carlo*).ab,ti.
 30
 31 265 or/248-264 [**cost effectiveness]
 32
 33 266 health care delivery/
 34
 35 267 integrated health care system/
 36
 37 268 health care planning/
 38
 39 269 health promotion/
 40
 41 270 health service/
 42
 43 271 integrative medicine/
 44
 45 272 case management/
 46
 47 273 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
 48
 49 274 barrier*.ab,ti.
 50
 51 275 facilitator*.ab,ti.
 52
 53 276 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or
 54 model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
 55
 56 277 implement*.ab,ti.
 57
 58 278 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
 59
 60 279 (model* adj care).ab,ti.

1 280 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
2 intervention* or model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or
3 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
4 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
5

6
7 281 (pathway* adj3 (clinical or care)).ab,ti.
8

9 282 (program* adj3 (assess* or evaluat*)).ab,ti.
10

11 283 or/266-282 [**implementation]
12

13 284 17 and 44 and 170
14

15 285 284 and (184 or 247 or 265 or 283)
16

17 286 limit 285 to (conference abstract or conference paper or "conference review" or editorial or letter)
18

19 287 285 not 286
20
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PsycINFO 1806

- 1
- 2
- 3 1 (baby or babies).ab,ti.
- 4
- 5 2 "newborn".ab,ti.
- 6
- 7 3 (infant or infants).ab,ti.
- 8
- 9 4 (child or children*).ab,ti.
- 10
- 11 5 (adolescent* or adolescence).ab,ti.
- 12
- 13 6 (teen or teens or teenager).ab,ti.
- 14
- 15 7 (pediatric* or paediatric*).ab,ti.
- 16
- 17 8 (young adj3 (person* or people)).ab,ti.
- 18
- 19 9 emerging adult*.ab,ti.
- 20
- 21 10 "youth".ab,ti.
- 22
- 23 11 or/1-10 [**pediatric population]
- 24
- 25 12 exp Back Pain/
- 26
- 27 13 Lumbar Spinal Cord/
- 28
- 29 14 Spinal Cord Injuries/
- 30
- 31 15 Spinal Column/
- 32
- 33 16 (back adj3 (ache* or injur* or pain*)).ab,ti.
- 34
- 35 17 (backache* adj3 (injur* or pain*)).ab,ti.
- 36
- 37 18 (back pain or back-pain).ab,ti.
- 38
- 39 19 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 40
- 41 20 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 42
- 43 21 "low* back pain".ab,ti.
- 44
- 45 22 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or zygapophys*)).ab,ti.
- 46
- 47 23 "Piriformis syndrome".ab,ti.
- 48
- 49 24 radiculopathy.ab,ti.
- 50
- 51 25 (sacral adj2 pain*).ab,ti.
- 52
- 53 26 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
- 54
- 55 27 spondylosis.ab,ti.
- 56
- 57 28 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
- 58
- 59 29 (T-spine or T-spinal).ab,ti.
- 60
- 30 or/12-29 [**back injuries]

1	31	Acupuncture/
2		
3	32	exp Behavior Therapy/
4		
5	33	exp Biofeedback/
6		
7	34	exp Cognitive Behavior Therapy/
8		
9	35	Alternative Medicine/
10		
11	36	Electrical Stimulation/
12		
13	37	Human Factors Engineering/
14		
15	38	exp Exercise/
16		
17	39	Movement Therapy/
18		
19	40	Shock Therapy/
20		
21	41	Heat/
22		
23	42	exp Hydrotherapy/
24		
25	43	Laser Irradiation/
26		
27	44	exp Magnetism/
28		
29	45	Massage/
30		
31	46	Client Education/
32		
33	47	Self-Care Skills/
34		
35	48	Physical Therapy/
36		
37	49	Self-Help Techniques/
38		
39	50	Physical Fitness/
40		
41	51	Vibration/
42		
43	52	acupressure.ab,ti.
44		
45	53	"acupunctur*".ab,ti.
46		
47	54	(advice or advise or advised).ab,ti.
48		
49	55	alexander technique.ab,ti.
50		
51	56	"assistive device*".ab,ti.
52		
53	57	"back belt*".ab,ti.
54		
55	58	"back school*".ab,ti.
56		
57	59	(back adj2 work).ab,ti.
58		
59	60	(braces or brace or bracing).ab,ti.
60		
	61	canes.ab,ti.
	62	chiropract*.ab,ti.

- 1 63 "cognitive behavioral therap*".ab,ti.
2
3 64 "cognitive behavioural therap*".ab,ti.
4
5 65 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
6
7 66 "core stabili*".ab,ti.
8
9 67 (corset or corsets).ab,ti.
10
11 68 crutches.ab,ti.
12
13 69 cryotherap*.ab,ti.
14
15 70 "deep tissue therap*".ab,ti.
16
17 71 diathermy.ab,ti.
18
19 72 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
20
21 73 electro-acupuncture.ab,ti.
22
23 74 (electrogalvanic stimulation or EGS).ab,ti.
24
25 75 (electromagnet* and (radiation or therap*)).ab,ti.
26
27 76 electromodalit*.ab,ti.
28
29 77 electrotherapy.ab,ti.
30
31 78 (exercise or exercises or exercising).ab,ti.
32
33 79 (flexion-distraction or flexion distraction).ab,ti.
34
35 80 fluidotherap*.ab,ti.
36
37 81 galvanic stimulation.ab,ti.
38
39 82 (H-Wave Device Stimulation or HWDS).ab,ti.
40
41 83 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
42 superficial or therapeutic)).ab,ti.
43
44 84 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
45
46 85 "hydrotherap*".ab,ti.
47
48 86 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
49
50 87 "interferential current*".ab,ti.
51
52 88 infrared.ab,ti.
53
54 89 iontophoresis.ab,ti.
55
56 90 electroanalgesia.ab,ti.
57
58 91 ergonomic*.ab,ti.
59
60 92 kinesiotap*.ab,ti.
61
62 93 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.

- 1 94 "low level laser".ab,ti.
2
3 95 "lumbar support".ab,ti.
4
5 96 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
6
7 97 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
8
9 98 "manual therap*".ab,ti.
10
11 99 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
12
13 100 microwave*.ab,ti.
14
15 101 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
16
17 102 "moist air bath".ab,ti.
18
19 103 moxibustion.ab,ti.
20
21 104 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or
22 package* or manage*)).ab,ti.
23
24 105 muscle activation.ab,ti.
25
26 106 "muscle energy technique".ab,ti.
27
28 107 myofascial release.ab,ti.
29
30 108 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
31
32 109 orthotic*.ab,ti.
33
34 110 "passive modalit".ab,ti.
35
36 111 (patient* adj3 (educat* or train*)).ab,ti.
37
38 112 "Percutaneous Electric* Nerve Stimulation".ab,ti.
39
40 113 (physical adj therap*).ab,ti.
41
42 114 physiotherap*.ab,ti.
43
44 115 photo-acupuncture.ab,ti.
45
46 117 pilates.ab,ti.
47
48 118 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
49
50 119 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
51
52 120 radiant light.ab,ti.
53
54 121 Russian stimulation.ab,ti.
55
56 122 "seat adj cushion".ab,ti.
57
58 123 (self-manage* or self manage*).ab,ti.
59
60 124 (short wave* or short-wave*).ab,ti.

- 1 125 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
- 2
- 3 126 "soft tissue therap*".ab,ti.
- 4
- 5 127 "spray and stretch".ab,ti.
- 6
- 7 128 strain-counterstrain.ab,ti.
- 8
- 9 129 strengthen*.ab,ti.
- 10
- 11 130 stretching.ab,ti.
- 12
- 13 131 (tape or taping).ab,ti.
- 14
- 15 132 thoracolumbosacral orthosis.ab,ti.
- 16
- 17 133 traction.ab,ti.
- 18
- 19 134 traditional Chinese medicine.ab,ti.
- 20
- 21 135 (transcutaneous electrical stimulation or TENS).ab,ti.
- 22
- 23 136 ultrasound.ab,ti.
- 24
- 25 137 vapocoolant spray.ab,ti.
- 26
- 27 138 "vibration therap*".ab,ti.
- 28
- 29 139 walkers.ab,ti.
- 30
- 31 140 "walking adj3 aid*".ab,ti.
- 32
- 33 141 "warm compress*".ab,ti.
- 34
- 35 142 whirlpool*.ab,ti.
- 36
- 37 143 yoga.ab,ti.
- 38
- 39 144 or/31-143 [**interventions]
- 40
- 41 145 Cohort Analysis/
- 42
- 43 146 Clinical Trials/
- 44
- 45 147 Longitudinal Studies/
- 46
- 47 148 exp Randomized Controlled Trials/
- 48
- 49 149 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
- 50
- 51 150 (cohort adj3 (stud* or design* or analysis)).ab,ti.
- 52
- 53 151 controlled clinical trial.pt.
- 54
- 55 152 "epidemiolog*".ab,ti.
- 56
- 57 153 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
- 58
- 59 154 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
- 60 155 (prospective adj3 (stud* or design* or analysis)).ab,ti.
- 156 (random* and (control* or clinical or allocat*)).ab,ti.

1	157	(retrospective adj3 (stud* or design*)).ab,ti.
2		
3	158	or/145-157 [**effectiveness]
4		
5	159	exp Attitudes/
6		
7	160	Awareness/
8		
9	161	Journal Writing/
10		
11	162	Emotions/
12		
13	163	Ethnology/
14		
15	164	Focus Group/
16		
17	165	Grounded Theory/
18		
19	166	Interviews/
20		
21	167	Mindfulness/ or Mindfulness-Based Interventions/
22		
23	168	Motivation/
24		
25	169	Narratives/
26		
27	170	exp Observation Methods/
28		
29	171	Perception/
30		
31	172	Preferences/
32		
33	173	Satisfaction/
34		
35	174	Qualitative Methods/
36		
37	175	Self-Report/
38		
39	176	Surveys/ or Questionnaires/
40		
41	177	exp Tape Recorders/
42		
43	178	Thinking/
44		
45	179	Digital Video/
46		
47	180	(attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception* or perspective*).ab,ti.
48		
49	181	((audio adj record*) or audiorecord* or audiotap*).ab,ti.
50		
51	182	((behavioral or behavioural) adj2 research).ab,ti.
52		
53	183	biographical method*.ab,ti.
54		
55	184	(constant adj2 (comparative or comparison)).ab,ti.
56		
57	185	((content or conversation or discourse) adj2 analys*).ab,ti.
58		
59	186	descriptive research.ab,ti.
60		
	187	(diary or diaries).ab,ti.

1 188 emotions.ab,ti.
2
3 189 ethnograph*.ab,ti.
4
5 190 ethnology.ab,ti.
6
7 191 ethnopsychology.ab,ti.
8
9 192 feelings.ab,ti.
10
11 193 (field adj2 (notes or research or study or studies)).ab,ti.
12
13 194 (focus adj2 group*).ab,ti.
14
15 195 framework analysis.ab,ti.
16
17 196 grounded theory.ab,ti.
18
19 197 interview*.ab,ti.
20
21 198 life world.ab,ti.
22
23 199 lived experience.ab,ti.
24
25 200 (meaning or meanings).ab,ti.
26
27 201 (narrative* or narration*).ab,ti.
28
29 202 (observe* or observation*).ab,ti.
30
31 203 (open adj ended).ab,ti.
32
33 204 phenomenology.ab,ti.
34
35 205 purposive sampl*.ab,ti.
36
37 206 qualitative.ab,ti.
38
39 207 questionnaire*.ab,ti.
40
41 208 (realist adj3 (review* or research or synthesis)).ab,ti.
42
43 209 satisfaction.ab,ti.
44
45 210 self report*.ab,ti.
46
47 211 semantic analysis.ab,ti.
48
49 212 standpoint*.ab,ti.
50
51 213 (story or stories).ab,ti.
52
53 214 survey*.ab,ti.
54
55 215 (theme* or thematic).ab,ti.
56
57 216 (theoretical adj2 (sampl* or saturation)).ab,ti.
58
59 217 (thoughts or thinking).ab,ti.
60 218 ((video adj record*) or videorecord* or videotap*).ab,ti.
219 or/159-218 [** qualitative_experience]

1	220	"Costs and Cost Analysis"/
2		
3	221	Health Care Costs/
4		
5	222	Quality of Life Measures/
6		
7	223	Health Care Economics/
8		
9	224	(economic* adj4 (evaluat* or stud*)).ab,ti.
10		
11	225	(health economic* adj4 (evaluat* or stud*)).ab,ti.
12		
13	226	((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
14		
15	227	((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
16		
17	228	(CEA or CUA or CBA).ab,ti.
18		
19	229	((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
20		
21	230	(economic* adj4 (impact or value or factor* or analys*)).ab,ti.
22		
23	231	(cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.
24		
25	232	(decision adj1 (tree* or analy* or model*)).ab,ti.
26		
27	233	[economics.fs.]
28		
29	234	(qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
30		
31	235	(sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
32		
33		
34	236	(markov* or monte carlo*).ab,ti.
35		
36	237	or/220-236 [**cost effectiveness]
37		
38	238	Health Care Delivery/
39		
40	239	Health Care Administration/
41		
42	240	Health Promotion/
43		
44	241	Integrated Services/
45		
46	242	Interdisciplinary Treatment Approach/
47		
48	243	Case Management/
49		
50	244	(approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
51		
52	245	barrier*.ab,ti.
53		
54	246	facilitator*.ab,ti.
55		
56	247	((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
57		
58	248	implement*.ab,ti.
59		
60		

- 1 249 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
- 2
- 3 250 (model* adj care).ab,ti.
- 4
- 5 251 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or intervention* or
- 6 model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or success* or constrain* or
- 7 difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or promot* or restrain* or restrict* or
- 8 disincentive* or factor* or capacity or enabler*)).ab,ti.
- 9
- 10
- 11 252 (pathway* adj3 (clinical or care)).ab,ti.
- 12
- 13 253 (program* adj3 (assess* or evaluat*)).ab,ti.
- 14
- 15 254 or/238-253 [**implementation]
- 16
- 17 255 11 and 30 and 144
- 18
- 19 256 limit 255 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 20 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 21 adolescence <age 13 to 17 yrs>))
- 22
- 23 257 255 and (158 or 219 or 237 or 254)
- 24
- 25 258 limit 257 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 26 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 27 adolescence <age 13 to 17 yrs>))
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Additional file 3: Risk of bias assessment according to study design

Quantitative studies (SIGN checklists)		
Randomized controlled trials	Cohort studies	Case-control studies
1. The study addresses an appropriate and clearly focused question.	1. The study addresses an appropriate and clearly focused question.	1. The study addresses an appropriate and clearly focused question.
2. The assignment of subjects to treatment groups is randomised.	2. The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.	2. The cases and controls are taken from comparable populations.
3. An adequate concealment method is used.	3. The study indicates how many of the people asked to take part did so, in each of the groups being studied.	3. The same exclusion criteria are used for both cases and controls.
4. The design keeps subjects and investigators 'blind' about treatment allocation.	4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.	4. What percentage of each group (cases and controls) participated in the study?
5. The treatment and control groups are similar at the start of the trial.	5. What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed.	5. Comparison is made between participants and non-participants to establish their similarities or differences.
6. The only difference between groups is the treatment under investigation.	6. Comparison is made between full participants and those lost to follow up, by exposure status.	6. Cases are clearly defined and differentiated from controls.
7. All relevant outcomes are measured in a standard, valid and reliable way.	7. The outcomes are clearly defined.	7. It is clearly established that controls are non-cases
8. What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	8. The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable.	8. Measures will have been taken to prevent knowledge of primary exposure influencing case ascertainment
9. All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	9. Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome.	9. Exposure status is measured in a standard, valid and reliable way
10. Where the study is carried out at more than one site, results are comparable for all sites.	10. The method of assessment of exposure is reliable.	10. The main potential confounders are identified and taken into account in the design and analysis
	11. Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable.	11. Confidence intervals are provided
	12. Exposure level or prognostic factor is assessed more than once.	
	13. The main potential confounders are identified and taken into account in the design and analysis.	

	14. Have confidence intervals been provided?	
Mixed methods studies (MMAT)		
Qualitative:		
1. Is the qualitative approach appropriate to answer the research question?		
2. Are the qualitative data collection methods adequate to address the research question?		
3. Are the findings adequately derived from the data?		
4. Is the interpretation of results sufficiently substantiated by data?		
5. Is there coherence between qualitative data sources, collection, analysis and interpretation?		
Quantitative randomized controlled trials:		
1. Is randomization appropriately performed?		
2. Are the groups comparable at baseline?		
3. Are there complete outcome data?		
4. Are outcome assessors blinded to the intervention provided?		
5. Did the participants adhere to the assigned intervention?		
Quantitative non-randomized:		
1. Are the participants representative of the target population?		
2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?		
3. Are there complete outcome data?		
4. Are the confounders accounted for in the design and analysis?		
5. During the study period, is the intervention administered (or exposure occurred) as intended?		
Quantitative descriptive:		
1. Is the sampling strategy relevant to address the research question?		
2. Is the sample representative of the target population?		
3. Are the measurements appropriate?		
4. Is the risk of nonresponse bias low?		
5. Is the statistical analysis appropriate to answer the research question?		
Mixed methods:		
1. Is there adequate rationale for using a mixed methods design to address the research question?		
2. Are the different components of the study effectively integrated to answer the research question?		
3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?		
4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?		
5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?		
Qualitative studies (JBI)		
1. Is there congruity between the stated philosophical perspective and the research methodology?		
2. Is there congruity between the research methodology and the research question or objectives?		
3. Is there congruity between the research methodology and the methods used to collect data?		
4. Is there congruity between the research methodology and the representation and analysis of data?		
5. Is there congruity between the research methodology and the interpretation of results?		
6. Is there a statement locating the researcher culturally or theoretically?		
7. Is the influence of the researcher on the research, and vice-versa, addressed?		
8. Are participants, and their voices, adequately represented?		
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?		
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?		
Economic evaluations (Drummond checklist)		
1. Was a well-defined question posed in an answerable form?		
2. Was a comprehensive description of the competing alternatives given?		
3. Was the effectiveness of the programmes or services established?		
4. Were all the important and relevant costs and consequences for each alternative identified?		
5. Were cost and effects measured accurately in appropriate physical units (e.g., QALYs)?		
6. Were costs and effects valued credibly?		
7. Were cost and effects adjusted for differential timing?		
8. Was an incremental analysis of cost and effects of alternatives performed?		

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|---|
| 9. Were allowances made for uncertainty in the estimates of cost and effects?
10. Did the presentation and discussion of study results include all issues of concern to users? |
|---|

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Drummond checklist: (Drummond M et al. Methods for the economic evaluation of health care programmes. Oxford: Oxford University Press, 2015). **JBI checklist:** Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research (JBI Manual for Evidence Synthesis. Appendix 2.1: <https://wiki.joannabriggs.org/display/MANUAL/Appendix+2.1%3A+JBI+Critical+Appraisal+Checklist+for+Qualitative+Research>). **MMAT:** Mixed Methods Appraisal Tool, version 18 (Hong QN, Pluye P, Fàbreques S, Bartlett G, Boardman F, Cargo M, Dagenais P, Gagnon M-P, Griffiths F, Nicolau B, O’Cathain A, Rousseau M-C, Vedel I. Mixed Methods Appraisal Tool (MMAT), version 2018. Registration of Copyright (#1148552, Canadian Intellectual Property Office, Industry Canada). **SIGN checklists:** Scottish Intercollegiate Guidelines Network checklists <https://www.sign.ac.uk/checklists-and-notes>

BMJ Open

Rehabilitative management of back pain in children: Protocol for a mixed studies systematic review

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1
2
3 1 **Title:** Rehabilitative management of back pain in children: Protocol for a mixed studies

4
5 2 systematic review

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48 ABSTRACT

49 **Introduction:** Little is known about effective, efficient and acceptable management of back pain
50 in children. A comprehensive and updated evidence synthesis can help to inform clinical
51 practice.

52 **Objective:** To inform clinical practice, we aim to conduct a systematic review of the literature
53 and synthesize the evidence regarding effective, cost-effective and safe rehabilitation
54 interventions for children with back pain to improve their functioning and other health outcomes.

55 **Methods and analysis:** We will search MEDLINE, Embase, PsycINFO, CINAHL, the Index to
56 Chiropractic Literature, the Cochrane Controlled Register of Trials, and EconLit for primary
57 studies published from inception in all languages. We will include quantitative studies
58 (randomized controlled trials, cohort and case-control studies), qualitative studies, mixed
59 methods studies, and full economic evaluations. To augment our search of the bibliographic
60 electronic databases, we will search reference lists of included studies and relevant systematic
61 reviews, the WHO International Clinical Trials Registry Platform, and consult with content
62 experts. We will assess risk of bias using appropriate critical appraisal tools. We will extract data
63 about study and participant characteristics, intervention type and comparators, context and
64 setting, outcomes, themes and methodological quality assessment. We will use a sequential
65 approach at the review level to integrate data from the quantitative, qualitative and economic
66 evidence syntheses.

67 **Ethics and dissemination:** Ethics approval is not required. We will disseminate findings
68 through activities including: (1) presentations in national and international conferences; (2)
69 meetings with national and international decision makers; (3) publications in peer-reviewed
70 journals; and (4) posts on organizational websites and social media.

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3 71 **Systematic review registration number:** PROSPERO CRD42019135009
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5 72 **Key words:** systematic review, back pain, child, adolescent
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10 74 **Article Summary**

11
12 75 Strengths and limitations of this study
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- 14
15 76 • A systematic review integrating quantitative, qualitative and economic evidence to
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17 77 examine the rehabilitative management of back pain in children.
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19 78 • Includes studies with a broad range of rehabilitation interventions as described by the
20
21 79 World Health Organization (WHO), and outcomes as described by the International
22
23 80 Classification of Functioning, Disability and Health (ICF) framework.
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25 81 • Implements the Preferred Reporting Items for Systematic Review and Meta-Analysis
26
27 82 Protocols guidelines.
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29 83 • There is no language restriction in articles.
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31 84 • Our search strategies, while comprehensive, may miss relevant studies.
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36 85 **Word count:** 4,973
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94 INTRODUCTION

95 Rationale

96 A significant proportion of children over 10 years of age suffer from back pain.¹⁻⁵ The
97 prevalence of back pain in children ranges between 4% and 74%; the wide range is due to
98 heterogeneous populations studied, outcome measurements and methodologies used.^{6,7} Data
99 from the World Health Organization (WHO) Global Burden of Disease study in 2017 shows that
100 low back pain is the leading cause of global years lived with disability.⁸ Back pain begins early
101 in life with physical, mental and social consequences (e.g., impact on school-related and sporting
102 activities, general physical activity and well-being) that extend into adulthood.⁹⁻¹¹ Most episodes
103 of spinal pain are brief; however, in a three-year prospective cohort study of 1,465 school
104 children in Denmark, up to 25% of children had three or more episodes over one year, and
105 approximately 13% of children reported episodes lasting five or more weeks.¹²

106
107 Two recent systematic reviews assessed the effectiveness of manual therapy to treat a number of
108 conditions including back pain in children, but low-quality evidence precludes drawing
109 conclusions.^{13,14} A previous systematic review and meta-analysis which evaluated the
110 effectiveness of conservative interventions for low back pain in children under 18 years of age
111 reported that exercise interventions may be promising for improving pain scores in children
112 compared to no treatment; however, the evidence was very limited and of low-quality.¹⁵ This
113 evidence also needs updating. Additionally, to our knowledge, no integrative systematic review –
114 one that incorporates both quantitative and qualitative studies – has been conducted regarding the
115 rehabilitative management of back pain in children. Compared to traditional systematic reviews
116 of quantitative studies, combining evidence of the effectiveness and efficiency of interventions

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3 117 with qualitative understanding from people's lived experiences can better inform clinical practice
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5 118 guidelines and policy.¹⁶
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10 120 This comprehensive knowledge synthesis can inform clinical practice for decision makers
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12 121 involved with caring for children with back pain including healthcare professionals in a variety
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14 122 of clinical, rehabilitation or community settings (e.g., physicians, nurses, physiotherapists,
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16 123 chiropractors, psychologists, occupational therapists, registered massage therapists). Moreover,
17
18 124 the knowledge gaps that we identify can inform future research agendas.
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24 126 **Objectives**

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26 127 To support clinical practice for children with back pain, we aim to conduct an integrative
27
28 128 systematic review of quantitative, qualitative and economic evidence regarding the rehabilitative
29
30 129 management of back pain (including mid-back and low back pain) in children aged 19 years and
31
32 130 under. Our review will address the following questions:
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- 35 131 1) What is the effectiveness and safety of rehabilitation interventions for improving
36
37 132 functioning and other health outcomes in children with back pain?
38
39 133 2) What are the patients', caregivers' and providers' experiences, preferences, expectations
40
41 134 and valued outcomes regarding rehabilitation interventions for back pain?
42
43 135 3) What is the cost-effectiveness of rehabilitation interventions for improving functioning
44
45 136 and other health outcomes in children with back pain?
46
47 137 4) What can be hypothesized from the integration of the quantitative, qualitative and
48
49 138 economic evidence about the effectiveness, cost-effectiveness and safety of rehabilitation
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51 139 interventions for low back pain in children?
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3 140 We are targeting decision makers (clinicians, health managers/administrators, policy makers,
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5 141 patients, and caregivers) involved in implementing, delivering or receiving rehabilitation
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7 142 interventions or programs of care. We aim to provide them with knowledge regarding effective,
8
9 143 acceptable and positively experienced interventions for children with back pain and their
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11 144 caregivers.
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17 146 **METHODS**

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19 147 We developed this systematic review protocol using the Preferred Reporting Items for
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21 148 Systematic Reviews and Meta-Analyses for Protocols (PRISMA-P)¹⁷ (Additional file 1) and
22
23 149 using methods already reported in detail elsewhere.¹⁸ We registered our protocol on the
24
25 150 International Prospective Register of Systematic Reviews (PROSPERO) (registration #
26
27 151 CRD42019135009).¹⁹ We will report our systematic review according to the Preferred Reporting
28
29 152 Items for Systematic Reviews and Meta-Analyses (PRISMA) statement,²⁰ and the Enhancing
30
31 153 Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) reporting
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33 154 guideline.²¹
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40 156 **Eligibility criteria**

41 157 *Population*

42
43 158 We will target studies including children (aged 19 years or younger)²² with non-specific low
44
45 159 back or thoracic spine pain of any duration and severity. We define LBP as pain and discomfort
46
47 160 below the costal margin and above the inferior gluteal folds, with or without radiculopathy
48
49 161 (referred leg pain).²³ Radiculopathy refers to inflammation, injury/dysfunction, or compression
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51 162 of spinal nerve roots that can present as pain, weakness, or altered sensation in a myotomal or
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3 163 dermatomal distribution. Lumbar radiculopathy is commonly attributed to lumbar disc herniation
4
5 164 (localized displacement of disc material beyond the normal margins of the intervertebral disc
6
7
8 165 space).²⁴ We define thoracic spine pain as pain within the region bounded superiorly by the first
9
10 166 thoracic spinous process, inferiorly by the last thoracic spinous process, and laterally by the most
11
12 167 lateral margins of the erector spinae muscles.²⁵ We will include studies investigating diagnoses
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14 168 including low back pain, mid-back pain, mechanical back pain, lumbago, lumbar sprain or strain,
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16 169 back sprain or strain, lumbopelvic pain, lumbar radiculopathy, lumbar disc herniation, sacroiliac
17
18 170 syndrome, sciatica, dysplastic or isthmic spondylolisthesis or spondylolysis, musculoskeletal or
19
20 171 non-specific chest wall pain (pain referred to the chest wall from the thoracic spine).
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26 173 We will exclude studies of children with back pain attributed to major structural or systemic
27
28 174 pathology (e.g., fracture, acute traumatic or pathological spondylolisthesis or spondylolysis,
29
30 175 infection, tumour, osteoporosis, inflammatory arthritides, cauda equina syndrome,
31
32 176 neuromuscular disease, myelopathy, and scoliosis); (2) studies of children with back pain
33
34 177 attributed to a non-spine-related condition that might refer pain to the chest wall (e.g., heart, lung
35
36 178 or esophagus conditions); and (3) studies that target asymptomatic children at baseline and assess
37
38 179 interventions that aim to prevent the incidence of back pain.
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43 44 181 ***Intervention***

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46 182 We will include studies that investigate the effectiveness and safety of rehabilitation
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48 183 interventions or programs of care for children with back pain, including education and self-
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50 184 management strategies, exercise, manual therapies, passive physical modalities, acupuncture,
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52 185 pharmacological interventions, psychological interventions, environmental modifications,
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186 assistive devices, and complementary and alternative therapies (CAM). Interventions may be
187 delivered in any manner such as in-person, or remotely using technology such as telehealth. The
188 WHO defines rehabilitation as a set of interventions that assist individuals who experience, or
189 are likely to experience, disability to achieve and maintain optimal functioning when interacting
190 with their environments (as described in detail previously).^{18 26} Rehabilitation interventions
191 include rehabilitation medicine/therapy, which aims to: 1) improve function through the
192 diagnosis and treatment of health conditions, reducing impairments, preventing or treating
193 complications; and 2) restore and compensate loss of functioning, and prevent or slow
194 deterioration in functioning in every area of a person's life.²⁶ It may also include assistive
195 devices, which refers to any item, piece of equipment, or product used to increase, maintain, or
196 improve functional capabilities.²⁶ Various healthcare providers may provide interventions
197 including, but not limited to, general practitioners, nurses, physiotherapists, chiropractors,
198 occupational therapists, psychologists, and registered massage therapists (Table 1).¹⁸ We will
199 exclude studies assessing surgical interventions, and interventions solely conducted at the
200 societal level, such as barrier removal initiatives (e.g., fitting a ramp to a public building).

201

202 ***Comparison***

203 The quantitative component of this review will consider comparisons including other
204 interventions, placebo or sham interventions, wait list, standard care, and no intervention.

205

206 ***Outcomes***

207 Our primary outcome of interest is a child's functioning. Secondary health outcomes of interest
208 are pain (e.g., pain intensity, frequency, or duration), psychological outcomes (e.g., anxiety and

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3 209 depression), health-related quality of life, adverse events, qualitative outcomes, and economic
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5 210 outcomes (Table 2). We are interested in both short-term (<3 months) and long-term (≥3 months)
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8 211 outcomes. We selected these outcomes because they are important to children, their caregivers
9
10 212 and decision makers, and they are reflected in the WHO's framework for health and disability
11
12 213 (International Classification of Functioning, Disability and Health [ICF]) (as described in detail
13
14 214 previously).^{18 27} The ICF provides a standard language and framework for the description of
15
16 215 health and health-related states, and organizes information into two components – ‘body
17
18 216 functions and body structures’ and ‘activities and participation’.²⁷ Our primary outcome of
19
20 217 interest, functioning, aligns with the ‘activities and participation’ component of the ICF.
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22 218 Examples of *activities* include walking, running, jumping and lifting. *Participation* refers to
23
24 219 involvement in life situations such as with one's family, school and community. Common
25
26 220 methods to measure *functioning* include the Modified Oswestry Low Back Pain Disability
27
28 221 Questionnaire,²⁸ Roland Morris Disability Questionnaire (RMDQ),²⁹ return to school, and
29
30 222 participation in sports or other recreational activities. Pain and psychological outcomes fit within
31
32 223 the ‘body functions and body structures’ component of the ICF. Common methods to measure
33
34 224 *pain* include the Visual Analogue Scale (VAS),³⁰ Numerical Rating Scale (NRS),³¹ and Faces
35
36 225 Pain Scale – Revised.^{32 33} Common methods to measure *psychological outcomes* (e.g., anxiety
37
38 226 and depression) include Revised Child Anxiety and Depression Scale,³⁴ and State-Trait Anxiety
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40 227 Inventory for Children.³⁵ We will also assess *health-related quality of life*, which is not
41
42 228 definable in the ICF framework.³⁶ It is commonly measured with the KIDSCREEN-52,³⁷
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44 229 Pediatric Quality of Life Inventory,³⁸ and PROMIS Pediatric Self Report Scale.³⁹ We defined
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46 230 *adverse events or harms* as any unfavourable sign, symptom, or disease temporarily associated
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48 231 with the treatment, whether or not caused by the treatment.^{40 41} We will consider indirect harms
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232 (where the use of an intervention delays a diagnosis or treatment, and such delay holds a
233 potential harm),⁴² number of adverse events, severity of adverse events (i.e., mild, moderate or
234 severe), and number of participant withdrawals from the study due to adverse events. **Qualitative**
235 **outcomes** include the experiences, preferences, expectations, and valued outcomes (of children,
236 caregivers, and providers). Lastly, **economic outcomes** include direct costs (e.g., resources saved
237 by an intervention), indirect costs (e.g., time freed by an intervention), economic health
238 outcomes (e.g., quality-adjusted life-year [QALY], incremental cost-effectiveness ratio [ICER],
239 net monetary benefit [NMB]), and intangible outcomes (e.g., pain or suffering saved by an
240 intervention).

241

242 **Types of studies**

243 We will include randomized controlled trials of any type (e.g., superiority, non-inferiority and
244 equivalence), cohort studies, case-control studies, and mixed-methods studies (quantitative
245 component) including any secondary analyses of eligible studies for question 1 (effectiveness
246 and safety of interventions); qualitative and mixed-methods studies (qualitative component) for
247 question 2 (users' experiences, preferences, expectations and valued outcomes of interventions);
248 and trial- and model-based full economic evaluations for question 3 (cost-effectiveness of
249 interventions) (Table 2).

250

251 We will exclude the following types of studies: cross-sectional studies, pilot studies assessing
252 feasibility, protocol studies, case reports, case series, studies assessing only prevention of back
253 pain and incidence outcomes, systematic reviews (although their reference lists will be searched
254 for potentially relevant studies) and other review papers, clinical practice guidelines,

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3 255 biomechanical studies, laboratory studies, cadaveric or animal studies, conceptual papers, letters,
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5 256 editorials, commentaries, books and book chapters, conference proceedings, meeting abstracts,
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7 257 lectures and addresses, consensus development statements, guideline statements, and studies
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10 258 reviewing solely partial economic evaluations (e.g., cost of illness studies).
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14 260 ***Context and setting***

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17 261 We will consider rehabilitation interventions/programs of care delivered in any healthcare
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19 262 system within an urban or rural area and in any healthcare setting (e.g., acute care, hospital,
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21 263 primary health care, rehabilitation clinics), or in the community (as described in detail
22
23 264 previously).¹⁸ Community-based rehabilitation is implemented through the combined efforts of
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25 265 individuals with disabilities, their families and communities, and relevant government and non-
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27 266 government health, education, social and other services (e.g., advocacy programme).⁴³
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31 268 **Information sources**

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35 269 We will develop the initial search strategy in MEDLINE, in consultation with an experienced
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37 270 health sciences librarian. A second experienced health sciences librarian will review the search
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39 271 strategy assessing its appropriateness and comprehensiveness using the Peer Review of
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41 272 Electronic Search Strategies (PRESS) Checklist.^{44 45} We will conduct electronic searches of the
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43 273 following databases from database inception to the present: MEDLINE (Ovid), Embase (Ovid),
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45 274 PsycINFO (Ovid), CINAHL (Cumulative Index to Nursing and Allied Health Literature,
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47 275 EBSCOhost), the Index to Chiropractic Literature (Chiropractic Library Collaboration), the
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49 276 Cochrane Controlled Register of Trials (Ovid), and EconLit (EBSCOhost). We will augment our
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51 277 search of the bibliographic electronic databases to identify additional relevant studies, and
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3 278 mitigate the potential impact of publication bias and selective outcome reporting bias.⁴⁶ We will
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5 279 search reference lists of included studies from the database searches and relevant systematic
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8 280 reviews; and we will consult with content experts. We will ask experts to suggest up to three
9
10 281 targeted websites that may contain relevant studies and other potentially relevant studies not
11
12 282 captured by our search strategy. Lastly, we will search the WHO International Clinical Trials
13
14 283 Registry Platform (<http://apps.who.int/trialsearch/>). For studies only reported in the registry, we
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16 284 will contact first authors by email (with two reminders over one month) to obtain full study
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18 285 reports, or additional study or outcome data. We will include studies in any language and will
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20 286 use professional medical translation services where required. If 12 or more months elapse
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22 287 between the search date and submission for publication, we will update the search.
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28 289 **Search strategy**

30 290 The searches will include a combination of subject headings specific to databases (e.g. MeSH in
31
32 291 MEDLINE) and free text words to capture the key concepts of rehabilitative management of
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34 292 back pain in children (Additional file 2).
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39 294 **Patient and public involvement**

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41 295 Patients were not involved in the design of our study. However, we will seek patient and public
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43 296 consultation during the development of clinical practice guidelines, which will be the next phase
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45 297 of this project.
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50 299 **Data management**

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3 300 We will download the electronic search results into Endnote X9 reference manager software
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5 301 (Clarivate Analytics, PA, USA). We will remove duplicates and upload the remaining references
6
7 302 to the Evidence for Policy and Practice Information and Coordinating (EPPI) Centre Reviewer
8
9 303 software for the data extraction stages (EPPI-Reviewer version 4, UCL Institute of Education,
10
11 304 University of London, UK). EPPI-Reviewer software stores references, manages and monitors
12
13 305 the data extraction process and provides an audit trail for the review.⁴⁷
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19 307 **Screening for eligibility**

20
21 308 Using the inclusion and exclusion criteria, pairs of reviewers will independently screen titles and
22
23 309 abstracts, and subsequently the full text of each selected article in order to confirm inclusion into
24
25 310 the study (as described in detail previously).¹⁸ Titles and abstracts will be classified as possibly
26
27 311 relevant or irrelevant. Subsequently, full-text articles of abstracts classified as possibly relevant
28
29 312 will be retrieved, reviewed and classified as relevant or irrelevant.
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35 314 We will conduct training exercises prior to initiating the screening process to ensure reliability
36
37 315 between reviewers. Reviewers will first screen a random sample of 50 records based on titles and
38
39 316 abstracts. Paired reviewers must reach 90% agreement before completing title and abstract
40
41 317 screening for the remaining studies.⁴⁸ If this threshold is not reached for all review teams, all
42
43 318 team members will discuss differences in classification to clarify and potentially modify the
44
45 319 eligibility criteria prior to completing title and abstract screening. Next, reviewers will screen a
46
47 320 random sample of 25 full-text articles. All paired reviewers must again reach 90% agreement
48
49 321 before completing full-text article screening for the remaining studies. If not, all team members
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51 322 will discuss to clarify eligibility criteria and resolve disagreements prior to completing full-text
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3 323 article screening. Upon completing full-text article screening, paired reviewers will discuss
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5 324 disagreements and reach consensus related to the inclusion of any article, involving a third
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7
8 325 reviewer if necessary.
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11 327 **Risk of bias in individual studies**

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14 328 We will critically appraise studies according to study design using appropriate checklists
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16 329 (Additional file 3) (as described in detail previously).¹⁸ We will assess the quality of studies
17
18
19 330 using the Scottish Intercollegiate Guidelines Network (SIGN) criteria for randomized controlled
20
21 331 trials (RCTs), cohort and case-control studies;⁴⁹ the Joanna Briggs Institute (JBI) Critical
22
23 332 Appraisal Checklist for qualitative studies;⁵⁰ the Mixed Methods Appraisal Tool (MMAT) for
24
25 333 mixed methods studies;⁵¹ and the Drummond checklist for economic evaluations.⁵² The SIGN
26
27 334 checklists allow reviewers to assess internal validity by considering the impact of selection bias,
28
29 335 information bias, and confounding on study results. The JBI checklist allows reviewers to assess
30
31 336 the possibility of bias in qualitative studies' design, conduct and analysis. The MMAT allows
32
33 337 reviewers to assess the interdependent qualitative and quantitative components of the study and
34
35 338 criteria to consider, such as justification for mixing evidence, and appropriate ways of integrating
36
37 339 the data. The Drummond checklist allows reviewers to identify elements that demonstrate a
38
39 340 sound economic evaluation such as the assessment of both costs and effects of interventions,
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41 341 accurate measurements of costs and effects, and allowances made for uncertainty in the estimates
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43 342 of costs and effects. We will contact the authors of papers to request missing or additional data
44
45 343 for clarification where required. Paired reviewers will independently assess the eligible studies
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47 344 for quality. Any disagreements that arise between the reviewers will be resolved through
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49 345 discussion, or with a third reviewer. Since some of the reviewers have published within this area,
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3 346 the review coordinator will ensure that reviewers will not be assigned their own studies for risk
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5 347 of bias assessment. Additionally, reviewers will reclude themselves from any discussion and
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7 348 decision-making that involves their paper. We will clearly describe this in our final systematic
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9
10 349 review report.

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14 351 Using these established checklists and notes to guide our assessment, we will categorize the
15
16 352 validity or credibility of each study as either high, low, or unclear risk of bias. We will not use a
17
18 353 quantitative cut-off score to determine study quality and will not pre-define weights for the
19
20 354 checklist items. Rather, we will make an overall quality judgement by considering the impact of
21
22 355 selection bias, information bias and confounding on study results throughout the conduct of each
23
24 356 study.⁵³ We will report detailed results of the critical appraisal in a narrative form and in a ‘risk
25
26 357 of bias’ table. All studies, regardless of their methodological quality, will be extracted and
27
28 358 synthesized (where possible). The overall methodological quality of relevant studies will be
29
30 359 considered in the individual synthesis of quantitative, qualitative and economic data and the
31
32 360 integration of these findings. The results of the risk of bias assessment will be used in a
33
34 361 sensitivity analysis to ensure that studies judged to be at ‘high risk of bias’ do not affect the
35
36 362 robustness of our results.

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40 364 **Data items and data extraction process**
41
42 365 Paired reviewers will independently extract the data from all eligible studies. For the quantitative
43
44 366 studies, we will extract data on the study and participant characteristics; intervention and
45
46 367 comparator intervention characteristics using the Template for Intervention Description and
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48 368 Replication (TIDieR) checklist;⁵⁴ all pre-determined outcomes including multiple measures if
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3 369 used; key findings; and methodological quality. The TIDieR checklist⁵⁴ consists of items to help
4
5 370 readers better understand the interventions and how they were delivered (i.e., name of
6
7 371 intervention, why, what (materials), what (procedure), who provided, how, where, when and how
8
9 372 much, tailoring, modifications, how well (planned), how well (actual)).⁵⁴ We will use the
10
11 373 PerSPecTIF question formulation framework to guide data extraction for the qualitative studies
12
13 374 regarding the items: perspective, setting, phenomenon of interest, environment, timing, and
14
15 375 findings (e.g., themes).⁵⁵ We will also extract data describing the qualitative approach used and
16
17 376 methodological quality of studies. For both quantitative and qualitative studies, we will extract
18
19 377 data on the ICF categories ‘environmental factors’ (contextual factors that make up the physical,
20
21 378 social and attitudinal environment in which people live and conduct their lives) and ‘personal
22
23 379 factors’ (internal contextual factors that influence how disability is experienced by the
24
25 380 individual) to add context to the interventions and outcomes.²⁷ For the economic evaluations, we
26
27 381 will use the Consolidated Health Economic Evaluation Reporting Standards (CHEERS)
28
29 382 statement⁵⁶ and extract data on the analytic approach (trial- or model-based), evaluation type, the
30
31 383 analytic perspective, time horizon adopted for costs, main cost items, setting, key findings, and
32
33 384 methodological quality of studies.
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42 386 Paired reviewers will pretest the data extraction form and revise as needed. We will use EPPI-
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44 387 Reviewer software to manage the data extraction process. Any disagreements that arise between
45
46 388 the reviewers will be resolved through discussion, or with a third reviewer. We will contact
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48 389 authors of papers to request missing or additional data, if required.
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53 391 **DATA SYNTHESIS**

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3 392 We will use a sequential approach at the review level to synthesize and integrate the data (as
4
5 393 described in detail previously).^{57 18}This will involve separate quantitative, economic, and
6
7 394 qualitative findings synthesis followed by integration of the resultant quantitative, economic, and
8
9 395 qualitative evidence.
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12 396

13 14 397 *Quantitative synthesis*

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17 398 We will stratify studies to conduct separate comparisons according to study design, population,
18
19 399 intervention, comparison, outcome, and methodological quality, and further conduct subgroup
20
21 400 analyses within categories (Table 3). Specifically, we will stratify results to conduct separate
22
23 401 comparisons between RCTs versus non-RCTs targeting, for example, children with acute low
24
25 402 back pain without radiculopathy, treated with a specific intervention (e.g., manual therapy)
26
27 403 compared to an active comparison, and assessed by the mean difference in functioning score
28
29 404 (e.g., ODI score) at 3 months.
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35 406 We will assess clinical, methodological, and statistical heterogeneity among studies (as described
36
37 407 in detail previously).¹⁸ Differences in populations, interventions, comparators, or outcomes
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39 408 across studies may result in clinical heterogeneity. Methodological and statistical heterogeneity
40
41 409 may result from differences in risk of bias and differences in outcomes across studies beyond
42
43 410 what could be expected by chance alone. We will assess the methodological heterogeneity across
44
45 411 studies using our assessments from the SIGN checklist as either high, low, or unclear risk of
46
47 412 bias. We will assess statistical heterogeneity using the I^2 statistic, whereby I^2 of <25-50% will be
48
49 413 considered low to moderate (homogeneous), and $\geq 50\%$ considered high (heterogeneous).⁵⁸ If
50
51 414 two or more studies are clinically homogeneous (i.e., similar populations, interventions,
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3 415 comparators and outcomes) and statistically homogeneous (i.e., $I^2 < 25-50\%$), we will perform a
4
5 416 random effects meta-analysis using EPPI-Reviewer software using the relative risk (or odds ratio
6
7 417 for rare events) effect measure for dichotomous data, mean differences for continuous data,
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9 418 hazard rate ratios for time-to-event data, and rates or rate ratios for count data. For studies that
10
11 419 used multiple measures to assess the same outcome and at multiple time points, we will select
12
13 420 the most prevalent measure and time point used across the studies to maximize comparability of
14
15 421 the findings. We will attempt to summarize the results in a similar way if possible. We will
16
17 422 contact study investigators to obtain the data if it is not reported. If the data are unavailable, we
18
19 423 will summarize the data in three ways: by entering the means as continuous outcomes, the counts
20
21 424 as dichotomous outcomes and by entering all of the data in text form as 'other data' outcomes.⁵⁹
22
23 425 We may also use statistical approaches to re-express odds ratios as standardized mean
24
25 426 differences (and vice versa), allowing us to combine dichotomous and continuous data.⁵⁹ For our
26
27 427 primary analysis, we will analyze the studies with low and unclear risk of bias. We will then
28
29 428 explore the impact of methodological heterogeneity through sensitivity analysis by analyzing all
30
31 429 studies together, including those with a high risk of bias, and comparing our primary analysis
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33 430 with our sensitivity analysis. If the results of the primary and sensitivity analyses differ, we will
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35 431 give precedence to the primary analysis because high risk of bias studies are known to be at risk
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37 432 of overestimating effect sizes.⁶⁰
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46 434 If the studies are heterogeneous (i.e., if there is clinical, methodological, and statistical
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48 435 heterogeneity), we will narratively summarize the characteristics and findings of all eligible
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50 436 studies according to the Synthesis Without Meta-analysis (SWiM) reporting guideline.⁶¹ To
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52 437 quantify the effectiveness of interventions, we will use the data provided in the studies to
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3 438 compute effect measures and 95% confidence intervals (i.e., odds ratio or relative risk for
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5 439 dichotomous outcomes, mean differences for continuous outcomes, hazard rate ratios for time-
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7 440 to-event outcomes, and rates or rate ratios for count outcomes).⁶²
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12 442 We will assess the potential impact of reporting biases on the results of our review or meta-
13
14 443 analysis by attempting to identify study protocols through the trials registry (WHO International
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16 444 Clinical Trials Registry Platform <http://apps.who.int/trialsearch/>), and through the use of funnel
17
18 445 plots. After studies are stratified (Table 3), outcomes that are reported in at least 10 studies will
19
20 446 be assessed for publication bias by visually inspecting funnel plots for asymmetry.^{63 64}
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25
26 448 We will interpret the quality of the evidence for each outcome according to GRADE.⁶⁵ The
27
28 449 quality of evidence ratings are *very low* (i.e., the true effect is probably markedly different from
29
30 450 the estimated effect), *low* (i.e., the true effect might be markedly different from the estimated
31
32 451 effect), *moderate* (i.e., the true effect is probably close to the estimated effect), and *high* (highly
33
34 452 confident that the true effect is similar to the estimated effect). Assessment of the quality of the
35
36 453 evidence is determined by considering the risk of bias, inconsistency, indirectness, imprecision
37
38 454 and publication bias.. We will use established minimal clinically important differences (MCID)
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40 455 to determine the clinical importance of effect sizes when possible. Similar to any meta-analysis
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42 456 we may conduct, we will give precedence to the primary analysis consisting of studies with low
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44 457 and unclear risk of bias.
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51 459 ***Economic synthesis***
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3 460 We will report the main findings of economic studies, first stratified by high, low or unclear risk
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5 461 of bias. We will further stratify findings by study design (i.e., cost-effectiveness, cost-utility,
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7 462 cost-benefit, or cost-consequences). We will then stratify findings by type of intervention,
8
9 463 outcome, and cost measure.

10 464
11
12 465 To indicate whether an intervention might be judged favourably (or unfavourably) from an
13
14 466 economic perspective,⁶⁶ we will use the Dominance Ranking Matrix (DRM) to classify the
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16 467 interventions into one of three options.⁶⁷ *Strong dominance* for the intervention will be selected
17
18 468 when the incremental cost-effectiveness measure shows the intervention as: (i) more effective
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20 469 and less costly than the comparator; or (ii) effective and less costly; or (iii) equal cost and more
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22 470 effective. In this case, from an efficiency perspective, decision makers should favor the
23
24 471 intervention over the comparator (in circumstances similar to those of the evaluations). *Weak*
25
26 472 *dominance* for the intervention will be selected when the measure shows the interventions as: (i)
27
28 473 equally costly and effective as the comparator; or (ii) more effective and more costly; or (iii) less
29
30 474 effective and less costly. In this case, no conclusion may be drawn about whether the
31
32 475 intervention is preferable from an efficiency perspective without further information on the
33
34 476 priorities or preferences of decision makers in a particular context. Decision makers must
35
36 477 determine whether the cost/benefit trade-offs are worth the implementing an intervention in their
37
38 478 particular context. Lastly, *non-dominance* for the intervention will be selected when the measure
39
40 479 shows the intervention as: (i) more costly and less effective; or (ii) equally as costly and less
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42 480 effective; or (iii) more costly and as effective. In this case the evidence we will interpret the
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44 481 evidence as suggesting the comparator is favourable from an efficiency perspective (in
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46 482 circumstances similar to those of the evaluations).

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5 484 ***Qualitative synthesis***
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8 485 We will stratify the qualitative findings similarly to the quantitative and economic findings. We
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10 486 will first stratify the findings by risk of bias (i.e., high/low/unclear), then by study approach or
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12 487 design (e.g., qualitative descriptive, ethnography, grounded theory), and by intervention type and
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14 488 outcome.

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19 490 Additionally, we will stratify findings according to individual perspective (i.e., patient (children),
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21 491 caregivers (parents/guardians), healthcare providers, community service providers, or others
22
23 492 involved with the rehabilitation of back pain in children). We will use thematic synthesis to
24
25 493 synthesize the qualitative research findings.^{68 69} First, we will enter all the text labelled as
26
27 494 ‘results’ or ‘findings’ of the primary studies verbatim into EPPI-Reviewer. Then, pairs of trained
28
29 495 reviewers will independently code each line of text according to its meaning and content, and
30
31 496 group codes hierarchically into descriptive themes, including the *a priori* themes (intervention
32
33 497 type and outcomes). Reviewers will also generate themes *a posteriori* to answer our review
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35 498 question (i.e., experiences, preferences, expectations and valued outcomes regarding
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37 499 rehabilitation interventions for back pain in children). Reviewers will finalize the themes through
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39 500 discussion. We will give precedence to studies with low or unclear risk of bias.⁷⁰
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501 502 ***Integration of quantitative, qualitative and economic evidence***

503 Various methods can be used to integrate diverse study types including: (1) juxtaposing findings
504 in a matrix, (2) using logic models/conceptual framework, (3) analyzing program theory, (4)
505 testing hypothesis derived using subgroup analysis, and (5) qualitative comparative analysis.⁵⁷

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3 506 We will integrate the evidence by juxtaposing findings in a matrix to generate hypotheses
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5 507 regarding the effectiveness, cost-effectiveness and safety of rehabilitation interventions for back
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7 508 pain in children. We selected this methodology because it is suitable for comparing and
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10 509 contrasting the findings across the individual quantitative, qualitative and economic evidence
11
12 510 syntheses in our review.⁵⁷ The use of a matrix will allow us to explore heterogeneity in the
13
14 511 findings of the quantitative studies and may indicate why some interventions may be effective,
15
16 512 cost-effective and safe, and some may not.⁵⁷ For example, we may list themes from the
17
18 513 qualitative synthesis along one side of the matrix, and then plot the interventions evaluated in the
19
20 514 quantitative synthesis against the themes as either a match (when the intervention matched a
21
22 515 theme) or a mismatch (when the intervention was the opposite of a theme) (as described in detail
23
24 516 previously).¹⁸ We will also plot the economic evaluation findings against the corresponding
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26 517 intervention and theme. We will identify gaps in knowledge if a particular theme for an
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28 518 intervention does not match with any of the interventions evaluated in the quantitative studies.
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35 520 **ETHICS AND DISSEMINATION**

37 521 Ethics approval is not required for this mixed studies review. Knowledge translation activities
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39 522 will include presentations to clinicians and researchers at national and international conferences;
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41 523 meetings with national and international decision makers (clinicians, health
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43 524 managers/administrators, policy makers and patients); publications in peer-reviewed journals;
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45 525 clinician and patient/caregiver resources; posts and lay language summaries on organizations'
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47 526 websites (open access) and other social media platforms.
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53 528 **DISCUSSION**

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3 529 Findings from this mixed studies review will advance our knowledge of the effectiveness, safety,
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5 530 user experience, and cost-effectiveness of a wide range of rehabilitation interventions for
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7 531 children with back pain. This work will provide the evidentiary basis to develop clinical practice
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9 532 guidelines and care pathways outlining the evidence-based management of back pain in children,
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11 533 which can be adapted for specific settings (e.g., hospitals, rehabilitation clinics, and schools) and
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13 534 geographical regions. Specifically, decision makers should consider interventions that are
14
15 535 identified as effective, safe, efficient, and positively experienced by patients and caregivers.
16
17 536 Mapping findings to the ICF framework will allow decision makers to use standardized language
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19 537 in the assessment and management of children during their care program. This may further
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21 538 facilitate improvements in functioning and health outcomes in this patient population.
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28 540 A potential limitation of our review is that our search strategy may miss potentially relevant
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30 541 studies, however, we have mitigated this by expanding our search strategy to include content
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32 542 experts and searching relevant websites. A potential risk is that there may be too little evidence
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34 543 available to answer our review questions.
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40 545 Findings from this review will guide future research by identifying methodological limitations
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42 546 and knowledge gaps in the available literature. Future studies can be designed to address these
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44 547 limitations and gaps. This novel interpretation of quantitative, qualitative and economic evidence
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46 548 according to the ICF framework serves as a model for how outcomes related to functioning and
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48 549 health can be prioritized in future research.
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3 552 **ADDITIONAL FILES**
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5 553 Additional file 1: PRISMA-P 2015 Checklist. Preferred Reporting Items for Systematic Review

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8 554 and Meta-Analysis Protocols (PRISMA-P) 2015 statement

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10 555 Additional file 2: Literature search strategies

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12 556 Additional file 3: Risk of bias assessment

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17 558 **DECLARATIONS**
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21 560 **Ethics approval and consent to participate:** Not applicable

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26 562 **Consent for publication:** Not applicable

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30 564 **Availability of data and materials:** Not applicable

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35 566 **Competing interests:** None declared.

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39
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41
42 569 funding organization was not involved in the design or conduct of this systematic review

43
44 570 protocol.

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48
49 572 **Author contributions:**

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51 573 All authors (CC, JJW, HY, SM, GB, HMS, DR, LH, EP, CC, MS, GC, LV, ATV, PC) assisted in

52
53 574 designing and planning the study, developing the research questions and systematic review

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2
3 575 methodology. CC and JJW drafted the manuscript. All authors reviewed and revised the
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5 576 manuscript, and approved the final manuscript.
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19
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24 585 Faculty of Health Sciences at Ontario Tech University.
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587 **REFERENCES**

- 588 1. Joergensen AC, Hestbaek L, Andersen PK, et al. Epidemiology of spinal pain in children: a
589 study within the Danish National Birth Cohort. *Eur J Pediatr* 2019;178(5):695-706. doi:
590 10.1007/s00431-019-03326-7 [published Online First: 2019/02/23]
- 591 2. Aartun E, Hartvigsen J, Wedderkopp N, et al. Spinal pain in adolescents: prevalence,
592 incidence, and course: a school-based two-year prospective cohort study in 1,300 Danes
593 aged 11-13. *BMC Musculoskelet Disord* 2014;15:187. doi: 10.1186/1471-2474-15-187
594 [published Online First: 2014/06/03]
- 595 3. Beynon AM, Hebert JJ, Lebouef-Yde C, et al. Potential risk factors and triggers for back pain
596 in children and young adults. A scoping review, part I: incident and episodic back pain.
597 *Chiropr Man Therap* 2019;27:58. doi: 10.1186/s12998-019-0280-9 [published Online
598 First: 2019/12/13]
- 599 4. Kamper SJ, Yamato TP, Williams CM. The prevalence, risk factors, prognosis and treatment
600 for back pain in children and adolescents: An overview of systematic reviews. *Best Pract*
601 *Res Clin Rheumatol* 2016;30(6):1021-36. doi: 10.1016/j.berh.2017.04.003 [published
602 Online First: 2017/11/07]
- 603 5. Calvo-Munoz I, Gomez-Conesa A, Sanchez-Meca J. Prevalence of low back pain in children
604 and adolescents: a meta-analysis. *BMC Pediatr* 2013;13:14. doi: 10.1186/1471-2431-13-
605 14 [published Online First: 2013/01/29]
- 606 6. King S, Chambers CT, Huguet A, et al. The epidemiology of chronic pain in children and
607 adolescents revisited: a systematic review. *Pain* 2011;152(12):2729-38. doi:
608 10.1016/j.pain.2011.07.016 [published Online First: 2011/11/15]

- 1
2
3 609 7. Jeffries LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain: a
4
5 610 systematic overview of the research literature. *Spine (Phila Pa 1976)* 2007;32(23):2630-
6
7 611 7. doi: 10.1097/BRS.0b013e318158d70b [published Online First: 2007/11/06]
8
9
10 612 8. Disease GBD, Injury I, Prevalence C. Global, regional, and national incidence, prevalence,
11
12 613 and years lived with disability for 354 diseases and injuries for 195 countries and
13
14 614 territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study
15
16 615 2017. *Lancet* 2018;392(10159):1789-858. doi: 10.1016/S0140-6736(18)32279-7
17
18 616 [published Online First: 2018/11/30]
19
20
21 617 9. Batley S, Aartun E, Boyle E, et al. The association between psychological and social factors
22
23 618 and spinal pain in adolescents. *Eur J Pediatr* 2019;178(3):275-86. doi: 10.1007/s00431-
24
25 619 018-3291-y [published Online First: 2018/11/23]
26
27
28 620 10. Kamper SJ, Henschke N, Hestbaek L, et al. Musculoskeletal pain in children and adolescents.
29
30 621 *Braz J Phys Ther* 2016;20(3):275-84. doi: 10.1590/bjpt-rbf.2014.0149 [published Online
31
32 622 First: 2016/07/22]
33
34
35 623 11. Stallknecht SE, Strandberg-Larsen K, Hestbaek L, et al. Spinal pain and co-occurrence with
36
37 624 stress and general well-being among young adolescents: a study within the Danish
38
39 625 National Birth Cohort. *Eur J Pediatr* 2017;176(6):807-14. doi: 10.1007/s00431-017-
40
41 626 2915-y [published Online First: 2017/05/05]
42
43
44 627 12. Dissing KB, Hestbaek L, Hartvigsen J, et al. Spinal pain in Danish school children - how
45
46 628 often and how long? The CHAMPS Study-DK. *BMC Musculoskelet Disord*
47
48 629 2017;18(1):67. doi: 10.1186/s12891-017-1424-5 [published Online First: 2017/03/28]
49
50
51 630 13. Driehuis F, Hoogeboom TJ, Nijhuis-van der Sanden MWG, et al. Spinal manual therapy in
52
53 631 infants, children and adolescents: A systematic review and meta-analysis on treatment
54
55
56
57
58
59
60

- 1
2
3 632 indication, technique and outcomes. *PLoS One* 2019;14(6):e0218940. doi:
4
5 633 10.1371/journal.pone.0218940 [published Online First: 2019/06/27]
6
7
8 634 14. Parnell Prevost C, Gleberzon B, Carleo B, et al. Manual therapy for the pediatric population:
9
10 635 a systematic review. *BMC Complement Altern Med* 2019;19(1):60. doi: 10.1186/s12906-
11
12 636 019-2447-2 [published Online First: 2019/03/15]
13
14
15 637 15. Michaleff ZA, Kamper SJ, Maher CG, et al. Low back pain in children and adolescents: a
16
17 638 systematic review and meta-analysis evaluating the effectiveness of conservative
18
19 639 interventions. *Eur Spine J* 2014;23(10):2046-58. doi: 10.1007/s00586-014-3461-1
20
21 640 [published Online First: 2014/07/30]
22
23
24 641 16. Harden A, Thomas J. Methodological issues in combining diverse study types in systematic
25
26 642 reviews. *International Journal of Social Research Methodology* 2005;8(3):257-71.
27
28
29 643 17. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and
30
31 644 meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews* 2015;4:1. doi:
32
33 645 10.1186/2046-4053-4-1 [published Online First: 2015/01/03]
34
35
36 646 18. Cancelliere C, Wong JJ, Yu H, et al. Postsurgical rehabilitation for adults with low back pain
37
38 647 with or without radiculopathy who were treated surgically: protocol for a mixed studies
39
40 648 systematic review. *BMJ open* 2020;10(3):e036817. doi: 10.1136/bmjopen-2020-036817
41
42 649 [published Online First: 2020/04/02]
43
44
45 650 19. National Institute for Health Research. International prospective register of systematic
46
47 651 reviews (PROSPERO). Available at: <https://www.crd.york.ac.uk/prospere/> (accessed Jan
48
49 652 10, 2019).
50
51
52 653 20. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and
53
54 654 meta-analyses: the PRISMA statement. *Journal of clinical epidemiology*
55
56
57
58
59
60

- 1
2
3 655 2009;62(10):1006-12. doi: 10.1016/j.jclinepi.2009.06.005 [published Online First:
4
5 656 2009/07/28]
6
7
8 657 21. Tong A, Flemming K, McInnes E, et al. Enhancing transparency in reporting the synthesis of
9
10 658 qualitative research: ENTREQ. *BMC Med Res Methodol* 2012;12:181. doi:
11
12 659 10.1186/1471-2288-12-181 [published Online First: 2012/11/29]
13
14
15 660 22. World Health Organization. Definition of key terms. Age groups and population [Available
16
17 661 from: <https://www.who.int/hiv/pub/guidelines/arv2013/intro/keyterms/en/> accessed
18
19 662 January 15, 2020.
20
21
22 663 23. Amundsen PA, Evans DW, Rajendran D, et al. Inclusion and exclusion criteria used in non-
23
24 664 specific low back pain trials: a review of randomised controlled trials published between
25
26 665 2006 and 2012. *BMC Musculoskelet Disord* 2018;19(1):113. doi: 10.1186/s12891-018-
27
28 666 2034-6 [published Online First: 2018/04/14]
29
30
31 667 24. North American Spine Society. NASS Clinical Guidelines: Lumbar Disc Herniation with
32
33 668 Radiculopathy. Available at:
34
35 669 <https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf>
36
37 670 [on.pdf](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf) (accessed Dec 12, 2018).
38
39
40 671 25. Merskey H, Bogduk N, International Association for the Study of Pain, et al. Classification
41
42 672 of chronic pain: descriptions of chronic pain syndromes and definitions of pain terms.
43
44 673 2nd ed. Seattle: IASP Press 1994:xvi, 222 p. p.
45
46
47 674 26. The World Health Organization. World Report on Disability: Chapter 4 Rehabilitation.
48
49 675 Available at:
50
51 676 <https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf>
52
53 677 [on.pdf](https://www.spine.org/Documents/ResearchClinicalCare/Guidelines/LumbarDiscHerniation.pdf) (access Dec 16, 2018).
54
55
56
57
58
59
60

- 1
2
3 678 27. World Health Organization. The International Classification of Functioning, Disability and
4
5 679 Health (ICF). Available at: <https://www.who.int/classifications/icf/icfbeginnersguide.pdf>
6
7
8 680 (accessed Dec 1, 2018).
9
- 10 681 28. Fairbank JC, Couper J, Davies JB, et al. The Oswestry low back pain disability
11
12 682 questionnaire. *Physiotherapy* 1980;66(8):271-3. [published Online First: 1980/08/01]
13
14
- 15 683 29. Roland M, Morris R. A study of the natural history of back pain. Part I: development of a
16
17 684 reliable and sensitive measure of disability in low-back pain. *Spine* 1983;8(2):141-4.
18
19 685 [published Online First: 1983/03/01]
20
- 21 686 30. McCormack HM, Horne DJ, Sheather S. Clinical applications of visual analogue scales: a
22
23 687 critical review. *Psychol Med* 1988;18(4):1007-19. doi: 10.1017/s0033291700009934
24
25 688 [published Online First: 1988/11/01]
26
27
- 28 689 31. Jensen MP, Turner JA, Romano JM, et al. Comparative reliability and validity of chronic
29
30 690 pain intensity measures. *Pain* 1999;83(2):157-62. doi: 10.1016/s0304-3959(99)00101-3
31
32 691 [published Online First: 1999/10/27]
33
34
- 35 692 32. Hicks CL, von Baeyer CL, Spafford PA, et al. The Faces Pain Scale-Revised: toward a
36
37 693 common metric in pediatric pain measurement. *Pain* 2001;93(2):173-83. doi:
38
39 694 10.1016/s0304-3959(01)00314-1 [published Online First: 2001/06/28]
40
41
- 42 695 33. Michaleff ZA, Kamper SJ, Stinson JN, et al. Measuring Musculoskeletal Pain in Infants,
43
44 696 Children, and Adolescents. *J Orthop Sports Phys Ther* 2017;47(10):712-30. doi:
45
46 697 10.2519/jospt.2017.7469 [published Online First: 2017/09/19]
47
48
- 49 698 34. Chorpita BF, Yim L, Moffitt C, et al. Assessment of symptoms of DSM-IV anxiety and
50
51 699 depression in children: a revised child anxiety and depression scale. *Behav Res Ther*
52
53
54
55
56
57
58
59
60

- 1
2
3 700 2000;38(8):835-55. doi: 10.1016/s0005-7967(99)00130-8 [published Online First:
4
5 701 2000/08/11]
6
7
8 702 35. Spielberger CD. Manual for the State-Trait Anxiety Inventory for Children. Palo Alto, Calif,
9
10 703 USA: Consulting Psychologists Press 1973.
11
12 704 36. Cieza A, Geyh S, Chatterji S, et al. ICF linking rules: an update based on lessons learned.
13
14 705 *Journal of rehabilitation medicine* 2005;37(4):212-8. doi: 10.1080/16501970510040263
15
16 706 [published Online First: 2005/07/19]
17
18
19 707 37. Ravens-Sieberer U, Gosch A, Rajmil L, et al. The KIDSCREEN-52 quality of life measure
20
21 708 for children and adolescents: psychometric results from a cross-cultural survey in 13
22
23 709 European countries. *Value Health* 2008;11(4):645-58. doi: 10.1111/j.1524-
24
25 710 4733.2007.00291.x [published Online First: 2008/01/09]
26
27
28 711 38. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of
29
30 712 Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med*
31
32 713 *Care* 2001;39(8):800-12. doi: 10.1097/00005650-200108000-00006 [published Online
33
34 714 First: 2001/07/27]
35
36
37 715 39. Health Measures, . [January 14, 2020]. Available from:
38
39 716 [http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
40
41 717 [promis/list-of-pediatric-measures.](http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/list-of-pediatric-measures)
42
43
44 718 40. Pohlman KA, O'Beirne M, Thiel H, et al. Development and validation of providers' and
45
46 719 patients' measurement instruments to evaluate adverse events after spinal manipulation
47
48 720 therapy. *European Journal of Integrative Medicine* 2014;6(4):451-66.
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 721 41. Ioannidis JP, Evans SJ, Gotzsche PC, et al. Better reporting of harms in randomized trials: an
4
5 722 extension of the CONSORT statement. *Ann Intern Med* 2004;141(10):781-8. doi:
6
7 723 10.7326/0003-4819-141-10-200411160-00009 [published Online First: 2004/11/17]
8
9
10 724 42. Zorzela L, Boon H, Mior S, et al. Serious adverse events associated with pediatric
11
12 725 complementary and alternative medicine. *European Journal of Integrative Medicine*
13
14 726 2014;6(4):467-72.
15
16
17 727 43. World Health Organization. Community-based rehabilitation. Available at:
18
19 728 <https://www.who.int/disabilities/cbr/en/> (accessed Dec. 1, 2018).
20
21
22 729 44. Sampson M, McGowan J, Cogo E, et al. An evidence-based practice guideline for the peer
23
24 730 review of electronic search strategies. *Journal of clinical epidemiology* 2009;62(9):944-
25
26 731 52. doi: 10.1016/j.jclinepi.2008.10.012 [published Online First: 2009/02/24]
27
28 732 45. McGowan J, Sampson M, Salzwedel DM, et al. PRESS Peer Review of Electronic Search
29
30 733 Strategies: 2015 Guideline Statement. *J Clin Epidemiol* 2016;75:40-6. doi:
31
32 734 10.1016/j.jclinepi.2016.01.021 [published Online First: 2016/03/24]
33
34
35 735 46. Godin K, Stapleton J, Kirkpatrick SI, et al. Applying systematic review search methods to the
36
37 736 grey literature: a case study examining guidelines for school-based breakfast programs in
38
39 737 Canada. *Syst Rev* 2015;4:138. doi: 10.1186/s13643-015-0125-0 [published Online First:
40
41 738 2015/10/27]
42
43
44 739 47. Centre EfPaPIaC. EPPI-Reviewer 4 software [Available from: eppi.ioe.ac.uk accessed
45
46 740 November 20, 2019].
47
48
49 741 48. Belur J, Tompson L, Thornton A, et al. Interrater reliability in systematic review
50
51 742 methodology: Exploring variation in coder decision-making. *Sociological Methods &*
52
53 743 *Research* 2018:1-29.
54
55
56
57
58
59
60

- 1
2
3 744 49. Scottish Intercollegiate Guidelines Network (SIGN). Critical appraisal notes and checklists,
4
5 745 2019. Available at: <https://www.sign.ac.uk/checklists-and-notes.html> (accessed Feb 1,
6
7 746 2019).
8
9
10 747 50. Lockwood C, Munn Z, Porritt K. Qualitative research synthesis: methodological guidance for
11
12 748 systematic reviewers utilizing meta-aggregation. *International journal of evidence-based*
13
14 749 *healthcare* 2015;13(3):179-87. doi: 10.1097/xeb.0000000000000062 [published Online
15
16 750 First: 2015/08/12]
17
18
19 751 51. Pluye P, Gagnon MP, Griffiths F, et al. A scoring system for appraising mixed methods
20
21 752 research, and concomitantly appraising qualitative, quantitative and mixed methods
22
23 753 primary studies in Mixed Studies Reviews. *International journal of nursing studies*
24
25 754 2009;46(4):529-46. doi: 10.1016/j.ijnurstu.2009.01.009 [published Online First:
26
27 755 2009/02/24]
28
29
30 756 52. Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic
31
32 757 submissions to the BMJ. The BMJ Economic Evaluation Working Party. *BMJ*
33
34 758 1996;313(7052):275-83. doi: 10.1136/bmj.313.7052.275 [published Online First:
35
36 759 1996/08/03]
37
38
39 760 53. Higgins JPT, Savovic J, Page MJ, et al. Chapter 8: Assessing risk of bias in a randomized
40
41 761 trial. In: Higgins JPT, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for*
42
43 762 *Systematic Reviews of Interventions* version 60 (updated July 2019): Cochrane, 2019.
44
45
46 763 54. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for
47
48 764 intervention description and replication (TIDieR) checklist and guide. *BMJ*
49
50 765 2014;348:g1687. doi: 10.1136/bmj.g1687 [published Online First: 2014/03/13]
51
52
53
54
55
56
57
58
59
60

- 1
2
3 766 55. Booth A, Noyes J, Flemming K, et al. Formulating questions to explore complex
4
5 767 interventions within qualitative evidence synthesis. *BMJ Glob Health* 2019;4(Suppl
6
7 768 1):e001107. doi: 10.1136/bmjgh-2018-001107 [published Online First: 2019/02/19]
9
10 769 56. Husereau D, Drummond M, Petrou S, et al. Consolidated Health Economic Evaluation
11
12 770 Reporting Standards (CHEERS) statement. *BMJ* 2013;346:f1049. doi:
13
14 771 10.1136/bmj.f1049 [published Online First: 2013/03/27]
16
17 772 57. Harden A, Thomas J, Cargo M, et al. Cochrane Qualitative and Implementation Methods
18
19 773 Group guidance series-paper 5: methods for integrating qualitative and implementation
20
21 774 evidence within intervention effectiveness reviews. *Journal of clinical epidemiology*
22
23 775 2018;97:70-78. doi: 10.1016/j.jclinepi.2017.11.029 [published Online First: 2017/12/16]
25
26 776 58. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Stat Med*
27
28 777 2002;21(11):1539-58. doi: 10.1002/sim.1186
30
31 778 59. Deeks JJ, Higgins JPT, Altman DG. Chapter 10: Analysing data and undertaking meta-
32
33 779 analyses. In: Higgins JPT, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for*
34
35 780 *Systematic Reviews of Interventions* version 60 (updated July 2019): Cochrane, 2019.
36
37 781 60. Higgins JP, Altman DG, Gotzsche PC, et al. The Cochrane Collaboration's tool for assessing
38
39 782 risk of bias in randomised trials. *BMJ (Clinical research ed)* 2011;343:d5928. doi:
40
41 783 10.1136/bmj.d5928 [published Online First: 2011/10/20]
43
44 784 61. Campbell M, McKenzie JE, Sowden A, et al. Synthesis without meta-analysis (SWiM) in
45
46 785 systematic reviews: reporting guideline. *BMJ* 2020;368:l6890. doi: 10.1136/bmj.l6890
47
48 786 [published Online First: 2020/01/18]
49
50 787 62. McKenzie JE, Brennan SE. Chapter 12: Synthesizing and presenting findings using other
51
52 788 methods. In: Higgins JPT TJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA., ed.
53
54
55
56
57
58
59
60

- 1
2
3 789 Cochrane Handbook for Systematic Reviews of Interventions version 60 (updated July
4
5 790 2019): Cochrane, 2019.
6
7
8 791 63. Page MJ, Higgins JPT, Sterne JAC. Chapter 13. Assessing risk of bias due to missing results
9
10 792 in a synthesis. In: Higgins JPT, Thomas J, Chandler J, et al., eds. Handbook for
11
12 793 Systematic Reviews of Interventions version 60 (updated July 2019): Cochrane, 2019.
13
14 794 64. Egger M, Davey Smith G, Schneider M, et al. Bias in meta-analysis detected by a simple,
15
16 795 graphical test. *BMJ (Clinical research ed)* 1997;315(7109):629-34. doi:
17
18 796 10.1136/bmj.315.7109.629 [published Online First: 1997/10/06]
19
20
21 797 65. Schünemann HJ, Higgins JP, Vist GE, et al. Chapter 14: Completing ‘Summary of findings’
22
23 798 tables and grading the certainty of the evidence. In: Higgins JPT TJ, Chandler J,
24
25 799 Cumpston M, Li T, Page MJ, Welch VA, ed. Cochrane Handbook for Systematic
26
27 800 Reviews of Interventions version 60 (updated July 2019): Cochrane 2019.
28
29
30 801 66. Shemilt I, Aluko P, Graybill E, et al. Economic Evidence. In: Higgins JPT TJ, Chandler J,
31
32 802 Cumpston M, Li T, Page MJ, Welch VA., ed. Cochrane Handbook for Systematic
33
34 803 Reviews of Interventions version 60, 2019.
35
36
37 804 67. Joanna Briggs Institute. Chapter 6: Systematic reviews of economic evidence 2019
38
39 805 [Available from:
40
41 806 [https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of](https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of+economic+evidence)
42
43 807 [+economic+evidence](https://wiki.joannabriggs.org/display/MANUAL/Chapter+6%3A+Systematic+reviews+of+economic+evidence) accessed February 1, 2020.
44
45
46 808 68. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic
47
48 809 reviews. *BMC Med Res Methodol* 2008;8:45. doi: 10.1186/1471-2288-8-45 [published
49
50 810 Online First: 2008/07/12]
51
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3 811 69. Noyes J, Booth A, Flemming K, et al. Cochrane Qualitative and Implementation Methods
4
5 812 Group guidance series-paper 3: methods for assessing methodological limitations, data
6
7 813 extraction and synthesis, and confidence in synthesized qualitative findings. *Journal of*
8
9 814 *clinical epidemiology* 2018;97:49-58. doi: 10.1016/j.jclinepi.2017.06.020 [published
10
11 815 Online First: 2017/12/17]
12
13
14 816 70. Slavin RE. Best evidence synthesis: an intelligent alternative to meta-analysis. *Journal of*
15
16 817 *clinical epidemiology* 1995;48(1):9-18. [published Online First: 1995/01/01]
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19 818
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820 **Table 1: Examples of rehabilitation interventions**

Intervention	Definition	Examples
Patient or caregiver education and self-management strategies (structured or unstructured)	Teaching patients skills that they can use to manage their health condition	<ul style="list-style-type: none"> • Learning disease-specific information • Learning general managing skills (e.g., problem-solving, finding and using community resources, working with healthcare team) • Learning strategies to increase confidence (i.e., self-efficacy) in ability to engage in behaviours that are needed to manage their condition on a daily basis • Adequate peer role models and support networks that facilitate the initiation and maintenance of desired behavioural changes
Exercise	A subcategory of physical activity that is planned, structured, repetitive, and purposeful; can be supervised (e.g., by a healthcare professional) or unsupervised	<ul style="list-style-type: none"> • Stretching • Strengthening • Range of motion exercises • Aerobic (e.g., swimming, cycling, walking, running) • Anaerobic (e.g., jumping, sprinting, weight lifting) • Yoga, Qigong
Manual therapies	<ul style="list-style-type: none"> - Manipulation: Techniques incorporating a high-velocity low-amplitude impulse or thrust applied at or near the end of a joint's passive range of motion - Mobilization: Techniques incorporating a low-velocity and small or large amplitude oscillatory movement, within a joint's passive range of motion - Traction: Manual or mechanically assisted application of an intermittent or continuous distractive force - Soft tissue therapy: A mechanical form of therapy where soft-tissue structures are pressed and kneaded, using physical contact with the hand or mechanical device 	<ul style="list-style-type: none"> • Lumbar manipulation, mobilization, or traction • Massage • Muscle energy technique • Strain-counterstrain
Passive physical modalities	A form of cold, heat, or light application affecting the body at the skin level or ultrasonic	<ul style="list-style-type: none"> • Heat application: heat pack, hydrotherapy

	<p>or electromagnetic radiation affecting structures beneath the skin surface:</p> <ul style="list-style-type: none"> - Passive assistive devices: Device to encourage immobilization in anatomic positions or actively inhibit or prevent movement 	<ul style="list-style-type: none"> • Cryotherapy: cold pack, vapocoolant spray • Low-level laser • Electrical muscle stimulation • Pulsed electromagnetic therapy
Acupuncture	Any body-needling, moxibustion, electric acupuncture, laser acupuncture, microsystem acupuncture, and acupressure	<ul style="list-style-type: none"> • Traditional needling • Dry needling • Burning of specific herbs • Electro-acupuncture • Photo-acupuncture
Pharmacological interventions	A substance used in treating disease or relieving pain	<ul style="list-style-type: none"> • Acetaminophen • Nonsteroidal anti-inflammatory drugs • Muscle relaxants • Antidepressants
Psychological interventions	Activities used to modify behaviour, emotional state, or feelings	<ul style="list-style-type: none"> • Cognitive behavioural therapy • Counselling • Social network and environment-based therapies • Psychoeducational interventions • Mindfulness meditation
Modifications to environment		<ul style="list-style-type: none"> • Ergonomic interventions at school or work
Assistive devices	Any item, piece of equipment or product system, used to increase, maintain, or improve the functional capabilities of people with disabilities	<ul style="list-style-type: none"> • Walking aids • Orthoses • Braces • Wheelchairs
Complementary and alternative therapies (CAM)	Medical products and practices that are not part of standard medical care	<ul style="list-style-type: none"> • Homeopathy • Traditional Chinese Medicine • Naturopathy • Products (e.g., herbs, dietary supplements, probiotics)

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823 **Table 2. Research questions, outcomes and study types**

Research Question	Outcomes	Study Types
<p>What is the effectiveness and safety of rehabilitation interventions for improving functioning and other health outcomes in children with back pain?</p>	<p><i>Primary:</i></p> <ol style="list-style-type: none"> 1. Functioning: e.g., Modified Oswestry Low Back Pain Disability Questionnaire, Roland Morris Disability Questionnaire, return to school, participation in sports/other recreational activities <p><i>Secondary:</i></p> <ol style="list-style-type: none"> 2. Pain (including pain intensity, frequency, duration): e.g., VAS, NRS, Faces Pain Scale - Revised 3. Psychological outcomes (including anxiety and depression): e.g., Revised Child Anxiety and Depression Scale, State-Trait Anxiety Inventory for Children 4. Health-related quality of life: e.g., KIDSCREEN-52, Pediatric Quality of Life Inventory, PROMIS Pediatric Self Report Scale 5. Adverse events: any unfavorable sign, symptom, or disease temporarily associated with treatment, indirect harms (e.g., delayed diagnosis/treatment), number of adverse events, severity of adverse events (i.e., mild, moderate, severe), number of participant withdrawals from study due to adverse events. 	<p>Randomized controlled trials</p> <p>Cohort studies</p> <p>Case-control studies</p> <p>Mixed methods studies (quantitative component)</p>
<p>What are the patients', caregivers' and providers' experiences, preferences, expectations and valued outcomes regarding rehabilitation interventions for back pain?</p>	<ol style="list-style-type: none"> 6. Qualitative outcomes: experiences, preferences, expectations, valued outcomes 	<p>Qualitative studies (e.g., phenomenology, grounded theory, ethnography, action research, descriptive qualitative studies)</p> <p>Mixed-methods studies (qualitative component)</p>
<p>What is the cost-effectiveness of rehabilitation interventions for improving functioning and other health outcomes in children with back pain?</p>	<ol style="list-style-type: none"> 7. Economic outcomes: Direct costs: resources consumed or saved by an intervention Indirect costs: productivity gains or losses (e.g., time consumed or freed by the intervention) Economic health outcomes: QALY, ICER, NMB 	<p>Full economic evaluations (trial- and model-based): cost-effectiveness, cost-utility, cost-benefit, cost-consequences</p>

	Intangible: e.g., pain or suffering saved or brought on by an intervention	
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824 ICER: incremental cost-effectiveness ratio; NMB: measure of net monetary benefit; NRS: Numerical
 825 Rating Scale; PROMIS: Patient-Reported Outcomes Measurement Information System; QALY: quality
 826 adjusted life years; VAS: Visual Analogue Scale

827 **Table 3. Categories to guide the analysis (meta-analysis or qualitative synthesis)**

Study Design	<p>Primary Synthesis:</p> <ul style="list-style-type: none"> • <i>Design:</i> RCTs vs. Non-RCTs (i.e., cohort, case-control) <p>Subgroup analysis:</p> <ul style="list-style-type: none"> – <i>Specific RCT:</i> e.g., superiority, non-inferiority, or equivalence
Population	<p>Primary Synthesis:</p> <ul style="list-style-type: none"> • <i>Pain duration:</i> acute/subacute pain (i.e., <12 weeks' duration) vs. persistent pain (≥12 weeks' duration) • <i>Age range:</i> infants (aged <1 year), children (aged 1-9 years), or adolescents (aged 10-19 years) • <i>Type of back pain:</i> thoracic spine pain with/without radiculopathy, low back pain with/without radiculopathy, musculoskeletal chest wall pain, spondylolisthesis/spondylolysis <p>Subgroup analysis:</p> <ul style="list-style-type: none"> – <i>Pain severity:</i> mild, moderate, or severe
Intervention	<p>Primary Synthesis:</p> <ul style="list-style-type: none"> • <i>Intervention type:</i> education/self-management strategies, manual therapy, passive physical modalities, acupuncture, pharmacological intervention, psychological intervention, multimodal care, environmental modifications, assistive devices, complementary and alternative medicine (CAM) <p>Subgroup analysis:</p> <ul style="list-style-type: none"> – <i>Specific intervention type:</i> e.g., type of exercise (e.g., stretching vs. aerobic) and type of manual therapy (e.g., mobilization, manipulation, traction, soft tissue therapy)
Comparison	<p>Primary Synthesis:</p> <ul style="list-style-type: none"> • <i>Comparator type:</i> active (other intervention) vs. inactive (e.g., placebo/sham intervention, wait list, standard or usual care, or no intervention)
Outcome	<p>Primary Synthesis:</p> <ul style="list-style-type: none"> • <i>Outcome type:</i> functioning (e.g., ODI, RMDQ), pain (e.g., VAS, NRS), psychological (e.g., Revised Child Anxiety and Depression Scale), health-related quality of life (e.g., KIDSCREEN-52), or adverse events (e.g., number, severity) • <i>Time of outcome assessment:</i> short- (<3 months) or long-term (≥ 3 months) • <i>Type of effect estimate:</i>* e.g., mean difference, relative risk, odds ratio, or hazard ratio
Methodological Quality	<p>Primary Synthesis:</p> <p><i>Methodological quality assessment:</i> low or unclear risk of bias</p> <p>Sensitivity analysis: low, unclear and high risk of bias</p>

828 *If data are unavailable to re-express effect estimates into a common effect estimate (if applicable)

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	(Page No.#)
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	4
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1-2
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	25
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial or other support for the review	25
Sponsor	5b	Provide name for the review funder and/or sponsor	
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	5-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	6
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	7-11
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	12-13
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits such that it could be repeated	Additional File 2

Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	13
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	14, 18-20
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently in duplicate), any processes for obtaining and confirming data from investigators	16-7
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	16-7
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	9-11
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	15-6
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	17-22
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I ² , Kendall's τ)	
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	15
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	20

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Additional file 2. Literatures search strategies

Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® 1946-Present

- 1 exp Infant/
- 2 Child, Preschool/
- 3 Child/
- 4 Adolescent/
- 5 Pediatrics/
- 6 (baby or babies).ab,ti.
- 7 "newborn*".ab,ti.
- 8 (infant or infants).ab,ti.
- 9 (child or children*).ab,ti.
- 10 (adolescent* or adolescence).ab,ti.
- 11 (teen or teens or teenager).ab,ti.
- 12 (pediatric* or paediatric*).ab,ti.
- 13 (young adj3 (person* or people)).ab,ti.
- 14 emerging adult*.ab,ti.
- 15 "youth*".ab,ti.
- 16 or/1-15 [**pediatric population]
- 17 exp Back Injuries/
- 18 exp Back Pain/
- 19 Coccyx/in [Injuries]
- 20 Intervertebral Disc Degeneration/
- 21 Intervertebral Disc Displacement/
- 22 Lumbar Vertebrae/in [Injuries]
- 23 Lumbosacral Region/in [Injuries]
- 24 Osteoarthritis, Spine/
- 25 Piriformis Muscle Syndrome/
- 26 Radiculopathy/
- 27 Sciatica/
- 28 Spinal Diseases/

1	29	Spinal Stenosis/
2		
3	30	Thoracic Injuries/
4		
5	31	Thoracic Vertebrae/
6		
7	32	(back adj3 (ache* or injur* or pain*)).ab,ti.
8		
9	33	(backache* adj3 (injur* or pain*)).ab,ti.
10		
11	34	(back pain or back-pain).ab,ti.
12		
13	35	(lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
14		
15	36	(lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
16		
17	37	"low* back pain".ab,ti.
18		
19	38	(lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or zygapophys*)).ab,ti.
20		
21	39	"Piriformis syndrome*".ab,ti.
22		
23	40	radiculopathy.ab,ti.
24		
25	41	(sacral adj2 pain*).ab,ti.
26		
27	42	((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
28		
29	43	spondylosis.ab,ti.
30		
31	44	(thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
32		
33	45	(T-spine or T-spinal).ab,ti.
34		
35	46	or/17-45 [**back pain]
36		
37	47	Acupressure/
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39	48	Acupuncture/
40		
41	49	exp Acupuncture Therapy/
42		
43	50	"Bedding and Linens"/
44		
45	51	Behavior Therapy/
46		
47	52	exp Biofeedback, Psychology/
48		
49	53	exp Cognitive Behavioral Therapy/
50		
51	54	Combined Modality Therapy/
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53	55	Community-Based Participatory Research/
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55	56	Community Health Services/
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57	57	Community Participation/
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59	58	Complementary Therapies/
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	59	Cryotherapy/

1 60 exp Diathermy/
2
3 61 exp Electric Stimulation Therapy/
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5 62 Electroacupuncture/
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7 63 Ergonomics/
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9 64 exp Exercise/
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11 65 exp Exercise Movement Techniques/
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13 66 exp Exercise Therapy/
14
15 67 Fluid Therapy/
16
17 68 High-Energy Shock Waves/tu [Therapeutic Use]
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19 69 Immobilization/
20
21 70 Hot Temperature/tu [Therapeutic Use]
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23 71 exp Hydrotherapy/
24
25 72 Laser Therapy, Low-Level/
26
27 73 Low-Level Light Therapy/
28
29 74 Magnetic Field Therapy/
30
31 75 Magnetics/tu [Therapeutic Use]
32
33 76 Massage/
34
35 77 exp Medicine, Chinese Traditional/
36
37 78 exp Musculoskeletal Manipulations/
38
39 79 Patient Education as Topic/
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41 80 Physical Therapy Modalities/
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43 81 Self Care/
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45 82 Self-Help Devices/
46
47 83 Physical Fitness/
48
49 84 Restraint, Physical/
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51 85 Transcutaneous Electric Nerve Stimulation/
52
53 86 Vibration/tu [Therapeutic Use]
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55 87 Wheelchairs/
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57 88 acupressure.ab,ti.
58
59 89 "acupunctur*".ab,ti.
60 90 (advice or advise or advised).ab,ti.
91 alexander technique.ab,ti.

- 1 92 "assistive device*".ab,ti.
2
3 93 "back belt*".ab,ti.
4
5 94 "back school*".ab,ti.
6
7 95 (back adj2 work).ab,ti.
8
9 96 (braces or brace or bracing).ab,ti.
10
11 97 canes.ab,ti.
12
13 98 chiropract*.ab,ti.
14
15 99 "cognitive behavioral therap*".ab,ti.
16
17 100 "cognitive behavioural therap*".ab,ti.
18
19 101 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
20
21 102 "core stabili*".ab,ti.
22
23 103 (corset or corsets).ab,ti.
24
25 104 crutches.ab,ti.
26
27 105 cryotherap*.ab,ti.
28
29 106 "deep tissue therap*".ab,ti.
30
31 107 diathermy.ab,ti.
32
33 108 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
34
35 109 electro-acupuncture.ab,ti.
36
37 110 (electrogalvanic stimulation or EGS).ab,ti.
38
39 111 (electromagnet* and (radiation or therap*)).ab,ti.
40
41 112 electromodalit*.ab,ti.
42
43 113 electrotherapy.ab,ti.
44
45 114 (exercise or exercises or exercising).ab,ti.
46
47 115 (flexion-distraction or flexion distraction).ab,ti.
48
49 116 fluidotherap*.ab,ti.
50
51 117 galvanic stimulation.ab,ti.
52
53 118 (H-Wave Device Stimulation or HWDS).ab,ti.
54
55 119 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or
56
57 bottle or superficial or therapeutic)).ab,ti.
58
59 120 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
60
61 121 "hydrotherap*".ab,ti.
62
63 122 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.

- 1 123 "interferential current*".ab,ti.
2
3 124 infrared.ab,ti.
4
5 125 iontophoresis.ab,ti.
6
7 126 electroanalgesia.ab,ti.
8
9 127 ergonomic*.ab,ti.
10
11 128 kinesiostat*.ab,ti.
12 129 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
13
14 130 "low level laser*".ab,ti.
15
16 131 "lumbar support*".ab,ti.
17
18 132 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
19
20 133 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
21
22 134 "manual therap*".ab,ti.
23
24 135 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
25
26 136 microwave*.ab,ti.
27 137 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
28
29 138 "moist air bath*".ab,ti.
30
31 139 moxibustion.ab,ti.
32
33 140 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or
34 procedure* or package* or manage*)).ab,ti.
35
36 141 muscle activation.ab,ti.
37
38 142 "muscle energy technique*".ab,ti.
39
40 143 myofascial release.ab,ti.
41
42 144 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
43
44 145 orthotic*.ab,ti.
45
46 146 "passive modalit*".ab,ti.
47
48 147 (patient* adj3 (educat* or train*)).ab,ti.
49
50 148 "Percutaneous Electric* Nerve Stimulation".ab,ti.
51
52 149 (physical adj therap*).ab,ti.
53
54 150 physiotherap*.ab,ti.
55
56 151 photo-acupuncture.ab,ti.
57
58 152 pillow*.ab,ti.
59
60 153 pilates.ab,ti.

- 1 154 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
2
3 155 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
4
5 156 radiant light.ab,ti.
6
7 157 Russian stimulation.ab,ti.
8
9 158 "seat adj cushion*".ab,ti.
10
11 159 (self-manage* or self manage*).ab,ti.
12
13 160 (short wave* or short-wave*).ab,ti.
14
15 161 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
16
17 162 "soft tissue therap*".ab,ti.
18
19 163 "spray and stretch".ab,ti.
20
21 164 strain-counterstrain.ab,ti.
22
23 165 strengthen*.ab,ti.
24
25 166 stretching.ab,ti.
26
27 167 (tape or taping).ab,ti.
28
29 168 thoracolumbosacral orthosis.ab,ti.
30
31 169 traction.ab,ti.
32
33 170 traditional Chinese medicine.ab,ti.
34
35 171 (transcutaneous electrical stimulation or TENS).ab,ti.
36
37 172 ultrasound.ab,ti.
38
39 173 vapocoolant spray.ab,ti.
40
41 174 "vibration therap*".ab,ti.
42
43 175 walkers.ab,ti.
44
45 176 "walking adj3 aid*".ab,ti.
46
47 177 "warm compress*".ab,ti.
48
49 178 whirlpool*.ab,ti.
50
51 179 yoga.ab,ti.
52
53 180 or/47-179 [**interventions]
54
55 181 Case-Control Studies/
56
57 182 Cohort Studies/
58
59 183 Controlled Clinical Trials as Topic/
60
184 Epidemiologic Studies/
185 Epidemiology/

1 186 Follow-Up Studies/
2
3 187 Longitudinal Studies/
4
5 188 Prospective Studies/
6
7 189 Retrospective Studies/
8
9 190 Randomized Controlled Trials as Topic/
10
11 191 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
12
13 192 (cohort adj3 (stud* or design* or analysis)).ab,ti.
14
15 193 controlled clinical trial.pt.
16
17 194 "epidemiolog*".ab,ti.
18
19 195 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
20
21 196 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
22
23 197 (prospective adj3 (stud* or design* or analysis)).ab,ti.
24
25 198 (random* and (control* or clinical or allocat*)).ab,ti.
26
27 199 randomized controlled trial.pt.
28
29 200 (retrospective adj3 (stud* or design*)).ab,ti.
30
31 201 or/181-200 [**study designs_effectiveness]
32
33 202 16 and 46 and 180 and 201
34
35 203 Anthropology, Cultural/
36
37 204 Attitude/
38
39 205 Awareness/
40
41 206 Behavioral Research/
42
43 207 Diary as Topic/
44
45 208 Emotions/
46
47 209 Ethnology/
48
49 210 Ethnopsychology/
50
51 211 Focus Groups/
52
53 212 Grounded Theory/
54
55 213 Interview, Psychological/
56
57 214 Interviews as Topic/
58
59 215 Mindfulness/
60
216 Motivation/
217 Narration/

- 1 218 Observation/
2
3 219 Perception/
4
5 220 Personal Narratives as Topic/
6
7 221 Personal Satisfaction/
8
9 222 Qualitative Research/
10
11 223 Self Report/
12
13 224 "Surveys and Questionnaires"/
14
15 225 Tape Recording/
16
17 226 Thinking/
18
19 227 Video Recording/ or Videotape Recording/
20
21 228 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or
22 perception* or perspective*).ab,ti.
23
24 229 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
25
26 230 ((behavioral or behavioural) adj2 research).ab,ti.
27
28 231 biographical method*.ab,ti.
29
30 232 (constant adj2 (comparative or comparison)).ab,ti.
31
32 233 ((content or conversation or discourse) adj2 analys*).ab,ti.
33
34 234 descriptive research.ab,ti.
35
36 235 (diary or diaries).ab,ti.
37
38 236 emotions.ab,ti.
39
40 237 ethnograph*.ab,ti.
41
42 238 ethnology.ab,ti.
43
44 239 ethnopsychology.ab,ti.
45
46 240 feelings.ab,ti.
47
48 241 (field adj2 (notes or research or study or studies)).ab,ti.
49
50 242 (focus adj2 group*).ab,ti.
51
52 243 framework analysis.ab,ti.
53
54 244 grounded theory.ab,ti.
55
56 245 interview*.ab,ti.
57
58 246 life world.ab,ti.
59
60 247 lived experience.ab,ti.
248 (meaning or meanings).ab,ti.

- 1 249 (narrative* or narration*).ab,ti.
- 2
- 3 250 (observe* or observation*).ab,ti.
- 4
- 5 251 (open adj ended).ab,ti.
- 6
- 7 252 phenomenology.ab,ti.
- 8
- 9 253 purposive sampl*.ab,ti.
- 10
- 11 254 qualitative.ab,ti.
- 12
- 13 255 questionnaire*.ab,ti.
- 14
- 15 256 (realist adj3 (review* or research or synthesis)).ab,ti.
- 16
- 17 257 satisfaction.ab,ti.
- 18
- 19 258 self report*.ab,ti.
- 20
- 21 259 semantic analysis.ab,ti.
- 22
- 23 260 standpoint*.ab,ti.
- 24
- 25 261 (story or stories).ab,ti.
- 26
- 27 262 survey*.ab,ti.
- 28
- 29 263 (theme* or thematic).ab,ti.
- 30
- 31 264 (theoretical adj2 (sampl* or saturation)).ab,ti.
- 32
- 33 265 (thoughts or thinking).ab,ti.
- 34
- 35 266 ((video adj record*) or videorecord* or videotap*).ab,ti.
- 36
- 37 267 or/203-266 [**experience/qualitative]
- 38
- 39 268 "Costs and Cost Analysis"/
- 40
- 41 exp Cost-Benefit Analysis/
- 42
- 43 270 Quality-Adjusted Life Years/
- 44
- 45 271 Economics, Medical/
- 46
- 47 272 (economic* adj4 (evaluat* or stud*)).ab,ti.
- 48
- 49 273 (health economic* adj4 (evaluat* or stud*)).ab,ti.
- 50
- 51 274 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
- 52
- 53 275 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
- 54
- 55 276 (CEA or CUA or CBA).ab,ti.
- 56
- 57 277 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
- 58
- 59 278 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
- 60 279 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.

- 1 280 (decision adj1 (tree* or analy* or model*)).ab,ti.
- 2
- 3 281 economics.fs.
- 4
- 5 282 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
- 6
- 7 283 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or
- 8 quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
- 9
- 10 284 (markov* or monte carlo*).ab,ti.
- 11
- 12 285 or/268-284 [**cost effectiveness]
- 13
- 14 286 Delivery of Health Care/
- 15
- 16 287 Delivery of Health Care, Integrated/
- 17
- 18 288 Health Planning/
- 19
- 20 289 Health Promotion/
- 21
- 22 290 Health Services Administration/
- 23
- 24 291 Integrative Medicine/
- 25
- 26 292 Interprofessional Relations/
- 27
- 28 293 Patient Care Management/
- 29
- 30 294 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
- 31
- 32 295 barrier*.ab,ti.
- 33
- 34 296 facilitator*.ab,ti.
- 35
- 36 297 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention*
- 37 or model* or plan* or process* or program*or services or strateg* or system* or team*)).ab,ti.
- 38
- 39 298 implement*.ab,ti.
- 40
- 41 299 (innovate* adj3 (intervention* or model* or plan* or process* or program*or strateg* or system*)).ab,ti.
- 42
- 43 300 (model* adj care).ab,ti.
- 44
- 45 301 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
- 46 intervention* or model* or plan* or process* or program*or strateg* or system* or challenge* or benefit* or
- 47 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
- 48 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
- 49
- 50 302 (pathway* adj3 (clinical or care)).ab,ti.
- 51
- 52 303 (program* adj3 (assess* or evaluat*)).ab,ti.
- 53
- 54 304 or/286-303 [**implementation]
- 55
- 56 305 16 and 46 and 180 and (201 or 267 or 285 or 304)
- 57
- 58 306 16 and 46 and 180 [**pediatric, back pain, interventions]
- 59
- 60

Embase Classic+Embase 1947 to 2020

- 1 newborn/
- 2 infant/ or infancy/ or baby/
- 3 childhood/
- 4 child/
- 5 adolescent/ or adolescence/
- 6 juvenile/
- 7 (baby or babies).ab,ti.
- 8 "newborn*".ab,ti.
- 9 (infant or infants).ab,ti.
- 10 (child or children*).ab,ti.
- 11 (adolescent* or adolescence).ab,ti.
- 12 (teen or teens or teenager).ab,ti.
- 13 (pediatric* or paediatric*).ab,ti.
- 14 (young adj3 (person* or people)).ab,ti.
- 15 emerging adult*.ab,ti.
- 16 "youth*".ab,ti.
- 17 or/1-16 [**pediatric population]
- 18 backache/
- 19 low back pain/
- 20 intervertebral disc degeneration/
- 21 intervertebral disk hernia/
- 22 lumbar vertebra/
- 23 lumbosacral region/
- 24 piriformis syndrome/
- 25 radiculopathy/
- 26 sciatica/
- 27 spine disease/
- 28 vertebral canal stenosis/
- 29 spondylosis/
- 30 (back adj3 (ache* or injur* or pain*)).ab,ti.

- 1 31 (backache* adj3 (injur* or pain*)).ab,ti.
2
3 32 (back pain or back-pain).ab,ti.
4
5 33 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
6
7 34 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
8
9 35 "low* back pain".ab,ti.
10
11 36 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or
12 zygapophys*)).ab,ti.
13
14 37 "Piriformis syndrome*".ab,ti.
15
16 38 radiculopathy.ab,ti.
17
18 39 (sacral adj2 pain*).ab,ti.
19
20 40 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
21
22 41 spondylosis.ab,ti.
23
24 42 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
25
26 43 (T-spine or T-spinal).ab,ti.
27
28 44 or/18-43 [**back injuries]
29
30 45 acupressure/
31
32 46 acupuncture/
33
34 47 behavior therapy/
35
36 48 biofeedback/
37
38 49 cognitive behavioral therapy/
39
40 50 participatory research/
41
42 51 community care/
43
44 52 community participation/
45
46 53 alternative medicine/
47
48 54 cryotherapy/
49
50 55 diathermy/
51
52 56 electrostimulation therapy/
53
54 57 electroacupuncture/
55
56 58 ergonomics/
57
58 59 exp exercise/
59
60 60 exp kinesiotherapy/
61
62 61 fitness/

- 1 62 fluid therapy/
- 2
- 3 63 shock wave/
- 4
- 5 64 immobilization/
- 6
- 7 65 heat/
- 8
- 9 66 exp hydrotherapy/
- 10
- 11 67 low level laser therapy/
- 12
- 13 68 phototherapy/
- 14
- 15 69 exp magnetism/
- 16
- 17 70 magnetotherapy/
- 18
- 19 71 massage/
- 20
- 21 72 Chinese medicine/
- 22
- 23 73 manipulative medicine/
- 24
- 25 74 patient education/
- 26
- 27 75 physiotherapy/
- 28
- 29 76 self care/
- 30
- 31 77 transcutaneous nerve stimulation/
- 32
- 33 78 whole body vibration/
- 34
- 35 79 acupressure.ab,ti.
- 36
- 37 80 "acupunctur*".ab,ti.
- 38
- 39 81 (advice or advise or advised).ab,ti.
- 40
- 41 82 alexander technique.ab,ti.
- 42
- 43 83 "assistive device*".ab,ti.
- 44
- 45 84 "back belt*".ab,ti.
- 46
- 47 85 "back school*".ab,ti.
- 48
- 49 86 (back adj2 work).ab,ti.
- 50
- 51 87 (braces or brace or bracing).ab,ti.
- 52
- 53 88 chiropract*.ab,ti.
- 54
- 55 89 "cognitive behavioral therap*".ab,ti.
- 56
- 57 90 "cognitive behavioural therap*".ab,ti.
- 58
- 59 91 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
- 60
- 92 "core stabili*".ab,ti.
- 93 (corset or corsets).ab,ti.

- 1 94 crutches.ab,ti.
2
3 95 cryotherap*.ab,ti.
4
5 96 "deep tissue therap*".ab,ti.
6
7 97 diathermy.ab,ti.
8
9 98 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
10
11 99 electro-acupuncture.ab,ti.
12
13 100 (electrogalvanic stimulation or EGS).ab,ti.
14
15 101 (electromagnet* and (radiation or therap*)).ab,ti.
16
17 102 electromodalit*.ab,ti.
18
19 103 electrotherapy.ab,ti.
20
21 104 (exercise or exercises or exercising).ab,ti.
22
23 105 (flexion-distraction or flexion distraction).ab,ti.
24
25 106 fluidotherap*.ab,ti.
26
27 107 galvanic stimulation.ab,ti.
28
29 108 (H-Wave Device Stimulation or HWDS).ab,ti.
30
31 109 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
32 superficial or therapeutic)).ab,ti.
33
34 110 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
35
36 111 "hydrotherap*".ab,ti.
37
38 112 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
39
40 113 "interferential current*".ab,ti.
41
42 114 infrared.ab,ti.
43
44 115 iontophoresis.ab,ti.
45
46 116 electroanalgesia.ab,ti.
47
48 117 ergonomic*.ab,ti.
49
50 118 kinesiopat*.ab,ti.
51
52 119 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.
53
54 120 "low level laser*".ab,ti.
55
56 121 "lumbar support*".ab,ti.
57
58 122 (magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
59
60 123 (manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
124 "manual therap*".ab,ti.

- 1 125 Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
2
3 126 microwave*.ab,ti.
4
5 127 ((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
6
7 128 "moist air bath*".ab,ti.
8
9 129 moxibustion.ab,ti.
10
11 130 ((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or
12 package* or manage*)).ab,ti.
13
14 131 muscle activation.ab,ti.
15
16 132 "muscle energy technique*".ab,ti.
17
18 133 myofascial release.ab,ti.
19
20 134 (Neuromuscular Electrical Stimulation or NMES).ab,ti.
21
22 135 orthotic*.ab,ti.
23
24 136 "passive modalit*".ab,ti.
25
26 137 (patient* adj3 (educat* or train*)).ab,ti.
27
28 138 "Percutaneous Electric* Nerve Stimulation".ab,ti.
29
30 139 (physical adj therap*).ab,ti.
31
32 140 physiotherap*.ab,ti.
33
34 141 photo-acupuncture.ab,ti.
35
36 142 pillow*.ab,ti.
37
38 143 pilates.ab,ti.
39
40 144 (postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
41
42 145 (pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
43
44 146 radiant light.ab,ti.
45
46 147 Russian stimulation.ab,ti.
47
48 148 "seat adj cushion*".ab,ti.
49
50 149 (self-manage* or self manage*).ab,ti.
51
52 150 (short wave* or short-wave*).ab,ti.
53
54 151 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
55
56 152 "soft tissue therap*".ab,ti.
57
58 153 "spray and stretch".ab,ti.
59
60 154 strain-counterstrain.ab,ti.
155 strengthen*.ab,ti.

1 156 stretching.ab,ti.
2
3 157 (tape or taping).ab,ti.
4
5 158 thoracolumbosacral orthosis.ab,ti.
6
7 159 traction.ab,ti.
8
9 160 traditional Chinese medicine.ab,ti.
10
11 161 (transcutaneous electrical stimulation or TENS).ab,ti.
12
13 162 ultrasound.ab,ti.
14
15 163 vapocoolant spray.ab,ti.
16
17 164 "vibration therap*".ab,ti.
18
19 165 walkers.ab,ti.
20
21 166 "walking adj3 aid*".ab,ti.
22
23 167 "warm compress*".ab,ti.
24
25 168 whirlpool*.ab,ti.
26
27 169 yoga.ab,ti.
28
29 170 or/45-169 [**interventions]
30
31 171 case control study/
32
33 172 cohort analysis/
34
35 173 "controlled clinical trial (topic)"/
36
37 174 longitudinal study/
38
39 175 "randomized controlled trial (topic)"/
40
41 176 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
42
43 177 (cohort adj3 (stud* or design* or analysis)).ab,ti.
44
45 178 "epidemiolog*".ab,ti.
46
47 179 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
48
49 180 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
50
51 181 (prospective adj3 (stud* or design* or analysis)).ab,ti.
52
53 182 (random* and (control* or clinical or allocat* or trial*)).ab,ti.
54
55 183 (retrospective adj3 (stud* or design*)).ab,ti.
56
57 184 or/171-183 [**effectiveness]
58
59 185 attitude to health/
60
61 186 patient attitude/
62
63 187 awareness/

- 1 188 behavioral research/
 2
 3 189 writing/
 4
 5 190 emotion/
 6
 7 191 ethnology/
 8
 9 192 cultural psychology/
 10
 11 193 information processing/
 12
 13 194 grounded theory/
 14
 15 195 interview/
 16
 17 196 mindfulness/
 18
 19 197 motivation/
 20
 21 198 exp verbal communication/
 22
 23 199 observation/ or participant observation/
 24
 25 200 perception/
 26
 27 201 satisfaction/ or patient satisfaction/
 28
 29 202 qualitative research/
 30
 31 203 self report/
 32
 33 204 health survey/
 34
 35 205 questionnaire/
 36
 37 206 exp recording/
 38
 39 207 exp thinking/
 40
 41 208 (attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception*
 42 or perspective*).ab,ti.
 43
 44 209 ((audio adj record*) or audiorecord* or audiotap*).ab,ti.
 45
 46 210 ((behavioral or behavioural) adj2 research).ab,ti.
 47
 48 211 biographical method*.ab,ti.
 49
 50 212 (constant adj2 (comparative or comparison)).ab,ti.
 51
 52 213 ((content or conversation or discourse) adj2 analys*).ab,ti.
 53
 54 214 descriptive research.ab,ti.
 55
 56 215 (diary or diaries).ab,ti.
 57
 58 216 emotions.ab,ti.
 59
 60 217 ethnograph*.ab,ti.
 218 ethnology.ab,ti.

1 219 ethnopsychology.ab,ti.
2
3 220 feelings.ab,ti.
4
5 221 (field adj2 (notes or research or study or studies)).ab,ti.
6
7 222 (focus adj2 group*).ab,ti.
8
9 223 framework analysis.ab,ti.
10
11 224 grounded theory.ab,ti.
12
13 225 interview*.ab,ti.
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15 226 life world.ab,ti.
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17 227 lived experience.ab,ti.
18
19 228 (meaning or meanings).ab,ti.
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21 229 (narrative* or narration*).ab,ti.
22
23 230 (observe* or observation*).ab,ti.
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25 231 (open adj ended).ab,ti.
26
27 232 phenomenology.ab,ti.
28
29 233 purposive sampl*.ab,ti.
30
31 234 qualitative.ab,ti.
32
33 235 questionnaire*.ab,ti.
34
35 236 (realist adj3 (review* or research or synthesis)).ab,ti.
36
37 237 satisfaction.ab,ti.
38
39 238 self report*.ab,ti.
40
41 239 semantic analysis.ab,ti.
42
43 240 standpoint*.ab,ti.
44
45 241 (story or stories).ab,ti.
46
47 242 survey*.ab,ti.
48
49 243 (theme* or thematic).ab,ti.
50
51 244 (theoretical adj2 (sampl* or saturation)).ab,ti.
52
53 245 (thoughts or thinking).ab,ti.
54
55 246 ((video adj record*) or videorecord* or videotap*).ab,ti.
56
57 247 or/185-246 [**qualitative_experience]
58
59 248 "cost effectiveness analysis"/
60 249 "cost benefit analysis"/
250 quality adjusted life_year/

- 1 251 health economics/
 2
 3 252 (economic* adj4 (evaluat* or stud*)).ab,ti.
 4
 5 253 (health economic* adj4 (evaluat* or stud*)).ab,ti.
 6
 7 254 ((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
 8
 9 255 ((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
 10
 11 256 (CEA or CUA or CBA).ab,ti.
 12
 13 257 ((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
 14
 15 258 (economic* adj4 (impact or value or factor* or analys*)).ab,ti.
 16
 17 259 (cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit*
 18 or consequence* or unit*)).ab,ti.
 19
 20 260 (decision adj1 (tree* or analy* or model*)).ab,ti.
 21
 22 261 economics.fs.
 23
 24 262 (qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
 25
 26 263 (sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-
 27 adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
 28
 29 264 (markov* or monte carlo*).ab,ti.
 30
 31 265 or/248-264 [**cost effectiveness]
 32
 33 266 health care delivery/
 34
 35 267 integrated health care system/
 36
 37 268 health care planning/
 38
 39 269 health promotion/
 40
 41 270 health service/
 42
 43 271 integrative medicine/
 44
 45 272 case management/
 46
 47 273 (approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
 48
 49 274 barrier*.ab,ti.
 50
 51 275 facilitator*.ab,ti.
 52
 53 276 ((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or
 54 model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
 55
 56 277 implement*.ab,ti.
 57
 58 278 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
 59
 60 279 (model* adj care).ab,ti.

1 280 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or
2 intervention* or model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or
3 success* or constrain* or difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or
4 promot* or restrain* or restrict* or disincentive* or factor* or capacity or enabler*)).ab,ti.
5
6

7 281 (pathway* adj3 (clinical or care)).ab,ti.
8

9 282 (program* adj3 (assess* or evaluat*)).ab,ti.
10

11 283 or/266-282 [**implementation]
12

13 284 17 and 44 and 170
14

15 285 284 and (184 or 247 or 265 or 283)
16

17 286 limit 285 to (conference abstract or conference paper or "conference review" or editorial or letter)
18

19 287 285 not 286
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PsycINFO 1806

- 1 (baby or babies).ab,ti.
- 2 "newborn*".ab,ti.
- 3 (infant or infants).ab,ti.
- 4 (child or children*).ab,ti.
- 5 (adolescent* or adolescence).ab,ti.
- 6 (teen or teens or teenager).ab,ti.
- 7 (pediatric* or paediatric*).ab,ti.
- 8 (young adj3 (person* or people)).ab,ti.
- 9 emerging adult*.ab,ti.
- 10 "youth*".ab,ti.
- 11 or/1-10 [**pediatric population]
- 12 exp Back Pain/
- 13 Lumbar Spinal Cord/
- 14 Spinal Cord Injuries/
- 15 Spinal Column/
- 16 (back adj3 (ache* or injur* or pain*)).ab,ti.
- 17 (backache* adj3 (injur* or pain*)).ab,ti.
- 18 (back pain or back-pain).ab,ti.
- 19 (lumbar disc* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 20 (lumbar disk* adj3 (extruded or degenerat* or herniat* or prolapse* or sequestered or slipped)).ab,ti.
- 21 "low* back pain".ab,ti.
- 22 (lumbar adj3 (pain or facet or nerve root* or osteoarthritis or radicul* or spinal stenosis or spondylo* or zygapophys*)).ab,ti.
- 23 "Piriformis syndrome*".ab,ti.
- 24 radiculopathy.ab,ti.
- 25 (sacral adj2 pain*).ab,ti.
- 26 ((spine or spinal) adj4 (condition* or disable* or disabilit* or disorder* or pain or stenosis)).ab,ti.
- 27 spondylosis.ab,ti.
- 28 (thoracic adj4 (injur* or pain or spine or spinal)).ab,ti.
- 29 (T-spine or T-spinal).ab,ti.
- 30 or/12-29 [**back injuries]

1	31	Acupuncture/
2		
3	32	exp Behavior Therapy/
4		
5	33	exp Biofeedback/
6		
7	34	exp Cognitive Behavior Therapy/
8		
9	35	Alternative Medicine/
10		
11	36	Electrical Stimulation/
12		
13	37	Human Factors Engineering/
14		
15	38	exp Exercise/
16		
17	39	Movement Therapy/
18		
19	40	Shock Therapy/
20		
21	41	Heat/
22		
23	42	exp Hydrotherapy/
24		
25	43	Laser Irradiation/
26		
27	44	exp Magnetism/
28		
29	45	Massage/
30		
31	46	Client Education/
32		
33	47	Self-Care Skills/
34		
35	48	Physical Therapy/
36		
37	49	Self-Help Techniques/
38		
39	50	Physical Fitness/
40		
41	51	Vibration/
42		
43	52	acupressure.ab,ti.
44		
45	53	"acupunctur*".ab,ti.
46		
47	54	(advice or advise or advised).ab,ti.
48		
49	55	alexander technique.ab,ti.
50		
51	56	"assistive device*".ab,ti.
52		
53	57	"back belt*".ab,ti.
54		
55	58	"back school*".ab,ti.
56		
57	59	(back adj2 work).ab,ti.
58		
59	60	(braces or brace or bracing).ab,ti.
60		
	61	canes.ab,ti.
	62	chiropract*.ab,ti.

- 1 63 "cognitive behavioral therap*".ab,ti.
2
3 64 "cognitive behavioural therap*".ab,ti.
4
5 65 (cold adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
6
7 66 "core stabili*".ab,ti.
8
9 67 (corset or corsets).ab,ti.
10
11 68 crutches.ab,ti.
12
13 69 cryotherap*.ab,ti.
14
15 70 "deep tissue therap*".ab,ti.
16
17 71 diathermy.ab,ti.
18
19 72 (electric* adj3 (stimulation or EMS or heating pad*)).ab,ti.
20
21 73 electro-acupuncture.ab,ti.
22
23 74 (electrogalvanic stimulation or EGS).ab,ti.
24
25 75 (electromagnet* and (radiation or therap*)).ab,ti.
26
27 76 electromodalit*.ab,ti.
28
29 77 electrotherapy.ab,ti.
30
31 78 (exercise or exercises or exercising).ab,ti.
32
33 79 (flexion-distraction or flexion distraction).ab,ti.
34
35 80 fluidotherap*.ab,ti.
36
37 81 galvanic stimulation.ab,ti.
38
39 82 (H-Wave Device Stimulation or HWDS).ab,ti.
40
41 83 ((heat* or hot) adj3 (therap* or pack* or compress or massage or lamp or pad or bath or soak or tub or bottle or
42 superficial or therapeutic)).ab,ti.
43
44 84 (high energy shock wave* or high-energy shock wave* or HESW).ab,ti.
45
46 85 "hydrotherap*".ab,ti.
47
48 86 (ice adj3 (therap* or pack* or compress or massage or immersion or soak or treatment or therap*)).ab,ti.
49
50 87 "interferential current*".ab,ti.
51
52 88 infrared.ab,ti.
53
54 89 iontophoresis.ab,ti.
55
56 90 electroanalgesia.ab,ti.
57
58 91 ergonomic*.ab,ti.
59
60 92 kinesiotap*.ab,ti.
93 (laser* adj3 (phototherapy or irradiation or biostimulation or light or therap*)).ab,ti.

1	94	"low level laser*".ab,ti.
2		
3	95	"lumbar support*".ab,ti.
4		
5	96	(magnetic adj3 (necklace* or therap* or bracelet*)).ab,ti.
6		
7	97	(manipulat* adj3 (therap* or treatment* or spinal or osteopath*)).ab,ti.
8		
9	98	"manual therap*".ab,ti.
10		
11	99	Microcurrent Electrical Neuromuscular Stimulation.ab,ti.
12		
13	100	microwave*.ab,ti.
14		
15	101	((mobilisation or mobilization) adj4 (osteopath* or orthopedic* or orthopaedic* or lumbar or spinal)).ab,ti.
16		
17	102	"moist air bath*".ab,ti.
18		
19	103	moxibustion.ab,ti.
20		
21	104	((multimodal* or multi-modal* or multi modal*) adj4 (treatment* or approach or care or therap* or procedure* or package* or manage*)).ab,ti.
22		
23	105	muscle activation.ab,ti.
24		
25	106	"muscle energy technique*".ab,ti.
26		
27	107	myofascial release.ab,ti.
28		
29	108	(Neuromuscular Electrical Stimulation or NMES).ab,ti.
30		
31	109	orthotic*.ab,ti.
32		
33	110	"passive modalit*".ab,ti.
34		
35	111	(patient* adj3 (educat* or train*)).ab,ti.
36		
37	112	"Percutaneous Electric* Nerve Stimulation".ab,ti.
38		
39	113	(physical adj therap*).ab,ti.
40		
41	114	physiotherap*.ab,ti.
42		
43	115	photo-acupuncture.ab,ti.
44		
45	116	pillow*.ab,ti.
46		
47	117	pilates.ab,ti.
48		
49	118	(postur* adj3 (correct* or educat* or instruct* or train*)).ab,ti.
50		
51	119	(pulsed adj3 (electromagnetic or magnetic or radio frequency or energy)).ab,ti.
52		
53	120	radiant light.ab,ti.
54		
55	121	Russian stimulation.ab,ti.
56		
57	122	"seat adj cushion*".ab,ti.
58		
59	123	(self-manage* or self manage*).ab,ti.
60		
	124	(short wave* or short-wave*).ab,ti.

- 1 125 ((shockwave* or shock wave* or shock-wave*) adj3 (ultrasonic or therap* or radiation)).ab,ti.
- 2
- 3 126 "soft tissue therap*".ab,ti.
- 4
- 5 127 "spray and stretch".ab,ti.
- 6
- 7 128 strain-counterstrain.ab,ti.
- 8
- 9 129 strengthen*.ab,ti.
- 10
- 11 130 stretching.ab,ti.
- 12
- 13 131 (tape or taping).ab,ti.
- 14
- 15 132 thoracolumbosacral orthosis.ab,ti.
- 16
- 17 133 traction.ab,ti.
- 18
- 19 134 traditional Chinese medicine.ab,ti.
- 20
- 21 135 (transcutaneous electrical stimulation or TENS).ab,ti.
- 22
- 23 136 ultrasound.ab,ti.
- 24
- 25 137 vapocoolant spray.ab,ti.
- 26
- 27 138 "vibration therap*".ab,ti.
- 28
- 29 139 walkers.ab,ti.
- 30
- 31 140 "walking adj3 aid*".ab,ti.
- 32
- 33 141 "warm compress*".ab,ti.
- 34
- 35 142 whirlpool*.ab,ti.
- 36
- 37 143 yoga.ab,ti.
- 38
- 39 144 or/31-143 [**interventions]
- 40
- 41 145 Cohort Analysis/
- 42
- 43 146 Clinical Trials/
- 44
- 45 147 Longitudinal Studies/
- 46
- 47 148 exp Randomized Controlled Trials/
- 48
- 49 149 ((case control or case-control) adj3 (stud* or design*)).ab,ti.
- 50
- 51 150 (cohort adj3 (stud* or design* or analysis)).ab,ti.
- 52
- 53 151 controlled clinical trial.pt.
- 54
- 55 152 "epidemiolog*".ab,ti.
- 56
- 57 153 ((followup or follow-up) adj3 (stud* or design* or analysis)).ab,ti.
- 58
- 59 154 (longitudinal* adj3 (stud* or design* or analysis)).ab,ti.
- 60 155 (prospective adj3 (stud* or design* or analysis)).ab,ti.
- 156 (random* and (control* or clinical or allocat*)).ab,ti.

1	157	(retrospective adj3 (stud* or design*)).ab,ti.
2		
3	158	or/145-157 [**effectiveness]
4		
5	159	exp Attitudes/
6		
7	160	Awareness/
8		
9	161	Journal Writing/
10		
11	162	Emotions/
12		
13	163	Ethnology/
14		
15	164	Focus Group/
16		
17	165	Grounded Theory/
18		
19	166	Interviews/
20		
21	167	Mindfulness/ or Mindfulness-Based Interventions/
22		
23	168	Motivation/
24		
25	169	Narratives/
26		
27	170	exp Observation Methods/
28		
29	171	Perception/
30		
31	172	Preferences/
32		
33	173	Satisfaction/
34		
35	174	Qualitative Methods/
36		
37	175	Self-Report/
38		
39	176	Surveys/ or Questionnaires/
40		
41	177	exp Tape Recorders/
42		
43	178	Thinking/
44		
45	179	Digital Video/
46		
47	180	(attitude* or aware* or belief* or believe* or experience* or mindfulness or motivation or opinion* or perception* or perspective*).ab,ti.
48		
49	181	((audio adj record*) or audiorecord* or audiotap*).ab,ti.
50		
51	182	((behavioral or behavioural) adj2 research).ab,ti.
52		
53	183	biographical method*.ab,ti.
54		
55	184	(constant adj2 (comparative or comparison)).ab,ti.
56		
57	185	((content or conversation or discourse) adj2 analys*).ab,ti.
58		
59	186	descriptive research.ab,ti.
60		
	187	(diary or diaries).ab,ti.

1 188 emotions.ab,ti.
2
3 189 ethnograph*.ab,ti.
4
5 190 ethnology.ab,ti.
6
7 191 ethnopsychology.ab,ti.
8
9 192 feelings.ab,ti.
10
11 193 (field adj2 (notes or research or study or studies)).ab,ti.
12
13 194 (focus adj2 group*).ab,ti.
14
15 195 framework analysis.ab,ti.
16
17 196 grounded theory.ab,ti.
18
19 197 interview*.ab,ti.
20
21 198 life world.ab,ti.
22
23 199 lived experience.ab,ti.
24
25 200 (meaning or meanings).ab,ti.
26
27 201 (narrative* or narration*).ab,ti.
28
29 202 (observe* or observation*).ab,ti.
30
31 203 (open adj ended).ab,ti.
32
33 204 phenomenology.ab,ti.
34
35 205 purposive sampl*.ab,ti.
36
37 206 qualitative.ab,ti.
38
39 207 questionnaire*.ab,ti.
40
41 208 (realist adj3 (review* or research or synthesis)).ab,ti.
42
43 209 satisfaction.ab,ti.
44
45 210 self report*.ab,ti.
46
47 211 semantic analysis.ab,ti.
48
49 212 standpoint*.ab,ti.
50
51 213 (story or stories).ab,ti.
52
53 214 survey*.ab,ti.
54
55 215 (theme* or thematic).ab,ti.
56
57 216 (theoretical adj2 (sampl* or saturation)).ab,ti.
58
59 217 (thoughts or thinking).ab,ti.
60 218 ((video adj record*) or videorecord* or videotap*).ab,ti.
219 or/159-218 [** qualitative_experience]

1	220	"Costs and Cost Analysis"/
2		
3	221	Health Care Costs/
4		
5	222	Quality of Life Measures/
6		
7	223	Health Care Economics/
8		
9	224	(economic* adj4 (evaluat* or stud*)).ab,ti.
10		
11	225	(health economic* adj4 (evaluat* or stud*)).ab,ti.
12		
13	226	((cost-utility or cost utility) adj4 (stud* or analys*)).ab,ti.
14		
15	227	((cost-benefit or cost benefit) adj4 (stud* or analys*)).ab,ti.
16		
17	228	(CEA or CUA or CBA).ab,ti.
18		
19	229	((cost-effective* or cost effective*) adj4 (analys* or stud*)).ab,ti.
20		
21	230	(economic* adj4 (impact or value or factor* or analys*)).ab,ti.
22		
23	231	(cost* adj4 (health care or analys* or savings or hospital or medical or utilit* or effective* or efficac* or benefit* or consequence* or unit*)).ab,ti.
24		
25	232	(decision adj1 (tree* or analy* or model*)).ab,ti.
26		
27	233	[economics.fs.]
28		
29	234	(qol or qoly or qolys or hrqol or qaly or qalys or qale or qales).ab,ti.
30		
31	235	(sensitivity analys* or "willingness to pay" or quality-adjusted life year* or quality adjusted life year* or quality-adjusted life expectanc* or quality adjusted life expectanc*).ab,ti.
32		
33		
34	236	(markov* or monte carlo*).ab,ti.
35		
36	237	or/220-236 [**cost effectiveness]
37		
38	238	Health Care Delivery/
39		
40	239	Health Care Administration/
41		
42	240	Health Promotion/
43		
44	241	Integrated Services/
45		
46	242	Interdisciplinary Treatment Approach/
47		
48	243	Case Management/
49		
50	244	(approach* adj3 (collaborative or complementary or comprehensive or innovative or integrated)).ab,ti.
51		
52	245	barrier*.ab,ti.
53		
54	246	facilitator*.ab,ti.
55		
56	247	((health care or healthcare or health-care) adj3 (clinic or clinics or delivery or implement* or intervention* or model* or plan* or process* or program* or services or strateg* or system* or team*)).ab,ti.
57		
58	248	implement*.ab,ti.
59		
60		

- 1 249 (innovate* adj3 (intervention* or model* or plan* or process* or program* or strateg* or system*)).ab,ti.
- 2
- 3 250 (model* adj care).ab,ti.
- 4
- 5 251 ((integrated or interdisciplinary or interprofessional or multidisciplinary) adj3 (care or clinic or clinics or intervention* or
- 6 model* or plan* or process* or program* or strateg* or system* or challenge* or benefit* or success* or constrain* or
- 7 difficult* or enhanc* or influen* or interfer* or motivat* or obstruct* or problem* or promot* or restrain* or restrict* or
- 8 disincentive* or factor* or capacity or enabler*)).ab,ti.
- 9
- 10
- 11 252 (pathway* adj3 (clinical or care)).ab,ti.
- 12
- 13 253 (program* adj3 (assess* or evaluat*)).ab,ti.
- 14
- 15 254 or/238-253 [**implementation]
- 16
- 17 255 11 and 30 and 144
- 18
- 19 256 limit 255 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 20 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 21 adolescence <age 13 to 17 yrs>))
- 22
- 23 257 255 and (158 or 219 or 237 or 254)
- 24
- 25 258 limit 257 to (childhood <birth to 12 years> and (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1
- 26 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200
- 27 adolescence <age 13 to 17 yrs>))
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Additional file 3: Risk of bias assessment according to study design

Quantitative studies (SIGN checklists)		
Randomized controlled trials	Cohort studies	Case-control studies
1. The study addresses an appropriate and clearly focused question.	1. The study addresses an appropriate and clearly focused question.	1. The study addresses an appropriate and clearly focused question.
2. The assignment of subjects to treatment groups is randomised.	2. The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.	2. The cases and controls are taken from comparable populations.
3. An adequate concealment method is used.	3. The study indicates how many of the people asked to take part did so, in each of the groups being studied.	3. The same exclusion criteria are used for both cases and controls.
4. The design keeps subjects and investigators 'blind' about treatment allocation.	4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.	4. What percentage of each group (cases and controls) participated in the study?
5. The treatment and control groups are similar at the start of the trial.	5. What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed.	5. Comparison is made between participants and non-participants to establish their similarities or differences.
6. The only difference between groups is the treatment under investigation.	6. Comparison is made between full participants and those lost to follow up, by exposure status.	6. Cases are clearly defined and differentiated from controls.
7. All relevant outcomes are measured in a standard, valid and reliable way.	7. The outcomes are clearly defined.	7. It is clearly established that controls are non-cases
8. What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	8. The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable.	8. Measures will have been taken to prevent knowledge of primary exposure influencing case ascertainment
9. All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	9. Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome.	9. Exposure status is measured in a standard, valid and reliable way
10. Where the study is carried out at more than one site, results are comparable for all sites.	10. The method of assessment of exposure is reliable.	10. The main potential confounders are identified and taken into account in the design and analysis
	11. Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable.	11. Confidence intervals are provided
	12. Exposure level or prognostic factor is assessed more than once.	
	13. The main potential confounders are identified and taken into account in the design and analysis.	

	14. Have confidence intervals been provided?	
Mixed methods studies (MMAT)		
Qualitative:		
1. Is the qualitative approach appropriate to answer the research question?		
2. Are the qualitative data collection methods adequate to address the research question?		
3. Are the findings adequately derived from the data?		
4. Is the interpretation of results sufficiently substantiated by data?		
5. Is there coherence between qualitative data sources, collection, analysis and interpretation?		
Quantitative randomized controlled trials:		
1. Is randomization appropriately performed?		
2. Are the groups comparable at baseline?		
3. Are there complete outcome data?		
4. Are outcome assessors blinded to the intervention provided?		
5. Did the participants adhere to the assigned intervention?		
Quantitative non-randomized:		
1. Are the participants representative of the target population?		
2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?		
3. Are there complete outcome data?		
4. Are the confounders accounted for in the design and analysis?		
5. During the study period, is the intervention administered (or exposure occurred) as intended?		
Quantitative descriptive:		
1. Is the sampling strategy relevant to address the research question?		
2. Is the sample representative of the target population?		
3. Are the measurements appropriate?		
4. Is the risk of nonresponse bias low?		
5. Is the statistical analysis appropriate to answer the research question?		
Mixed methods:		
1. Is there adequate rationale for using a mixed methods design to address the research question?		
2. Are the different components of the study effectively integrated to answer the research question?		
3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?		
4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?		
5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?		
Qualitative studies (JBI)		
1. Is there congruity between the stated philosophical perspective and the research methodology?		
2. Is there congruity between the research methodology and the research question or objectives?		
3. Is there congruity between the research methodology and the methods used to collect data?		
4. Is there congruity between the research methodology and the representation and analysis of data?		
5. Is there congruity between the research methodology and the interpretation of results?		
6. Is there a statement locating the researcher culturally or theoretically?		
7. Is the influence of the researcher on the research, and vice-versa, addressed?		
8. Are participants, and their voices, adequately represented?		
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?		
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?		
Economic evaluations (Drummond checklist)		
1. Was a well-defined question posed in an answerable form?		
2. Was a comprehensive description of the competing alternatives given?		
3. Was the effectiveness of the programmes or services established?		
4. Were all the important and relevant costs and consequences for each alternative identified?		
5. Were cost and effects measured accurately in appropriate physical units (e.g., QALYs)?		
6. Were costs and effects valued credibly?		
7. Were cost and effects adjusted for differential timing?		
8. Was an incremental analysis of cost and effects of alternatives performed?		

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|---|
| 9. Were allowances made for uncertainty in the estimates of cost and effects?
10. Did the presentation and discussion of study results include all issues of concern to users? |
|---|

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Drummond checklist: (Drummond M et al. Methods for the economic evaluation of health care programmes. Oxford: Oxford University Press, 2015). **JBI checklist:** Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research (JBI Manual for Evidence Synthesis. Appendix 2.1: <https://wiki.joannabriggs.org/display/MANUAL/Appendix+2.1%3A+JBI+Critical+Appraisal+Checklist+for+Qualitative+Research>). **MMAT:** Mixed Methods Appraisal Tool, version 18 (Hong QN, Pluye P, Fàbreques S, Bartlett G, Boardman F, Cargo M, Dagenais P, Gagnon M-P, Griffiths F, Nicolau B, O’Cathain A, Rousseau M-C, Vedel I. Mixed Methods Appraisal Tool (MMAT), version 2018. Registration of Copyright (#1148552, Canadian Intellectual Property Office, Industry Canada). **SIGN checklists:** Scottish Intercollegiate Guidelines Network checklists <https://www.sign.ac.uk/checklists-and-notes>