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Interventions for the Management of Acute and Chronic Low Back Pain: Revision 2021

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association

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Summary of Recommendations

EXERCISE FOR ACUTE LOW BACK PAIN

C Physical therapists can use exercise training interventions, including specific trunk muscle activation, for patients with acute low back pain (LBP).

EXERCISE FOR ACUTE LOW BACK PAIN WITH LEG PAIN

B Physical therapists may use exercise training interventions, including trunk muscle strengthening and endurance and specific trunk muscle activation, to reduce pain and disability for patients with acute LBP with leg pain.

EXERCISE FOR CHRONIC LOW BACK PAIN

A Physical therapists should use exercise training interventions, including trunk muscle strengthening and endurance, multimodal exercise interventions, specific trunk muscle activation exercise, aerobic exercise, aquatic exercise, and general exercise, for patients with chronic LBP.

B Physical therapists may provide movement control exercise or trunk mobility exercise for patients with chronic LBP.

EXERCISE FOR CHRONIC LOW BACK PAIN WITH LEG PAIN

B Physical therapists may use exercise training interventions, including specific trunk muscle activation and movement control, for patients with chronic LBP with leg pain.

EXERCISE FOR CHRONIC LOW BACK PAIN WITH MOVEMENT CONTROL IMPAIRMENT

A Physical therapists should use specific trunk muscle activation and movement control exercise for patients with chronic LBP and movement control impairment.

EXERCISE FOR CHRONIC LOW BACK PAIN IN OLDER ADULTS

A Physical therapists should use general exercise training to reduce pain and disability in older adults with chronic LBP.

EXERCISE FOR POSTOPERATIVE LOW BACK PAIN

C Physical therapists can use general exercise training for patients with LBP following lumbar spine surgery.

MANUAL AND OTHER DIRECTED THERAPIES FOR ACUTE LOW BACK PAIN

A Physical therapists should use thrust or nonthrust joint mobilization to reduce pain and disability in patients with acute LBP.

B Physical therapists may use massage or soft tissue mobilization for short-term pain relief in patients with acute LBP.

MANUAL AND OTHER DIRECTED THERAPIES FOR CHRONIC LOW BACK PAIN

A Physical therapists should use thrust or nonthrust joint mobilization to reduce pain and disability in patients with chronic LBP.

B Physical therapists may use thrust or nonthrust joint mobilization to reduce pain and disability in patients with chronic LBP with leg pain.

B Physical therapists may use soft tissue mobilization or massage in conjunction with other treatments to reduce pain and disability in the short term for patients with chronic LBP.

C Physical therapists can consider the use of dry needling in conjunction with other treatments to reduce pain and disability in the short term for patients with chronic LBP.

B Physical therapists may use neural mobilization in conjunction with other treatments for short-term improvements in pain and disability in patients with chronic LBP with leg pain.

D Physical therapists should not use mechanical traction for patients with chronic LBP with leg pain, based on the lack of benefit when added to other interventions.

CLASSIFICATION SYSTEMS FOR ACUTE LOW BACK PAIN

B Physical therapists may use treatment-based classification (TBC) to reduce pain and disability in patients with acute LBP. This recommendation is unchanged from the 2012 clinical practice guideline.

C Physical therapists can use Mechanical Diagnosis and Therapy (MDT) to reduce pain and disability in patients with acute LBP.

CLASSIFICATION SYSTEMS FOR CHRONIC LOW BACK PAIN

B Physical therapists may use MDT, prognostic risk stratification, or pathoanatomic-based classification to reduce pain and disability in patients with chronic LBP.

C Physical therapists can use TBC, cognitive functional therapy, or movement system impairment to reduce pain and disability in patients with chronic LBP.

EDUCATION FOR ACUTE LOW BACK PAIN

B Physical therapists may use active education strategies rather than passive strategies (ie, providing access to educational materials only). Active education strategies include one-on-one education on the biopsychosocial contributors to pain and self-management techniques, such as remaining active, pacing strategies, and back-protection techniques. Physical therapists may also incorporate counseling on the favorable natural history of acute LBP as part of the education strategy.

EDUCATION FOR CHRONIC LOW BACK PAIN

B Physical therapists may use standard education strategies for patients with chronic LBP, but not as a stand-alone treatment. Standard education strategies include advice related to exercise and advice about staying active.

A Physical therapists should deliver pain neuroscience education alongside other physical therapy interventions, such as exercise or manual therapy, to patients with chronic LBP.

A Physical therapists should use active treatments (ie, yoga, stretching, Pilates, and strength training) instead of stand-alone educational interventions for patients with chronic LBP.

EDUCATION FOR POSTOPERATIVE LOW BACK PAIN

B Physical therapists may use general education (ie, post-surgical precautions, exercise, and resuming physical activity) for patients with LBP following lumbar spine surgery. This recommendation applies to those undergoing discectomy or decompression surgery. No specific recommendation is provided for education for patients undergoing other surgical procedures (eg, spinal fusion) due to lack of evidence.

List of Abbreviations

AMSTAR: A MeaSurement Tool to Assess Systematic Reviews
AOPT: Academy of Orthopaedic Physical Therapy
APTA: American Physical Therapy Association
CFT: cognitive functional therapy
CI: confidence interval
CPG: clinical practice guideline
ICD: International Classification of Diseases
ICF: International Classification of Functioning, Disability and Health
***JOSPT**: Journal of Orthopaedic & Sports Physical Therapy*
LBP: low back pain
MDT: Mechanical Diagnosis and Therapy
MSI: movement system impairment
NPRS: numeric pain-rating scale
ODI: Oswestry Disability Index
PA: posterior to anterior
PEDro: Physiotherapy Evidence Database
PNE: pain neuroscience education
RCT: randomized clinical trial
RMDQ: Roland-Morris Disability Questionnaire
SMD: standardized mean difference
TBC: treatment-based classification
VAS: visual analog scale

Introduction

Low back pain (LBP) remains a musculoskeletal condition with an adverse societal impact. Globally, LBP is highly prevalent and a leading cause of disability.[137] In the United States, LBP remains one of the most common reasons to seek health care and, along with neck pain, is the medical condition associated with the highest overall costs.[45,50] Surgical cases are the costliest per care episode, but the majority of spending on LBP management can be attributed to the significantly larger volume of nonoperative care episodes.[89] Costs for LBP are escalating at a faster pace than overall health care spending and come with no evidence suggesting that there are improved outcomes (ie, reduced pain or disability) at a societal level.[45] In fact, a population-based study has suggested that rates of chronic LBP have been increasing during this period of escalating costs.[56]

In 2018, a series of articles in the *Lancet* called attention to the high priority of improving the quality of care for operative and nonoperative LBP management.[29,54,72] Reducing variability of care to better represent evidence-informed approaches is one way quality of care could improve for LBP. Clinical practice guidelines (CPGs) can serve as an important resource in the process of improving quality of care for LBP by synthesizing existing evidence and providing recommendations for evidence-informed treatment options. This information can then be used to assist individual providers with

clinical decision making and to encourage health systems to develop clinical pathways that structure care delivery that is aligned with CPG recommendations.[64] The development of CPGs for LBP is important, but admittedly only the start of improving patient care. Delivering guideline-adherent treatment as part of routine clinical practice remains a continuing challenge for physical therapists.[172,173]

SCOPE AND RATIONALE

Rationale

This is an update to the 2012 Academy of Orthopaedic Physical Therapy (AOPT), formerly the Orthopaedic Section of the American Physical Therapy Association (APTA), CPG for LBP.[38] The 2012 guidelines made recommendations for LBP that encompassed a broad scope, including risk factors, clinical course, diagnosis/classification, differential diagnosis, examination, and interventions. Several key considerations guided the 2021 update (see box below). Since 2012, many additional CPGs for LBP have been published, and the primary literature related to LBP has expanded exponentially. The proliferation of CPGs has resulted in convergent recommendations for topic areas included in the 2012 AOPT LBP CPG. For example, a 2020 review of 11 high-quality musculoskeletal pain CPGs (including 4 for LBP) identified consistent best-practice recommendations to (1) ensure care is patient centered, (2) screen for red flag conditions, (3) assess psychosocial factors, (4) use imaging selectively, (5) undertake a physical examination to assess impairments, (6) monitor patient progress, (7) provide education and evidence-based information as a treatment supplement, (8) incorporate physical activity/exercise, (9) use manual therapy only as an adjunct to other active treatments, (10) offer high-quality, nonsurgical care prior to surgery, and (11) try to keep patients at work.[100] An in-press review of 5 high-quality CPGs for LBP produced a synthesis of 13 very similar recommendations for screening, assessment, and treatment approaches.[101] This consistency of recommendations for LBP across diagnosis, differential diagnosis, and examination was helpful in supporting the decision to de-emphasize these topic areas for the updated AOPT CPG for LBP. That is, a decision to focus the 2021 update on treatments was made because diagnosis, differential diagnosis, and examination recommendations are well covered in other guidelines.

CONSIDERATIONS FOR THE 2021 CPG UPDATE

- Recommendations focused on interventions: while there are many other CPGs for LBP, none specifically addresses interventions commonly used by physical therapists
- This CPG excluded studies in which interventions were not provided by physical therapists or in care settings that did not include physical therapists
- Recommendations were made for specific subgroups (eg, acute or chronic, leg pain, and postoperative care) as allowed by the available literature
- Recommendations were further differentiated with World Health Organization ICF terminology as study eligibility criteria allowed
- This CPG includes interventions not considered in the 2012 CPG (eg, dry needling, cognitive functional therapy, and pain neuroscience education)
- This CPG includes randomized trials published before July 1, 2020. Thus, these guidelines cannot account for any more recent individual studies, systematic reviews, or meta-analyses that could impact recommendations

Abbreviations: CPG, clinical practice guideline; ICF, International Classification of Functioning, Disability and Health; LBP, low back pain.

The importance of nonpharmacologic treatments is another development directly relevant to the 2021 update's focus on treatments. Since the 2012 CPG, recommendations have been made for nonpharmacologic interventions as first-choice treatments for chronic pain conditions and LBP, as opposed to commonly prescribed pharmacologic treatments like opioids.[47,131] However, these recommendations are made broadly, without providing guidance on differentiating the levels of evidence for specific nonpharmacologic treatments.[47,100,131] Accordingly, this AOPT CPG update focused on synthesizing new evidence, with the purpose of making recommendations for specific nonpharmacologic treatments.

Scope

Therefore, the overall objective of the 2021 LBP CPG update was to provide recommendations on interventions delivered by physical therapists or studied in care settings that included physical therapy providers. The health question covered by this CPG was to determine which interventions could be recommended for their potential in providing effective pain relief, functional improvement, and/or disability reduction (ie, the primary outcomes for this CPG). The interventions in the 2021 CPG were reviewed in 1 of the following categories: (1) exercise, (2) manual and other directed therapies, (3) classification systems, and (4) patient education. Our primary goal was to make this CPG update applicable to physical therapists practicing globally, and, as such, our literature search was not limited to studies originating in the United States. We acknowledge that there are likely to be differences in factors that influence care delivery for LBP that influence the applicability of these recommendations. For example, differences in health systems, cultural norms, and social determinants of health could all influence the application of these recommendations. Physical therapists are the intended primary audience, but other stakeholders (eg, patients, the public, other provider types, policy makers, and payers) may

find application in the 2021 CPG update if there is interest in defining evidence-informed care for LBP.

STATEMENT OF INTENT

The 2021 LBP CPG update is not intended to be construed or serve as a standard of medical care. Standards of care are determined on the basis of all clinical data available for an individual patient and are subject to change as scientific knowledge and technology advance and patterns of care evolve. The parameters of practice described in this CPG should be considered as guidelines only. Adherence to them will not ensure a successful outcome in every patient, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care. The ultimate judgment regarding a particular clinical procedure or treatment plan must be made based on clinician experience and expertise in light of the clinical presentation of the patient, in addition to the available evidence, available diagnostic and treatment options, and the patient's values, expectations, and preferences. However, we suggest that the rationale for significant departures from accepted guidelines be documented in the patient's medical records at the time the relevant clinical decision is made.

Methods

Committee members for this CPG update were selected by the AOPT based on content expertise in LBP. The committee was charged with performing a systematic review and evaluation of the literature to produce an updated evidence synthesis for LBP interventions. Meta-analysis of the extracted literature was not performed because it was considered outside the scope of a CPG update. The scope of this update was to consider all relevant literature that has been published since the search for the 2012 CPG. A large body of LBP literature was anticipated, and the committee was subdivided into 4 focus groups, with each category led by a content expert. The 4 intervention categories for this CPG update included (1) exercise, (2) manual and other directed therapies, (3) classification systems, and (4) patient education.

Committee members were required to submit conflict-of-interest forms to the AOPT as a condition of authorship. Funding and support for CPG development were provided through the APTA (CPG grant) and the AOPT, as well as support from a dedicated librarian through Duke University. These sponsors did not have any influence over the recommendations in this updated CPG. The development of the final CPG was guided by an expert in CPG development, following standards set by the Institute of Medicine and the APTA Clinical Practice Guideline Process Manual.

LITERATURE SEARCH

A research librarian with experience in systematic reviews updated the original searches that had been completed in 2010 for the 2012 CPG. An initial literature search for this CPG was performed in 2016, a revised search was completed early in 2020, and the final search was completed in June 2020. The literature searches completed in 2020 used a more inclusive list of search terms and removed duplicates from the 2016 search results. Several additional key words and subject headings were included to increase comprehensiveness of the final search. For example, key word synonyms for back pain such as "back ache" and "back strain" were added to all searches, and new concepts such as treatment-based classification (TBC), multidimensional clinical framework, and cognitive functional therapy (CFT) were added to the classification search. All searches were limited by a filter to include only randomized clinical trials (RCTs), systematic reviews, CPGs, and meta-analyses.

The final search strategy consisted of a total of 8 subsearches, based on the aforementioned 4 intervention categories. Multiple subsearches were necessary for the larger treatment categories of exercise and manual and other directed therapies, following the previous LBP CPG search strategy. Exercise subsearches included centralization, progressive endurance, and trunk coordination, while subsearches for manual and other directed therapies included manual therapies, traction, and mobilization. The final search was conducted on June 25, 2020, with no date or language limitations, to capture any new articles based on the addition of updated search terms. Each search was conducted in MEDLINE via PubMed, Embase (via Elsevier), CINAHL Complete (via EBSCOHost), and the Cochrane Library. The 4 sets of search results were compiled in separate EndNote X9 (Clarivate Analytics, Philadelphia, PA) libraries before they were added to a Covidence (Veritas Health Innovation Ltd, Melbourne, Australia) project that contained search results from the 2016 update, which allowed Covidence to deduplicate across all searches and filter to a unique set of articles for screening. Additional information on the search strategies is included in **APPENDIX A** (available at www.jospt.org). EndNote, Covidence, and Excel (Microsoft Corporation, Redmond, WA) were used to manage literature searches, coordinate article selection, and complete critical appraisals. The search results are presented in **APPENDIX B** (available at www.jospt.org). Four PRISMA figures that

describe the results of the literature search for each of the intervention categories are included in **APPENDIX C** (available at www.jospt.org).

EVIDENCE SELECTION

The evidence-selection process is summarized in **FIGURE 1** and described in more detail in the subsequent sections.

Title and Abstract Screening and Review of Full-Text Articles

Title and abstract screening and full-text article reviews were independently conducted, using prespecified inclusion and exclusion criteria, by 2 team members. Reviewers followed inclusion and exclusion criteria from the 2012 CPG for inclusion in the 2021 CPG update (**APPENDIX D**, available at www.jospt.org). Conflicts were resolved by a third team member and discussed with content experts as needed.

Extraction

For each extracted full-text article, 2 reviewers evaluated article quality using the Physiotherapy Evidence Database (PEDro) scale for RCTs and the A MeaSurement Tool to Assess Systematic Reviews (AMSTAR) for systematic reviews. The PEDro scale rates 10 internal validity criteria from a Delphi list for assessing RCT quality.[164] The AMSTAR rates 11 different criteria for methodological quality in systematic reviews.[146] Any conflicts regarding PEDro scale and AMSTAR scores were resolved by the 2 reviewers assigned to the same article. Disagreements unable to be resolved were discussed with the CPG lead author to arrive at the final decision on article score.

LEVELS OF EVIDENCE

The level-of-evidence table (**TABLE 1**) used for the 2021 CPG update is provided below, and summary information is in **APPENDIX E** (available at www.jospt.org). Given the size of the body of LBP literature, the committee made the decision to include all systematic reviews but only higher-quality RCTs (PEDro scale score, 6 or greater) in the 2021 update. Thus, the strength of evidence for all recommendations in this CPG is either I or II. The distinction between level I and II evidence was made by focus group members for each intervention category. Because all studies included in this CPG had PEDro scale scores of 6 or greater, the distinction between level I and II evidence was primarily based on number of studies for a given treatment (level I, multiple individual RCTs or systematic reviews/meta-analyses), sample size of individual RCTs (level I, larger sample size), and length of

TABLE 1 Levels of Evidence

I	Evidence obtained from high-quality diagnostic studies, prospective studies, randomized controlled trials, or systematic reviews
II	Evidence obtained from lesser-quality diagnostic studies, prospective studies, systematic reviews, or randomized controlled trials (eg, weaker diagnostic criteria and reference standards, improper randomization, no blinding, less than 80% follow-up)
III	Case-control studies or retrospective studies
IV	Case series
V	Expert opinion

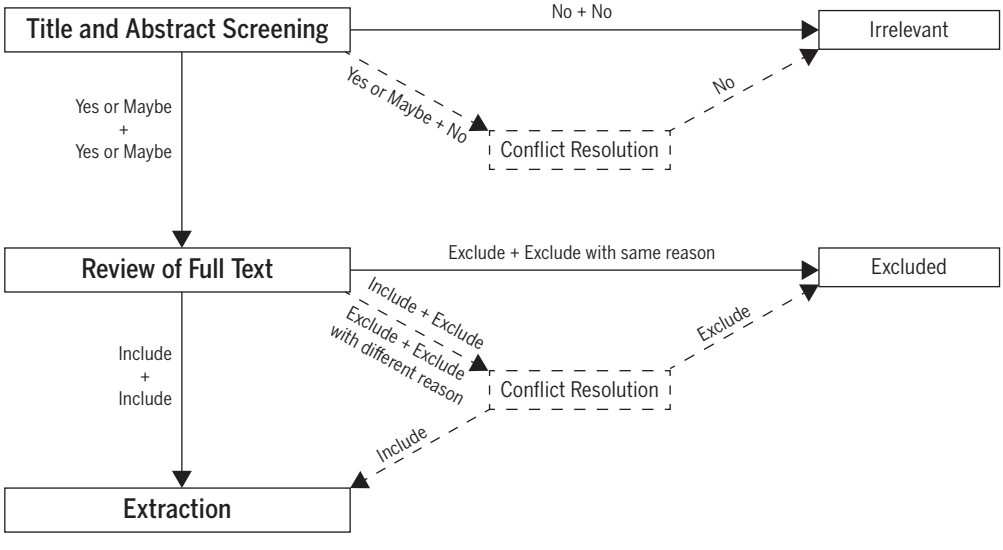

FIGURE 1. The evidence-selection process started with title and abstract screening and included input from 2 reviewers. Titles and abstracts that were rated as "no" by both reviewers were excluded (ie, irrelevant source). Titles and abstracts that were rated as "yes" or "maybe" by both reviewers were moved forward to full-text review. Disagreements on ratings were resolved before a final decision was made. A similar process occurred during the full-text review, resulting in articles being extracted that were rated as "include" by both reviewers. Adapted from the Covidence Knowledge Base (https://support.covidence.org/help/how-references-move-through-a-review, accessed June 25, 2020).

follow-up times (level I, short- and long-term follow-ups). Disagreements on evidence level were resolved by additional discussion until consensus was reached.

STRENGTH OF EVIDENCE AND RECOMMENDATIONS

The strength of recommendations was then given a grade to reflect the confidence in and impact of the included evidence. The strength of recommendation was based on the evidence grade from the 2012 CPG (if available) and the composition of level I and level II studies from the updated literature. Our literature search was limited to RCTs, and there were very few examples of clear superiority for treatment options. Therefore, we modified the language used to avoid any "must" recommendations. Instead, we framed recommendations to range from "should" (grade A) to "should not" (grade D). These grades and how they were determined are summarized in **TABLE 2**. Further information related to evidence grading is available online (www.orthopt.org).

TABLE 2 Grades of Recommendation

Grades of Recommendation		Strength of Evidence	Level of Obligation
A	Strong evidence	A preponderance of level I and/or level II studies support the recommendation. This must include at least 1 level I study	Should
B	Moderate evidence	A single high-quality randomized controlled trial or a preponderance of only level II studies support the recommendation. This included studies with short-term follow-up (eg, 3 months or less) and smaller sample sizes (eg, fewer than 100 participants)	May
C	Weak evidence	A single level II study supports the recommendation	Can
D	Conflicting or no evidence	Level I and/or level II studies disagree with respect to their conclusions or provide no evidence of benefit	Should not

PATIENT SUBGROUPS

Patient subgroups were included in the 2021 CPG update to allow for refinement of clinical recommendations. The 2012 CPG[38] differentiated acute, subacute, and chronic LBP; however, the 2021 CPG update only differentiates acute from chronic LBP. This decision was based on the lack of an accepted standard for definitions of subacute pain. Since 2012, there have been operational definitions for chronic LBP reported (eg, the National Institutes of Health Task Force on research standards for chronic LBP and the International Classification of Diseases [ICD], 11th revision).[42,120] The committee decided it would be more practical and consistent with the existing literature to only differentiate acute from chronic LBP in the 2021 CPG update. Additionally, we differentiated presence of leg pain, older adults, and postoperative LBP as study eligibility criteria allowed. Therefore, the patient subgroups in the 2021 CPG update were:

- Acute or chronic LBP
  - Studies that specifically recruited patients with symptoms for less than or equal to 6 weeks were grouped as acute LBP (ie, this was clearly indicated in the eligibility criteria). All other studies were classified as chronic LBP
- LBP with leg pain
  - Studies that specifically recruited patients with LBP, buttock pain, and/or symptoms extending into the leg (above or below the knee) were grouped as LBP with leg pain (ie, this was clearly indicated in the eligibility criteria)
- LBP in older adults
  - Studies that specifically recruited patients with LBP who were aged 60 years or older
- Postoperative LBP
  - Studies that intentionally recruited patients having surgery for LBP in conjunction with the treatment of interest were grouped as postoperative LBP (ie, this was clearly indicated in the eligibility criteria). Studies that included patients with a history of surgery for LBP were included in other subgroups as indicated (eg, in chronic LBP if meeting the symptom duration criterion)

INTERNATIONAL CLASSIFICATION OF FUNCTION

An International Classification of Functioning, Disability and Health (ICF) LBP category was included with the recommendation when a study provided enough information in the eligibility criteria. This information was presented to be consistent with the 2012 CPG and to match recommendations to the current CPG's ICF system. Briefly, the rationale for including an ICF category is that it provides additional signs and symptoms to support clinical decision making at the individual patient level. The ICF subgroups in this updated CPG remain unchanged from the 2012 version, except for omitting the subacute group. Refer to the 2012 CPG[38] for more details on ICF categories for LBP.

CLASSIFICATION CODES

There have been no changes in ICD-10 codes that would impact the 2021 CPG update. Therefore, this part of the CPG was not updated or revised, as ICD-10 codes were part of the 2012 CPG. There is a transition planned to ICD-11 codes, which will include coding for primary chronic pain and secondary chronic pain conditions (eg, musculoskeletal).[120,125] Changes to the ICD-11 codes are likely to be included in a future CPG update, as we expect that the opportunity to directly code chronic pain will have a noticeable impact on clinical classification of LBP.

TREATMENT DESCRIPTION

It was outside the scope of the 2021 CPG update to provide detailed descriptions for each of the individual treatments included in RCTs. However, for the intervention categories with many different treatment approaches (ie, exercise, manual and other directed therapies), we provide operational definitions that summarized key treatment characteristics. These intervention category sections include a table providing the treatments and their supporting operational definitions.

GUIDELINE REVIEW PROCESS AND VALIDATION

Drafts of the CPG update were reviewed by multiple stakeholder groups to ensure that the goals and priorities of this publication were appropriately developed. Stakeholder groups include additional health care providers and organizations, consumers, patient representatives, and experts in physical therapy practice guideline methodology. The AOPT provides a network of external stakeholders who regularly participate in formal reviews of CPGs, including consumer/patient representatives and claims reviewers, medical coding experts, academic educators, clinical educators, physician specialists, and researchers. The guideline draft was also posted for public comment and review on www.orthopt.org, and a notification of this posting was sent to the members of the AOPT. All comments, suggestions, and feedback from the expert reviewers, the public, and consumer/patient representatives were provided to the authors and editors for consideration and revisions. Additional health care providers who reviewed this CPG methodology and publication include physical therapists and assistants, physicians and assistants, and chiropractors. Acknowledgments of external stakeholders and reviewers are provided at the end of the CPG.

There is an annual review of the AOPT CPG performed by experts in physical therapy practice guideline methodology. This review provides feedback to the CPG coordinator and editors to continue to improve and develop APTA guidelines.

DISSEMINATION AND IMPLEMENTATION TOOLS

The APTA developed a process of endorsing CPGs to increase the reach and adoption of evidence-based practice information. The updated CPG will also be presented at the next Combined Sections Meeting in 2022. Future plans for dissemination include other educational conferences and webinars for clinicians.

In addition to publishing these guidelines in the *Journal of Orthopaedic & Sports Physical Therapy* (*JOSPT*), these guidelines will be posted on CPG areas of the JOSPT, AOPT, and APTA websites, and made available for free (open access) on the ECRI Guidelines Trust (guidelines.ecri.org) and the PEDro (https://pedro.org.au/) websites. The implementation tools planned to be available for patients, clinicians, educators, payers, policy makers, and researchers, and the associated implementation strategies, are listed in **TABLE 3**.

ORGANIZATION OF THE GUIDELINE

Recommendations and accompanying evidence statements are presented in separate sections for (1) exercise, (2) manual and other directed therapies, (3) classification systems, and (4) patient education. Each section has the same format. First, the 2012 CPG recommendations are reviewed, then a review of the literature supporting the 2021 updated recommendation is provided, and finally a distillation of the evidence is presented to summarize recommendations. Please see the recommendation guidance for key elements.

TABLE 3 Planned Strategies and Tools to Support the Dissemination and Implementation of This CPG

Tool	Strategy
JOSPT's "Perspectives for Patients" and/or "Perspectives for Practice" articles	Patient-oriented guideline summary available on www.jospt.org
Mobile app of guideline-based exercises for patient/clients and health care practitioners	Marketing and distribution of app via www.orthopt.org
Clinician's Quick-Reference Guide	Summary of guideline recommendations available on www.orthopt.org
JOSPT's Read for Credit℠ continuing education units	Continuing education units available for physical therapists and athletic trainers on www.jospt.org
Webinars and educational offerings for health care practitioners	Guideline-based instruction available for practitioners on www.orthopt.org
Mobile and web-based app of guideline for training of health care practitioners	Marketing and distribution of app via www.orthopt.org

CLINICAL PRACTICE GUIDELINES

Intervention: Exercise

EVIDENCE STATEMENTS AND RECOMMENDATIONS

2012 Recommendations

The 2012 recommendations were not divided by patient subgroup (eg, they did not include separate recommendations for acute and chronic LBP).

Progressive Endurance Exercise and Fitness Activities

A

Physical therapists should consider (1) moderate- to high-intensity exercise for patients with chronic LBP without generalized pain, and (2) incorporating progressive, low-intensity, submaximal fitness and endurance activities into pain management and health promotion strategies for patients with chronic LBP with generalized pain.

Trunk Coordination, Strengthening, and Endurance Exercises

A

Physical therapists should consider utilizing trunk coordination, strengthening, and endurance exercises to reduce LBP and disability in patients with subacute and chronic LBP with movement coordination impairments and in patients post lumbar microdiscectomy.

Centralization and Directional Preference Exercises and Procedures

A

Physical therapists should consider utilizing repeated movements, exercises, or procedures to promote centralization to reduce symptoms in patients with acute LBP with related (referred) lower extremity pain. Physical therapists should consider using repeated exercises in a specific direction determined by treatment response to improve mobility and reduce symptoms in patients with acute, subacute, or chronic LBP with mobility deficits.

Flexion Exercises

C

Physical therapists can consider flexion exercises, combined with other interventions such as manual therapy, strengthening exercises, nerve mobilization procedures, and progressive walking, for reducing pain and disability in older patients with chronic LBP with radiating pain.

Exercise training interventions were categorized using the operational definitions displayed in **TABLE 4**.

EVIDENCE UPDATE

Based on the results of our literature search, the 2021 update will include some of the same, but also different, treatment categories as did the 2012 CPG.

EXERCISE TRAINING FOR ACUTE LBP

General Exercise Training

II

Aluko et al[7] compared 6 weeks of specific trunk muscle activation exercises added to a trunk strengthening and endurance exercise program with the exercise program alone in 33 participants with acute LBP. This RCT reported no between-group differences at assessments conducted 3, 6, and 12 weeks after enrollment.

TABLE 4 Operational Definitions for Exercise

Intervention	Operational Definition
Trunk muscle strengthening and endurance exercise	Exercise training prescribed to restore or improve strength, endurance, or power of trunk muscles or muscle groups
Specific trunk muscle activation exercise	Exercise training prescribed to target specific deep trunk muscles (eg, transversus abdominis, multifidus) using cocontraction to alter or restore control or coordination of the lumbopelvic region
Movement control exercise	Exercise training prescribed to alter, restore, or retrain control of functional movements and tasks, with feedback on movement patterns
General exercise	Exercise training prescribed to restore or improve overall strength or endurance of the major muscle groups of the upper/lower extremities and trunk, including exercises for flexibility/mobility and aerobic/conditioning exercises
Trunk mobility exercise	Exercise training prescribed to restore trunk range of motion or to repeatedly move the trunk in a specific direction to achieve a reduction of symptoms
Aerobic exercise	Exercise training prescribed to restore or enhance capacity or efficiency of the cardiovascular system
Multimodal exercise	Exercise training that combines 2 or more of the interventions described above

Evidence Synthesis and Rationale

There is a lack of RCTs examining exercise training interventions for patients with acute LBP who do not have related leg pain. This paucity of clinical trials is the primary limiting factor in making a stronger recommendation for exercise training. A stronger recommendation will require the completion of level I RCTs investigating the effects of exercise training in patients with acute LBP.

2021 Recommendation

C

Physical therapists can use exercise training interventions, including specific trunk muscle activation, for patients with acute LBP.

EXERCISE TRAINING FOR ACUTE LBP WITH LEG PAIN

Muscle Strengthening and Endurance

II

Huber et al[79] compared a muscle strengthening and endurance exercise intervention, consisting of supine isometric back extension and abdominal exercises, to advice to reduce activity and loading of the spine in 52 patients with acute back pain with leg pain. Assessments were made before treatment and after 20 days. Patients in the muscle strengthening and endurance exercise group had a greater reduction of pain intensity after 20 days (mean difference, −1.7 on the numeric pain-rating scale [NPRS]).

Specific Trunk Muscle Activation

II

Ye et al[170] compared 2 different exercise training interventions in 63 young male participants (age, 20-29 years) with diagnosed lumbar disc herniation. Patients were randomized to general exercise or specific trunk muscle activation exercises for 3 months. Outcomes were assessed after 3 months and 1 year. There were no differences at the 3-month assessment; however, at 1 year, those receiving specific trunk muscle activation had greater improvement in back pain and disability (mean group difference, −6.7 on the Oswestry Disability Index [ODI]).

Evidence Synthesis and Rationale

These 2 RCTs provide evidence of short-term benefit of exercise training interventions, specifically muscle strengthening and endurance versus advice only. There was support for specific trunk muscle activation having a superior long-term benefit when compared to general exercise. The reviewed RCTs had methodologic limitations in the duration of follow-up and generalizability of the study participants. Based on the available evidence, there is support for incorporating muscle strengthening and endurance and specific trunk muscle activation exercise training interventions for patients with acute LBP with leg pain. This would include patients with ICF categories of LBP with related lower extremity pain and radiating pain. A stronger recommendation will require more level I RCTs.

2021 Recommendation

B

Physical therapists may use exercise training interventions, including trunk muscle strengthening and endurance and specific trunk muscle activation, to reduce pain and disability in patients with acute LBP with leg pain.

Gaps in Knowledge

More research is needed to examine exercise training interventions for patients with acute LBP with and without leg pain. There is a need for level I RCTs comparing exercise training interventions against usual care or other control interventions to clarify whether exercise training interventions provide benefit beyond the favorable natural history of acute LBP. There is also a need for direct comparisons of different exercise training interventions for patients with acute LBP with leg pain. Effort should be made to ensure that individuals recruited into exercise RCTs match demographic and clinical characteristics of those seeking care for LBP.

EXERCISE FOR CHRONIC LBP

Muscle Strengthening and Endurance

I

Rantonen et al[133] compared a muscle strengthening and endurance exercise intervention to either a multidisciplinary rehabilitation program or a self-care program in an RCT involving 126 patients with chronic LBP in an occupational health setting. The group receiving muscle strengthening and endurance exercise had greater improvement in pain compared to the self-care group after 3 and 6 months (pain visual analog scale [VAS] between-group mean difference, −10 mm for both follow-up occasions; ODI between-group mean difference, −4 and −5, respectively). There were no differences among the groups after 24 months.

Specific Trunk Muscle Activation

I

An RCT by Macedo et al[104] compared specific trunk muscle activation exercise to a general exercise program with cognitive behavioral principles in 172 patients with chronic LBP. Assessments at 2, 6, and 12 months found no difference in pain or disability between groups.

II

Nine RCTs[6,9,13,39,95,111,115,153,159] with small sample sizes and primarily short-term follow-up compared specific trunk muscle activation exercise to other exercise or an active intervention. Comparison exercise training interventions were general exercise,[6] yoga,[39] manual therapy,[159] movement control exercise using proprioceptive neuromuscular facilitation,[13] and muscle strengthening and endurance.[9,95,111,115,153] Results were mixed, with some studies finding differences favoring specific trunk muscle activation exercise for pain or disability after 4 to 12 weeks[6,95,115,153] and

others finding no between-group differences.[9,13,111] Demirel et al[39] found yoga to have a greater effect on pain than specific trunk muscle activation exercise after 6 weeks (mean difference, −1.4 on the NPRS). Tagliaferri et al[153] found that a muscle strengthening and endurance exercise intervention combined with manual therapy had a greater effect on disability than specific trunk muscle activation exercise after 6 months. Ulger et al[159] found that manual therapy had a greater effect on pain and disability after 6 weeks than specific trunk muscle activation exercise (mean difference, −7.5 on the ODI).

II Four RCTs[12,121,130,169] compared specific trunk muscle exercise with a wait-list group,[121] modalities alone,[130] modalities and trunk exercise,[12] or trunk endurance exercises.[169] All 4 RCTs found greater improvement in pain and disability in patients receiving specific trunk muscle activation exercise at short-term follow-ups ranging from 4 to 11 weeks.

Movement Control

II Four RCTs with only short-term outcomes compared movement control exercise to other exercise training interventions. Gatti et al[63] compared movement control exercise (balance exercise) to a general exercise program in 79 patients with chronic LBP. Both groups received flexibility exercises as well. Greater improvement of pain and disability occurred in the movement control exercise group after 6 weeks (mean difference, −2.1 on the Roland-Morris Disability Questionnaire [RMDQ]). Three separate RCTs by Areeudomwong and Buttagat[12,13] and Areeudomwong et al[15] examined movement control exercise using proprioceptive neuromuscular facilitation compared to specific trunk muscle activation and a control group in 55 patients,[12] compared to a control group in 42 patients,[15] and compared to general exercise in 44 patients.[13] Results favored movement control exercise versus control or general exercise after 3 to 4 weeks and after 12 weeks for pain and disability,[12,13,15] and no differences were found when compared to specific trunk muscle activation after 4 weeks.[13]

Aerobic Exercise

I Sitthipornvorakul et al[149] performed a systematic review and meta-analysis of aerobic exercise using a walking intervention for chronic LBP. Nine RCTs were included; 4 compared walking intervention alone to other interventions. Five studies compared walking as an intervention alone to walking in addition to other interventions. For walking alone versus other interventions (general exercise, education), the review found moderate-quality evidence of no significant difference between groups for pain in the short term (pooled standardized mean difference [SMD], 0.07) or long term (pooled SMD, 0.06). Similarly, no differences were found between groups for disability level in the short term (pooled SMD, 0.03) or long term (pooled SMD, 0.15). For walking plus other interventions versus other interventions alone, the review found low- to moderate-quality evidence of no significant difference between groups for pain intensity in the short term (pooled SMD, 0.04) or long term (pooled SMD, 0.00). Consistent with other findings, low- to moderate-quality evidence found no differences between groups for disability level in the short term (pooled SMD, −0.08) or long term (pooled SMD, −0.19).

II Two RCTs compared aerobic exercise to minimal intervention or control groups. Bruehl et al[28] compared aerobic exercise to a usual activity control group in 82 patients with chronic LBP. Posttreatment comparisons (6 weeks) found greater reductions in pain intensity and pain interference in the group receiving aerobic exercise (NPRS between-group mean difference, −1.5 for average pain and −1.7 for worst pain). Cuesta-Vargas et al[34] compared a deep water–running aerobic exercise program along with care from a general practice physician to general practice care alone in 58 patients with chronic LBP and found differences favoring the group receiving the deep water–running aerobic exercise program in pain (pain VAS between-group mean differences: −14.8 mm at 4 months, −14.2 mm at 6 months, −26.0 mm at 12 months) and disability (RMDQ score between-group mean differences: −3.4 at 4 months, −3.8 at 6 months, −2.5 at 12 months).

General Exercise

I Four RCTs compared general exercise interventions to other exercise training interventions. Iversen et al[82] found no differences in pain and function across 1 year between general exercise and muscle strengthening and endurance using resistance bands in 99 patients. Harris et al[71] compared general exercise to cognitive behavioral therapy or a brief cognitive intervention in 214 patients and found no differences in pain and function at 1-year follow-up. Bello et al[20] compared a general exercise program to a general exercise program using graded activity and found no difference between groups after 4 or 12 weeks. Monticone et al[114] compared a group-based general exercise program to a group-based general exercise program combined with cognitive behavioral therapy principles in 150 patients with chronic LBP. The group receiving general exercise with cognitive behavioral principles had greater improvements in pain and disability after 5 weeks and 1 and 2 years (NPRS [0-10] between-group mean differences: −3.1 postintervention, −1.8 at 12-month follow-up, and −1.9 at 24-month follow-up; ODI score [0-100] between-group mean differences: −9.8 postintervention, −15.8 at 12-month follow-up, and −15.0 at 24-month follow-up).

II Two RCTs compared general exercise to control conditions. An RCT by Masharawi and Nadaf[109] compared group-based, non–weight-bearing general exercise to a control group in 40 female nurses with chronic LBP. Assessments at 4 and 8 weeks found greater improvement in pain (mean difference, −2.2 on the NPRS) and disability (mean difference, −5 on the RMDQ) in the group receiving general exercise. Jensen et al[83] compared general exercise to advice to rest and use of a back brace for 100 patients with chronic LBP and Modic changes on imaging. There were no differences between groups after 10 weeks or 1 year.

Trunk Mobility

II Segal-Snir et al[143] compared trunk mobility using rotational exercises to a wait-list control in 50 women (aged 40 to 70 years) with chronic LBP. Both groups received education and advice. There were no differences between groups for either pain or disability postintervention or at 8-week follow-up.

II Shah and Kage[145] compared trunk mobility exercise consisting of repeated prone extension to manual therapy in 40 patients with LBP lasting less than 3 months. Results after 7 treatment sessions showed greater improvement in pain (mean differences, −1.1 and −2.5 on the NPRS) and disability (mean differences, −9.3 and −15.9 on the ODI) in the group receiving manual therapy.

Multimodal

I Bronfort et al[27] conducted an RCT (n = 301) comparing a multimodal exercise training intervention, including specific trunk muscle activation and muscle strength and endurance training, to spinal manipulation and a group receiving instruction in a home-based general exercise program. There were no differences among the 3 treatment groups at the 3-month or 1-year follow-up.

II Nazzal et al[119] compared a general exercise program to a multimodal exercise program, including general exercise, muscle endurance, and strengthening, along with manual therapy in 100 patients and found greater improvements in the multimodal group in pain and disability after 6, 12, and 24 weeks. Two additional RCTs found no benefit to adding general exercise (deep-water running or aerobic exercise training) to a multimodal treatment that included education, manual therapy, specific trunk muscle activation, and passive modalities.[31,35]

II Magalhães et al[106,107] compared 2 different multimodal exercise programs in 66 patients with chronic LBP. One program used aerobic exercise and muscle strengthening and endurance provided with cognitive behavioral principles. The other program used a general exercise program and specific trunk muscle activation exercise. There were no differences in pain and disability between groups at 6-week, 3-month, and 6-month follow-ups.

Evidence Synthesis and Rationale

There are a large number of RCTs examining exercise interventions for patients with chronic LBP. However, most are level II studies with high heterogeneity in patient populations, small sample sizes, and short-term follow-up, including several trials that reported null findings. The available level I RCTs support using multimodal programs and trunk muscle strengthening and endurance exercise interventions for chronic LBP generally and with older adults specifically. No studies reported harm from exercise training interventions. Therefore, exercise training interventions can be broadly recommended for chronic LBP. More level I RCTs are needed to directly compare different types of exercise, as there is no clear evidence of the superiority of one form of exercise training intervention over another. The duration, dosing, and intensity of exercise interventions were highly variable across studies, and controlling this variability should be a focus in future RCTs.

2021 Recommendations

A Physical therapists should use exercise training interventions, including trunk muscle strengthening and endurance, multimodal exercise interventions, specific trunk muscle activation exercise, aerobic exercise, aquatic exercise, and general exercise, for patients with chronic LBP.

B Physical therapists may provide movement control exercise or trunk mobility exercise for patients with chronic LBP.

Gaps in Knowledge

There is a need for additional level I RCTs evaluating exercise training interventions for patients with chronic LBP. In particular, RCTs are needed that directly compare different types of exercise, examine the optimal way to deliver exercise training interventions with respect to dosage and intensity, and target exercise interventions to particular subgroups of patients with chronic LBP. In addition, the effects of contextual, medical, and/or social factors (eg, expectations for treatment, fear of movement, comorbid conditions, socioeconomic status) that modulate the effects of exercise should also be explored.

EXERCISE FOR CHRONIC LBP WITH LEG PAIN

Specific Trunk Muscle Activation

II One RCT by França et al[55] compared specific trunk muscle activation exercise to transcutaneous electrical nerve stimulation in 40 patients with chronic

LBP with leg pain and found greater improvements in pain (adjusted mean difference, −2.6 on the NPRS) and disability (adjusted mean difference, −5.7 on the ODI) posttreatment (8 weeks) for the specific trunk muscle activation exercise group.

Multimodal

I Two RCTs examined multimodal exercise training interventions versus minimal treatment for patients with chronic LBP with leg pain. Hahne et al[67] compared a multimodal exercise training intervention including trunk mobility exercise and specific trunk muscle activation exercise and advice to advice only in 54 patients. Greater improvements in back pain (adjusted mean difference, −1.4 points on the NPRS) and disability (adjusted mean difference, −7.7 on the ODI) favoring the multimodal exercise training intervention were observed after 10 weeks, and in disability (adjusted mean difference, −8.2 on the ODI) after 1 year. Albert and Manniche[3] compared a multimodal exercise training intervention including general exercise, trunk strengthening and endurance, and specific trunk exercises to a sham exercise program in 181 patients. All patients received education and advice. There were no differences between groups in disability at follow-ups of 8 weeks and 1 year. There was a trend toward small differences in leg pain favoring the multimodal exercise training group.

I Moustafa and Diab[116] compared a multimodal exercise training intervention that included general exercise and specific trunk muscle activation exercise to that intervention plus exercise intended to correct forward head posture in 154 patients with LBP with leg pain who were randomly assigned to either intervention. There were no differences between groups at 8 weeks after treatment. Differences favoring the group including the postural exercise were reported for disability (mean difference, −11.8 points on the ODI), back pain, and leg pain (mean difference, −1.6 on the NPRS) after 2 years.

Evidence Synthesis and Rationale

A total of 3 RCTs comparing exercise training interventions to minimal treatment generally support the use of exercise training interventions for patients with chronic LBP with leg pain. One study examined a specific trunk muscle activation exercise program, while the remaining studies used multimodal exercise approaches. The studies do not clearly support one type of exercise training intervention. One RCT with a larger sample size supported the inclusion of postural exercise along with a multimodal exercise training intervention.

2021 Recommendation

B Physical therapists may use exercise training interventions, including specific trunk muscle activation and movement control, for patients with chronic LBP with leg pain.

EXERCISE FOR CHRONIC LBP WITH MOVEMENT CONTROL IMPAIRMENT

II Four RCTs[14,88,124,129] compared specific trunk muscle activation exercise to other exercise interventions in patients with chronic LBP who also had signs associated with the ICF category of movement control impairment. Khodadad et al[88] compared specific trunk muscle activation exercise to cognitive functional training and a control group in 52 patients and found no differences among the groups after 8 weeks. Three RCTs[14,124,129] compared specific trunk muscle activation exercises to stretching exercises in studies with small sample sizes ranging from 20 to 42 patients. These RCTs each found better outcomes for the group receiving specific trunk muscle activation exercise in the short term (6-10 weeks), with 1 RCT[129] showing continued benefit for disability in the specific trunk muscle activation group after 6 months.

II Macedo et al[105] conducted a preplanned secondary analysis of an RCT not included in the systematic review by Luomajoki et al.[103] The RCT compared specific trunk muscle activation and a general exercise program provided with cognitive behavioral principles in 172 patients with chronic LBP. Patients with clinical signs of movement control impairment via a questionnaire had greater improvement in function after 12 months than patients with fewer signs of movement control impairment on the questionnaire.

Movement Control

I One systematic review and meta-analysis included 11 RCTs that examined movement control exercise training intervention programs for patients with chronic LBP and movement control impairment.[103] The systematic review found that movement control exercise had a small effect on pain postintervention (SMD, −0.39; 95% confidence interval [CI]: −0.73, −0.04), with no effect after 1 year. For disability, movement control exercise had a small effect postintervention in 4 of 11studies (SMD, −0.38; 95% CI: −0.68, −0.09), with a small effect maintained after 1 year (n = 212; SMD, −0.37; 95% CI: −0.69, −0.04).

Evidence Synthesis and Rationale

For patients with clinical findings consistent with movement control impairment, there is consistent evidence supporting specific trunk activation exercise and movement control exercise interventions.

2021 Recommendation

A Physical therapists should use specific trunk muscle activation and movement control exercise for patients with chronic LBP and movement control impairment.

Gaps in Knowledge

Additional level I RCTs are needed to clarify which movement control exercise approaches are the most effective and/or which patient characteristics are indicative of positive treatment outcomes.

EXERCISE RECOMMENDATIONS FOR CHRONIC LBP IN OLDER ADULTS

I Two RCTs examined multimodal exercise programs for older adults. Ammendolia et al[8] compared a multimodal general exercise and aerobic exercise program to a self-directed exercise program in 104 adults with lumbar spinal stenosis (mean age, 71 years). The group receiving multimodal exercise had greater improvements in pain and disability after 6 months (adjusted mean difference, −1.4 on the NPRS). Schneider et al[142] compared a group-based general exercise program to an individually delivered general exercise program with manual therapy and to usual medical care from a physiatrist in 259 adults over the age of 60 with lumbar spinal stenosis. The group receiving individualized general exercise with manual therapy had greater improvement in disability after 2 months than either the usual medical care or group-based general exercise group (adjusted mean differences: medical care, −2.0; 95% CI: −3.6, −0.4; group exercise, −2.4; 95% CI: −4.1, −0.8). There were no differences between groups after 6 months.

II Hicks et al[75] compared a muscle strengthening and endurance exercise intervention augmented with neuromuscular electrical stimulation to passive modalities in 64 older adults (age, 60-85 years). The muscle strengthening and endurance exercise group had greater improvements in pain and function 12 weeks and 6 months post intervention (adjusted mean difference at immediate follow-up, −4.8; at 6 months, −5.1 on the ODI).

II Three RCTs with small sample sizes and short-term follow-ups examined general exercise programs in older adults with chronic LBP. Vincent et al[166] examined 49 older adults with abdominal obesity (age, 60-85 years), comparing 3 groups: (1) a general exercise program consisting of total body progressive resistance exercises, (2) an isolated trunk extensor muscle strengthening exercise program, and (3) a control group. The general exercise group had greater improvement in disability after treatment (4 months) than the muscle strengthening group (mean difference, −2.6 on the ODI and −3.2 on the RMDQ). Both the general exercise and muscle strengthening groups had greater reduction in pain during movement than the control group (mean difference, −0.6 on the NPRS). Zadro et al[174] examined 60 older adults (age, older than 55 years), comparing a general exercise program provided using video game technology to usual care. The group receiving general exercise had greater improvements in pain (mean difference, less than 1 point on the NPRS) and disability (mean difference, −1.5 points on the RMDQ) after 8 weeks. There were no differences between groups after 6 months. No adverse events were reported. Homayouni et al[78] compared an aquatic general exercise program to a trunk mobility exercise program using flexion and extension, along with passive modalities, in 50 patients with chronic LBP diagnosed with lumbar spinal stenosis. The study found that the aquatic exercise program provided a slight benefit for pain and disability outcomes after 8 weeks, with no differences between groups after 3 months (mean difference, 2.5 on the pain VAS).

Evidence Synthesis and Rationale

There is strong evidence to support the use of general exercise training (including aquatic exercise) for the management of chronic LBP in the older adult population. However, benefits within these studies appear to be more related to exercise prescription (ie, the need to have appropriate volume/intensity and incorporate principles of exercise progression intensity) than to a given exercise type.

2021 Recommendation

A Physical therapists should use general exercise training to reduce pain and disability in older adults with chronic LBP.

EXERCISE FOR POSTOPERATIVE LBP

General Exercise

I Aalto et al[1] performed an RCT examining 102 patients receiving open or microscopic decompression surgery for lumbar spinal stenosis (19 of the enrolled patients had additional fusion surgery). A general exercise program was compared to standard postoperative treatment. No differences between groups were observed at 3 and 6 months, and at 1- and 2-year follow-ups.

I Hebert et al[73] performed an RCT examining a general exercise program with and without the addition of specific trunk muscle activation exercises started 2 weeks post surgery in 61 patients after lumbar disc surgery. Both groups demonstrated a 50% reduction in disability, but no additional benefit was gained from adding the specific trunk muscle activation when assessed at 10 and 26 weeks.

II An RCT by Ogutluler Ozkara et al[122] examined 30 patients following microdiscectomy and compared a general exercise program beginning immediately after surgery to a control group. The general exercise group had

greater improvements in disability at 6 and 12 weeks (mean difference, −10.4 and −12.6 on the ODI, respectively) and in pain at 12 weeks (mean difference, −0.8 on the VAS).

Evidence Synthesis and Rationale

There are few studies examining exercise training interventions for patients following spine surgery. The results provide inconsistent evidence regarding general exercise interventions. None of the RCTs reported harm to patients with exercise training interventions following spine surgery.

2021 Recommendation

C Physical therapists can use general exercise training for patients with LBP following lumbar spine surgery.

Gaps in Knowledge

To better inform postoperative care, there is a need for level I RCTs evaluating the effects of different exercise training interventions in patients following surgery for LBP.

KEY POINTS FOR EXERCISE INTERVENTIONS

Acute LBP

- Many exercise training interventions potentially reduce pain and disability for individuals with acute LBP; however, given the available evidence, it is not possible to recommend any one type of exercise.
- Muscle strength and endurance and specific trunk muscle activation exercise interventions have demonstrated some benefit for individuals with acute LBP and related leg pain.

Chronic LBP

- Exercise training interventions can be broadly recommended to reduce pain and disability for individuals with chronic LBP.
- There is no clear evidence of superiority of one exercise type or approach over another when exercise protocols are directly compared.

Older Adults With Chronic LBP

- Progressive exercise training can be recommended to reduce pain and disability in older adults with chronic LBP.

Postoperative LBP

- Exercise training interventions may be recommended to reduce pain and disability for individuals with LBP following lumbar spine surgery.
- Surgeries in the literature search included lumbar discectomy, spinal fusion, and decompressive surgery (eg, laminotomy, hemilaminectomy, or laminectomy).

CLINICAL PRACTICE GUIDELINES

Intervention: Manual and Other Directed Therapies

EVIDENCE STATEMENTS AND RECOMMENDATIONS

2012 Recommendations

The 2012 recommendations were not divided by patient subgroup (eg, they did not include separate recommendations for acute and chronic LBP).

Manual Therapy

A Physical therapists should consider utilizing thrust joint mobilization procedures to reduce pain and disability in patients with mobility deficits and acute low back and back-related buttock or thigh pain. Thrust and nonthrust joint mobilization procedures can also be used to improve spine and hip mobility and reduce pain and disability in patients with subacute and chronic low back and back-related lower extremity pain.

Lower-Quarter Nerve Mobilization Procedures

C Physical therapists should consider utilizing lower-quarter nerve mobilization procedures to reduce pain and disability in patients with subacute and chronic LBP and radiating pain.

Traction

D There is conflicting evidence for the efficacy of intermittent lumbar traction for patients with LBP. There is preliminary evidence that a subgroup of patients with signs of nerve root compression, along with peripheralization of symptoms or a positive crossed straight leg raise test, will benefit from intermittent lumbar traction in the prone position. There is moderate evidence that physical therapists should not utilize intermittent or static lumbar traction for reducing symptoms in patients with acute or subacute, nonradicular LBP or in patients with chronic LBP.

2021 UPDATE

Manual and other directed therapies were categorized using the operational definitions displayed in **TABLE 5**.

EVIDENCE UPDATE

Based on the results of our literature search, the 2021 update will include some of the same treatment categories included in the 2012 CPG and also some different ones.

MANUAL AND OTHER DIRECTED THERAPIES FOR ACUTE LBP

Thrust or Nonthrust Joint Mobilization

I Fritz et al[57] conducted a high-quality RCT of 220 patients with acute LBP and compared treatment with thrust mobilization combined with exercise and education to usual care. The group receiving mobilization with exercise and education had greater improvement in disability after 4 weeks and 3 months, although effect sizes were small. There were no between-group differences in pain or disability at 1 year, or in pain at 4 weeks or 3 months.

TABLE 5 Operational Definitions for Manual and Other Directed Therapies

Intervention	Operational Definition
Thrust or nonthrust joint mobilization	A continuum of skilled passive movement applied at varying speeds and amplitudes within or at the end range of motion of a joint. Thrust procedures are those provided with low amplitude and high velocity
Soft tissue mobilization	Skilled passive movement of soft tissue, including fascia, muscles, and ligaments, to reduce pain or improve range of motion. Techniques include myofascial release, trigger point therapy, strain/counterstrain, etc
Neural tissue mobilization	Manual therapy techniques intended to enhance the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces
Massage	A general term referring to techniques using the hands to promote relaxation of underlying muscles
Dry needling	An intervention that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points and muscular and connective tissues for the management of pain and movement impairments
Traction	An intervention that uses manually or mechanically applied forces with the intention of stretching and distracting the spine

II Shah and Kage[145] compared nonthrust posterior-to-anterior (PA) mobilizations (grades I-IV) to prone press-up exercise in 40 patients with acute LBP. Only 1 treatment session was provided. Between-group comparisons showed significantly greater improvement in pain and disability in the group receiving PA mobilizations. No long-term follow-up was conducted.

Soft Tissue Mobilization

II Takamoto et al[154] conducted a 3-arm RCT with 63 patients with acute LBP. Patients were randomized into 1 of 3 groups: (1) manual compression at trigger points, (2) compression at nontrigger points, or (3) effleurage massage. Subjects received the assigned treatments 3 times per week over a 2-week period. There was a significant difference at 1 week and 1 month post treatment for pain, but not for disability, in favor of the group that received manual compression at trigger points.

Massage

II We identified 1 systematic review[58] that included 1 RCT with 51 participants examining massage for acute LBP. This RCT found that 8 sessions of massage over a 3-week period were superior to inactive controls for pain at the 1-week follow-up, but no difference between inactive controls and massage for disability was found. No long-term follow-up was conducted.[171]

Evidence Synthesis and Rationale

There are several RCTs examining manual therapy or other directed interventions for patients with acute LBP. Of the studies included, evidence supports short-term benefits for joint mobilizations (2 RCTs), massage (1 RCT), and soft tissue mobilization (1 RCT). The duration of treatment in these RCTs was short, including no longer than a 3-week period. This is an important consideration when applying these treatments, as there is no evidence investigating the prolonged use of manual therapy or other directed interventions for acute LBP. Furthermore, most of the included studies had a large degree of heterogeneity in intervention delivery parameters. The evidence in support of thrust or nonthrust joint mobilization was stronger than for other directed interventions.

2021 Recommendations

A Physical therapists should use thrust or nonthrust joint mobilization to reduce pain and disability in patients with acute LBP.

B Physical therapists may use massage or soft tissue mobilization for short-term pain relief in patients with acute LBP.

Gaps in Knowledge

There is a need for additional level I RCTs evaluating manual and other directed therapy interventions for acute LBP. Specifically, more RCTs comparing manual therapy and other directed interventions against usual care are needed to clarify whether these therapies provide additional benefit beyond the natural course of acute LBP. Additionally, level I RCTs that directly compare different types of manual therapy and other directed interventions are needed for patients with acute LBP.

MANUAL AND OTHER DIRECTED THERAPIES FOR CHRONIC LBP

Thrust or Nonthrust Joint Mobilization

I We identified 20 RCTs examining thrust or nonthrust mobilization, 8 of which used a control or sham comparator.[25,44,49,53,76,93,163,165] Dosing and follow-up periods varied across these RCTs. Seven of these RCTs found short-term improvement in pain and disability outcomes for the group receiving mobilization.[44,49,53,76,93,163,165] Sample sizes for these 7 RCTs ranged from 25 to 75, with none including long-term follow-up outcome measures. Some RCTs provided mobilization combined with other interventions, including neural mobilization[49] or other physical therapy interventions.[93] One small pilot RCT found no difference in pain or function between mobilization and sham treatment.[25]

Seven RCTs compared thrust or nonthrust mobilization with active treatment comparators in patients with chronic LBP.[4,36,113,140,153,155,160] Two RCTs compared thrust or nonthrust mobilization with electrotherapy.[4,160] Both RCTs favored the group receiving mobilization. Five RCTs[36,113,140,153,155] compared thrust or nonthrust mobilization with different types of exercise. Two of these RCTs found that nonthrust mobilization did not provide greater short-term improvement in pain or disability than did exercise interventions,[36,113] with 1 of these RCTs finding greater improvement for a group receiving specific trunk activation exercise.[113] Another RCT[155] comparing thrust mobilization with an exercise program of stretching and general exercise found that the mobilization group had greater improvement in short-term (5 weeks) pain and disability. Two RCTs investigated mobilization combined with ergonomic advice[140] or muscle strengthening and endurance exercise,[153] with the groups receiving mobilization experiencing greater short-term improvement in pain and quality of life than groups receiving other types of exercise without mobilization.

Five RCTs examined the addition of mobilization to an active treatment that was received by all patients.[51,65,118,141,175] Two RCTs that added mobilization to exercise and education[51] or

to cognitive behavioral treatment and exercise[65] found no additional benefit of adding the mobilization intervention. Three RCTs found greater short-term improvements in pain and disability when mobilization was added to standard physical therapy,[175] laser therapy plus exercise,[118] or exercise plus electrotherapy.[141]

I Five RCTs compared different delivery methods of mobilization for patients with chronic LBP. Two RCTs[30,33] compared thrust and nonthrust mobilization techniques to each other. One RCT[30] found greater improvement in short-term disability for the group receiving thrust mobilization. The other RCT[33] had a larger sample size (n = 149) and reported no significant between-group differences. Two RCTs[41,46] compared mobilization techniques that were targeted to specific spinal segments or regions to mobilization techniques that were nonspecific. These RCTs found no differences in outcomes for specific versus nonspecific techniques. The larger RCT[41] (n = 148) found that both groups improved in terms of an immediate decrease in pain, but no significant between-group differences were observed. One RCT[86] of 32 women with chronic LBP compared thrust mobilization directed at 2 regions (the sacroiliac joint and lumbar spine) to thrust mobilization directed at a single region (the sacroiliac joint). The authors found a single session of thrust mobilization directed at 2 regions to be more effective for improving short-term (48 hours and 1 month) disability than sacroiliac joint mobilization alone.

Soft Tissue Mobilization

II We identified 6 RCTs that examined soft tissue mobilization for patients with chronic LBP. None of these studies conducted a long-term follow-up. Two of these RCTs[16,17] compared myofascial release to sham myofascial release and found that the group receiving soft tissue mobilization with myofascial release had greater improvement in short-term pain and disability. Another RCT[24] compared the combination of myofascial release and thrust mobilization to thrust mobilization alone and found no significant between-group differences. An RCT by Dayanir et al[37] compared 3 separate soft tissue mobilization techniques (manual pressure release, strain/counterstrain, and integrated neuromuscular inhibition), each combined with a home exercise program, to a group receiving only the home exercise program. The group receiving strain/counterstrain had slightly greater improvement in pain and disability compared to the other groups. Kotteeswaran et al[92] compared dynamic soft tissue mobilization of the hamstring with a stretching program in young adults (age, 20-35 years) with chronic LBP and found the soft tissue mobilization to be more effective for short-term reduction of pain. Finally, 1 RCT[144] compared 4 groups that each received specific trunk activation exercises, with one group also receiving a combination of nonthrust mobilization and soft tissue mobilization, another receiving elastic taping, and another receiving reflexology. There were no differences between groups in pain or disability at 4-week follow-up.

Massage

I We identified 1 systematic review[58] that included 24 RCTs examining massage for chronic LBP. The systematic review found that massage was superior to inactive controls for pain and disability in the short term, but not in the long term. When compared to active controls, massage was superior for the outcome of pain, in both the short and long term, but no differences were found for function in either the short or long term. There were no reports of serious adverse events. The evidence was judged to be of low to very low quality.

I We identified 6 RCTs examining massage for patients with chronic LBP that were not included in the systematic review. Two RCTs[19,84] compared an exercise intervention provided with or without massage. Both RCTs found that the addition of massage provided superior outcomes compared to those provided by exercise alone. Two RCTs compared specific types of massage (Thai and Ayurvedic massage) with other active comparator interventions. One of these RCTs[94] compared Ayurvedic massage with standard massage and found that the Ayurvedic method led to greater short-term (2 and 4 weeks) improvement in pain, but not in disability. The other, larger RCT[85] (n = 120) compared traditional Thai massage with joint mobilization and found that both interventions were equally effective for short-term (4 weeks) reductions in pain and disability. One RCT[98] compared the effect of interferential current electromassage to superficial massage in patients with chronic LBP and found the electromassage intervention to be superior for short-term improvements in pain and disability. Finally, 1 RCT[177] investigated massage with and without a preparatory phase (patients were provided active feedback during the massage, and the preparatory phase included pleasant touch before initiating the massage) and language as therapy for LBP and found that massage improved pain and disability at short-term follow-up, with the experimental group having a more immediate response.

Neural Mobilization

I We identified 1 systematic review[151] that included 7 RCTs examining neural mobilization in patients with chronic LBP with leg pain and 2 RCTs examining patients with chronic LBP without leg pain. The review concluded that neural mobilization was superior to minimal interventions for pain and disability in patients with chronic LBP with leg pain, but neural mobilization was not superior to comparator interventions.

II We identified 4 additional RCTs not included in the systematic review that examined neural mobilization in patients with chronic LBP with leg pain. One RCT[49] evaluated advice to stay active, with and without the addition of neural mobilization. The group receiving sciatic nerve mobilization had greater improvement in pain and disability at 4 weeks compared to the advice-only group. Two RCTs examined the addition of neural mobilization for the sciatic nerve to an exercise program. Bhatia et al[21] examined the addition of neural mobilization to a physical therapy exercise program and found greater short-term (4 weeks) improvements in pain and disability in the group also receiving neural mobilization. Plaza-Manzano et al[127] examined the addition of neural mobilization to a specific trunk muscle activation exercise program and found no significant difference between groups at short-term follow-up (4 weeks). Satpute et al[141] added neural mobilization combined with nonthrust mobilization to a program of exercise and electrotherapy, and found that the neural mobilization group had significant improvements in pain and disability compared to the group receiving only exercise and electrotherapy immediately postintervention, as well as at 3- and 6-month follow-ups.

Dry Needling

II We identified 3 RCTs examining dry needling interventions provided by physical therapists to patients with chronic LBP, each with only short-term outcomes. Griswold et al[66] compared dry needling and nonthrust mobilization and found no significant differences in pain and disability after 3 weeks. Tüzün et al[158] conducted a small RCT (n = 34) that compared dry needling to a comparison group receiving passive modalities and a home exercise program. The group receiving dry needling had greater improvement in pain immediately following the last treatment session. There was no long-term follow-up. Mahmoudzadeh et al[108] examined 58 patients with chronic LBP with leg pain. All participants received physical therapy, with or without dry needling. The group receiving dry needling along with physical therapy experienced significantly greater improvements in pain and disability at the end of treatment and at 2-month follow-up.

II An RCT by Wang-Price et al[167] compared 2 dry needling techniques (with and without needle manipulation) for a single treatment session. There were no significant differences between groups immediately posttreatment.

Traction

I We identified 7 RCTs examining traction for patients with chronic LBP. Six of these RCTs[22,40,43,117,128,156] examined the addition of traction to another treatment in patients with chronic LBP with leg pain. Bilgilisoy Filiz et al[22] conducted a study of 125 patients who were randomized to mechanical lumbar traction in either the prone or supine position, along with physical therapy, or to physical therapy alone (without traction). The combination of prone traction and physical therapy showed greater improvement in pain and function at the end of treatment (15 sessions) compared to the physical therapy–only group. Moustafa and Diab[117] conducted an RCT comparing hot packs and interferential therapy, with and without the addition of lumbar extension traction. The traction group showed significant improvements in pain and disability at the end of treatment and 6-month follow-up. Diab and Moustafa[43] compared stretching and heat with and without the addition of lumbar extension traction, with the traction group showing significant improvements in pain and disability at the end of treatment and at 6 months.

Other studies examining the addition of traction to mobilizing exercise,[156] to specific trunk muscle activation exercise with massage and electrotherapy,[40] and to a standard physical therapy program using an inversion device[128] found no differences between groups in pain or disability outcomes. Thackeray et al[156] conducted an RCT of 120 patients with LBP with leg pain randomized to receive an extension-oriented physical therapy approach, with or without the addition of lumbar traction. No significant differences were found in pain or disability at the end of treatment and at 6-month or 1-year follow-up. Demirel et al[40] performed a pilot RCT of 20 patients, comparing a combination of deep friction massage, electrotherapy, and stabilization exercises with and without the addition of lumbar traction. There were no significant between-group differences in pain or function observed at the end of treatment. An RCT conducted by Prasad et al[128] compared physical therapy with or without the addition of gravity-inversion traction in 24 patients. There were no significant between-group differences in pain or disability at the end of treatment. Last, another RCT[81] compared high- and low-force mechanical traction in patients with chronic LBP and radiating pain, and found no difference between groups based on the amount of traction force.

Evidence Synthesis and Rationale

There are numerous studies examining manual therapy and other directed interventions for chronic LBP. There is good evidence in support of thrust or nonthrust joint mobilization for short-term benefit for pain and disability associated with chronic LBP. There was no evidence of differences based on mobilization technique. Other directed interventions had less consistent findings. Some RCTs found evidence of benefit of either soft tissue mobilization or massage when added to other interventions (joint mobilization,

exercise), particularly for short-term outcomes, although some studies failed to find benefit. There is little evidence investigating dry needling for patients with chronic LBP. Some evidence supports dry needling to improve short-term pain and disability when paired with joint mobilization or exercise programs.

For patients with chronic LBP with leg pain, including patients who would fit the ICF category of radiating pain, evidence supports the addition of neural mobilization to other interventions (exercise, physical therapy). One level II RCT supported adding dry needling to a physical therapy program for patients with chronic LBP with leg pain. Multiple RCTs examined traction for chronic LBP with leg pain, but there was conflicting evidence for the efficacy of lumbar traction. A few studies showed small improvements in short-term pain and disability when mechanical traction was combined with heat, stretching, and/or standard physical therapy, or in comparison to directed modalities. However, the majority of studies showed no additional benefit in pain or disability when traction was added to a program of exercise and joint mobilization.

2021 Recommendations

A Physical therapists should use thrust or nonthrust joint mobilization to reduce pain and disability in patients with chronic LBP.

B Physical therapists may use thrust or nonthrust joint mobilization to reduce pain and disability in patients with chronic LBP with leg pain.

B Physical therapists may use soft tissue mobilization or massage in conjunction with other treatments to reduce pain and disability in the short term in patients with chronic LBP.

C Physical therapists can consider the use of dry needling in conjunction with other treatments to reduce pain and disability in the short term in patients with chronic LBP.

B Physical therapists may use neural mobilization in conjunction with other treatments for short-term improvements in pain and disability in patients with chronic LBP with leg pain.

D Physical therapists should not use mechanical traction for patients with chronic LBP with leg pain, based on the lack of benefit when added to other interventions.

Gaps in Knowledge

There is a need for more level I RCTs to examine manual therapy and other directed interventions for patients with chronic LBP, with or without leg pain. Because of the preference for active interventions, study designs examining the effects of adding manual and other directed therapies to exercise can inform the potential value of these treatments when multimodal approaches are used for patient care. In addition, future RCTs examining manual and other directed therapies should incorporate longer follow-up times, as existing trials often only include immediate posttreatment or short follow-up for primary end points.

KEY POINTS FOR MANUAL AND OTHER DIRECTED THERAPIES

Acute LBP

- Thrust or nonthrust joint mobilization, massage, and soft tissue mobilization have some evidence of reducing pain and disability for individuals with acute LBP.
- There is no evidence to support the use of other directed therapies for individuals with acute LBP.

Chronic LBP

- Most studies support only short-term effectiveness for any of the therapies included in this CPG update (ie, group differences favoring the therapy were not observed at long-term follow-up).
- Traction is not supported by the current evidence as beneficial when added to other interventions for individuals with chronic LBP with leg pain.

CLINICAL PRACTICE GUIDELINES

Intervention: Classification Systems

EVIDENCE STATEMENTS AND RECOMMENDATIONS

2012 Recommendations

The 2012 recommendations were not divided by patient subgroup (ie, they did not include separate recommendations for acute and chronic LBP).

Classification systems represent decision-making strategies that are designed to help physical therapists identify important subgroups of patients with LBP and match the subgroups to the interventions most likely to be beneficial to them.[87] The 2012 CPG noted that a few RCTs were available that examined specific classification systems, but the CPG did not provide recommendations about these systems.[38] The following endorsements were made regarding classification in general in the 2012 CPG.

1. Emphasis in the development of subgrouping methods has been placed on patterns of signs and symptoms from the clinical examination.
2. The development of classification systems has been identified as a priority among researchers in the primary care management of patients with LBP.
3. The best available evidence supports a classification approach that de-emphasizes identifying specific anatomical lesions after red flag screening is completed.

Because the 2012 CPG did not make recommendations about specific classification systems, the authors considered evidence from RCTs cited in the previous CPG in these updated recommendations when there were no RCTs published since the previous CPG literature search.

2021 Update

Classification systems were categorized using the operational definitions presented in **TABLE 6**. Based on the results of our literature search, the 2021 update will include some of the same, but also different, treatment categories as did the 2012 CPG.

CLASSIFICATION SYSTEMS FOR ACUTE LBP

Mechanical Diagnosis and Therapy

I Lam et al[96] performed a systematic review of 4 RCTs that found that Mechanical Diagnosis and Therapy (MDT) is not superior to other rehabilitation interventions such as manual therapy plus exercise, exercise, or education for addressing pain or disability outcomes in patients with acute LBP. There were no RCTs comparing MDT with control conditions.

TABLE 6 Operational Definitions for Classification Systems

Intervention	Operational Definition
Mechanical Diagnosis and Therapy	Classification method based on changes in low back pain (and/or lower extremity) symptoms in response to direction-specific, repeated lumbar spine movements or sustained postures. Findings are used to classify patients into different syndromes (ie, derangement, dysfunction, or postural) that guide the treatment approach
Treatment-based classification	Classification method to guide initial treatment approach (manipulation, stabilization, specific exercise, or traction) based on specific initial assessment findings, including but not limited to patient history, clinical presentation, and physical examination
Movement system impairment	Classification method based on impaired trunk movements and postures associated with low back pain symptoms observed during a standardized examination. Test results are used to classify patients based on observed lumbar movement or alignment impairments (rotation, extension, flexion, rotation with extension, or rotation with flexion), with subgroup assignment guiding the initial treatment approach to match specific signs and symptoms
Cognitive functional therapy	Classification method that uses an integrated behavioral approach for individualizing the management of low back pain Pathoanatomical, physical, psychological, social, lifestyle, and health-related risk factors are assessed, with nonmodifiable barriers and a modifiable target for change identified to guide treatment based on 3 components ("making sense of pain," "exposure with control," and "lifestyle change"). Formerly called O'Sullivan's classification system
Prognostic risk stratification	Classification method that identifies patients at different levels of risk for persistent pain (low, medium, high) using a multidimensional screening tool, with each risk category associated with different treatment pathways. Examples include the STarT Back Tool
Pathoanatomic-based classification	Classification method based on pathoanatomic-based findings from examination that could cause low back pain Subgroups are defined by symptom location and response to examination procedures and used to guide the treatment approach

Evidence Synthesis and Rationale

We identified 1 systematic review published since the last CPG comparing the effectiveness of MDT to other interventions for patients with acute LBP. There was no evidence that MDT was superior to other common interventions for acute LBP. Our search failed to identify any additional RCTs comparing the effectiveness of MDT to other classification systems or examining the effectiveness of classification systems other than MDT for patients with acute LBP.

2021 Recommendations

B — Physical therapists may use TBC to reduce pain and disability in patients with acute LBP. This recommendation is unchanged from the 2012 CPG.

C — Physical therapists can use MDT to reduce pain and disability in patients with acute LBP.

Gaps in Knowledge

The MDT classification system has been the most studied for acute LBP. Accordingly, there is a need for level I RCTs investigating other classification systems for patients with acute LBP.

CLASSIFICATION SYSTEMS FOR CHRONIC LBP

I — We identified 1 systematic review including 12 RCTs that found some evidence to support using a classification system for patients with chronic LBP.[176] Another systematic review examining different classification systems for patients with chronic LBP included 6 RCTs of moderate-to-high methodological quality and found that only 1 RCT supported the use of a classification-based approach.[135]

I — One RCT[74] (n = 101) compared the effectiveness of providing matched versus unmatched treatment using the TBC and movement system impairment (MSI) classification systems and found no differences based on the classification approach used.

Evidence Synthesis and Rationale

Our search identified 2 systematic reviews and 1 RCT published since the 2012 CPG comparing the effectiveness of classification systems (in general) for patients with chronic LBP. The results failed to find consistent, high-quality evidence of benefit when a classification approach was compared to not using a classification approach or to another classification approach. No recommendations were made based on these studies. They were included in the CPG update to provide a general overview of the evidence base for classification systems.

Mechanical Diagnosis and Therapy

I — We identified 3 systematic reviews examining MDT. A review by Halliday et al[68] of 23 RCTs compared MDT to other interventions. Delivery of MDT was categorized as "adherent" to the principles of MDT or "nonadherent." Studies investigating adherent MDT found greater reductions in pain (15.0 points on a 100-point scale) and disability (11.7 points) after 3 months compared to RCTs with "nonadherent" MDT. Another systematic review identified 7 RCTs that compared the effectiveness of MDT to other interventions in patients with chronic LBP. Lam et al[96] found moderate- to high-quality evidence that MDT is superior to other interventions for reducing pain (−0.33 points) and disability (−0.28 points) following treatment. Another systematic review identified 10 RCTs, 2 of which directly compared MDT to specific trunk muscle activation exercise in patients with chronic LBP.[5] There was no difference between MDT and specific trunk muscle activation exercises for pain and disability following treatment.

I — One RCT[59] (n = 148) compared MDT with a back school intervention and found short-term benefit for MDT for disability (RMDQ mean difference, 2.37), but not for pain, at 4-week follow-up. There were no differences between groups at 6-month follow-up. A secondary analysis of this RCT found that older patients had more benefit from MDT at the 4-week follow-up than younger patients (RMDQ mean difference, 1.27).[60] Another RCT[126] (n = 350) compared MDT to manual therapy as an adjunct to information and advice in patients with chronic LBP who demonstrated centralization or peripheralization. Results favored MDT for disability after 2 and 12 months (RMDQ mean difference, 1.5 at both time points). No differences were found for pain. A third RCT[61] (n = 148) compared MDT to placebo interventions in patients with chronic LBP and found short-term benefit of MDT for pain (NPRS mean difference, −1.0), but not for disability, at 5-week follow-up. No differences were found at the 6- or 12-month follow-up.[61]

II — A small RCT[70] compared MDT to motor control exercise in patients with chronic LBP who had a directional preference on clinical examination. A small difference in perceived benefit was found at 8-week follow-up. No differences between groups for perceived benefit, pain, or disability were found at 12-month follow-up.[69]

Treatment-Based Classification

I — A large RCT[138] (n = 320) of predominantly low-income adults with chronic LBP compared education, yoga, and physical therapy provided using a TBC approach. There were no differences between groups for

disability at 12-week follow-up. Physical therapy provided using TBC was superior to education for pain at 12-week follow-up (mean difference, 0.84). There were no differences between groups at 12-month follow-up. Another large RCT[10] (n = 156) compared a TBC approach with usual physical therapy in patients with chronic LBP. There were no differences between groups for any of the outcomes at the 2-, 6-, or 12-month follow-up.

Movement System Impairment

I Our search identified 3 high-quality RCTs published since the last CPG comparing the MSI classification system to other interventions for patients with chronic LBP. A large (n = 101) RCT[162] compared the MSI classification treatment to nonclassification treatment in patients with chronic LBP. No differences were found between groups after treatment (8-week follow-up) or at 12-month follow-up for pain or disability. A large (n = 148) RCT[18] compared MSI classification treatment to treatment with symptom-guided stretching and strengthening exercises in people with chronic LBP. There were no differences between groups for pain or disability at 2-month follow-up.

II A small (n = 39) RCT[90] compared MSI classification treatment to a single education session in patients with chronic LBP, with clinical examination findings associated with a lumbar extension-rotation pattern. There was a benefit for the MSI classification treatment for pain (VAS mean difference, 17.71) and disability (ODI mean difference, 5.47) at 6-week follow-up.

Cognitive Functional Therapy

II A small (n = 49) RCT[147] compared CFT treatment with a generalized postural intervention in patients with chronic LBP and clinical findings of a flexion or extension pattern. There was benefit for the CFT group for disability (RMDQ mean difference, 3.8) and pain (mean difference, 2.2) at 4-week follow-up. Another small (n = 70) RCT[99] compared CFT and general exercise in patients with chronic LBP and clinical findings of a movement control impairment. Results favored the CFT group for disability at 3 months (RMDQ mean difference, 2.4) and 12 months (RMDQ mean difference, 1.7).[99]

Prognostic Risk Stratification

I Our search identified 1 high-quality RCT published since the literature search for the 2012 CPG that compared prognostic risk stratification to nonstratified current best practice.[77] This large (n = 851) RCT found benefits for treatment based on prognostic risk stratification using the STarT Back Tool for disability at 4-month (RMDQ mean difference, 1.8) and 12-month (RMDQ mean difference, 1.1) follow-ups. The pain outcome favored prognostic risk stratification at 4-month follow-up (mean difference, 0.55), with no difference at 12-month follow-up. Patients receiving stratified care were also more likely to be satisfied with treatment at 4-month follow-up and took fewer days off work due to LBP at the 12-month follow-up.

Pathoanatomic-Based Classification

I Our search identified 1 RCT[52] published since the 2012 CPG that compared pathoanatomic-based classification with guideline-based advice or advice alone. This large (n = 300) RCT found benefit for pathoanatomic-based classification for pain at 10-week (mean difference, 1.3) and 6-month (mean difference, 0.90) follow-ups. There was no difference between groups for pain at the 12-month follow-up. The pathoanatomic-based classification showed benefit for disability at 10-week (ODI mean difference, 4.7), 6-month (ODI mean difference, 5.4), and 12-month (ODI mean difference, 4.3) follow-ups.

Evidence Synthesis and Rationale

The largest number of studies published since the 2012 CPG have examined MDT for patients with chronic LBP. Two of the 3 published systematic reviews supported the use of MDT to reduce pain and disability for chronic LBP, and several of the RCTs found a reduction in pain or disability in the short term, with small or moderate effect sizes, but did not report differences at longer-term follow-ups. There is some evidence to suggest that MDT may be more effective when applied in an adherent fashion or matched to specific examination findings related to directional preference. Two RCTs compared the effectiveness of TBC to other interventions. These RCTs suggested that TBC may be superior to minimal intervention (education) but is comparable to other active treatment approaches (yoga and usual physical therapy). Three RCTs investigated the effectiveness of MSI. The high-quality RCTs suggested that MSI is similar to other active comparator treatments, while evidence from a low-quality RCT suggested that MSI may have short-term benefits when matched to specific clinical examination findings. Two RCTs supported the use of CFT for chronic LBP to reduce pain and disability at short- and long-term follow-ups. A single level I RCT (each) supports the use of prognostic risk stratification and pathoanatomic-based classification to reduce pain and disability. The magnitude of the differences supporting these classification systems ranged from small to moderate, and some systems were associated with differences noted at short- and long-term follow-ups.

2021 Recommendations

B Physical therapists may use MDT, prognostic risk stratification, or pathoanatomic-based classification to reduce pain and disability in patients with chronic LBP.

C Physical therapists can use TBC, CFT, or MSI to reduce pain and disability in patients with chronic LBP.

Gaps in Knowledge

Additional level I RCTs examining classification systems involving patients with chronic LBP are needed. There is also a need for RCTs directly comparing different classification systems. Some classification systems have only been tested in specific countries or used specially trained physical therapists. The generalizability of the findings from these studies should be investigated.

KEY POINTS FOR CLASSIFICATION SYSTEMS

Acute LBP

- There is no evidence directly comparing the effectiveness of different classification systems for patients with acute LBP.

Chronic LBP

- Some evidence supports the notion that treatments informed by MDT, CFT, prognostic risk stratification, and pathoanatomic-based classification lead to reduced pain and disability in patients with chronic LBP.
- No evidence exists to support the notion that treatment informed by any single classification system is more effective than another for reducing pain and disability in patients with chronic LBP.

CLINICAL PRACTICE GUIDELINES

Intervention: Patient Education

EVIDENCE STATEMENTS AND RECOMMENDATIONS

2012 Recommendation

The 2012 recommendations were not divided by patient subgroup (ie, they did not include separate recommendations for acute and chronic LBP).

B Physical therapists should not utilize patient education and counseling strategies that either directly or indirectly increase the perceived threat or fear associated with LBP, such as education and counseling strategies that (1) promote extended bed rest or (2) provide in-depth, pathoanatomical explanations for the specific cause of the patient's LBP. Patient education and counseling strategies for patients with LBP should emphasize (1) the promotion of the understanding of the anatomical/structural strength inherent in the human spine, (2) the neuroscience that explains pain perception, (3) the overall favorable prognosis of LBP, (4) the use of active pain coping strategies that decrease fear and catastrophizing, (5) the early resumption of normal or vocational activities, even when still experiencing pain, and (6) the importance of improvement in activity levels, not just pain relief.

2021 Evidence Update

Based on the results of our literature search, the 2021 update will include some of the same, but also different, treatment categories as did the 2012 CPG.

EDUCATION FOR PATIENTS WITH ACUTE LBP

Education and Advice

I Traeger et al[157] performed a large (n = 202) placebo-controlled RCT of adults with acute LBP. The investigators compared intensive patient education over two 1-hour sessions that included information on pain and biopsychosocial contributors, plus self-management techniques, to placebo patient education (active listening without information or advice). This study found a small benefit of patient education for disability at 1 week and 3 months, but not at 6 or 12 months. There was no additional benefit of intensive patient education for pain intensity at any time point.

II An RCT[80] (n = 30) in adults with acute LBP found a moderate-to-large benefit of adding health coaching by telephone to usual physical therapy for measures of patient-specific functioning (Patient-Specific Functional Scale) after 12 weeks (mean difference, 3.0 points; 95% CI: 0.7, 5.4), with a corresponding standardized effect size (Hedges' g = 1.1). No additional benefit of health coaching was seen at any time on the ODI.

II An RCT[123] (n = 109) of adults with acute severe LBP found no difference in 1-week pain intensity trajectory following treatment advice to "stay active in spite of pain" versus advice to "adjust activity to the pain."

Evidence Update

There were 3 RCTs that evaluated the use of different types of education strategies among patients with acute LBP. Two of these evaluated the addition of intensive education to physical therapy, and they supported the short-term benefits of education for disability and functional end points, but not for pain intensity. In particular, the level I RCT reported a small benefit for disability at short-term follow-up, but not at long-term follow-up, and no additional benefit of intensive patient education for pain intensity.

2021 Recommendation

B Physical therapists may use active education strategies rather than passive strategies (ie, providing access to educational materials only). Active education strategies include one-on-one education on the biopsychosocial contributors to pain and self-management techniques, such as remaining active, pacing strategies, and back-protection techniques. Physical therapists may also incorporate counseling on the favorable natural history of acute LBP as part of the education strategy.

EDUCATION FOR PATIENTS WITH CHRONIC LBP

Education and Advice

II One clinical trial (n = 90) by Akca et al[2] showed moderate benefit for pain intensity of postrehabilitation group education sessions that included anatomy and function of the spine, how back pain develops, proper body movements, the most commonly made mistakes in everyday life, correct postures at work and rest, and back-protection techniques, compared to no treatment. Mean pain scores for patients in the education group decreased at 3-month follow-up and showed significant improvement over the control group, favoring education.

II Du Bois and Donceel[48] performed a large RCT (n = 509) that found no difference in the average number of days on sick leave for the index episode of

LBP across participants managed with rehabilitation-oriented information and advice or with usual care. The proportion of claimants with 1 or more recurrences of sick leave for LBP was significantly higher in the control group. During the total follow-up period, the mean number of days on full benefits because of back pain was higher in the control group compared to the intervention group.

II Another RCT[132] (n = 126) found no additional benefit of education using "The Back Book" pamphlet over a natural history control group for outcomes related to physical impairment, pain intensity, health-related quality of life, and accumulated sickness absence days in an occupational cohort with nonacute LBP.

II An RCT[150] (n = 62) found no additional benefit for pain intensity or disability with administration of "The Back Book" versus no intervention at a follow-up time of approximately 3 weeks.

II One RCT[134] (n = 181) found no additional benefit of a face-to-face review of "The Back Book" compared to a control group that only received "The Back Book" (without a face-to-face review) for pain intensity or disability at any time point during the 24-month follow-up.

II An RCT[152] (n = 219) of female health care workers with recurrent LBP found a moderate benefit of combined neuromuscular exercise and back care counseling compared to either intervention alone and to a nontreatment control group for measures of pain intensity (effect size = 0.7). The counseling-only intervention showed no additional benefit over the control group.

Evidence Update

In the updated search, 6 RCTs evaluated the use of general education or advice as a stand-alone treatment for patients with chronic LBP. Four RCTs compared education to no treatment or usual care, while the other 2 RCTs compared the use of an education booklet ("The Back Book") to no treatment. The majority of the RCTs that used general education or advice as a stand-alone treatment found no additional benefit for pain and disability. Studies that included exercise showed improvements in pain and disability when combined with education.

2021 Recommendation

B Physical therapists may use standard education strategies for patients with chronic LBP, but not as a stand-alone treatment. Standard education strategies include advice related to exercise and advice about staying active.

Pain Neuroscience Education

I An RCT[91] (n = 104) studying adults with chronic pain found small or moderate short-term benefits of pain psychology and neuroscience education compared to a health behavior education program for pain severity and pain interference at 1-month follow-up.

I A systematic review and meta-analysis[168] reported that the use of pain neuroscience education (PNE) resulted in small additional benefits over no PNE for short-term pain (weighted mean difference, 0.73) and that benefits were slightly higher (weighted mean difference, 1.32) when used alongside physical therapy interventions. Likewise, meta-analysis for short-term disability demonstrated a weighted mean difference of 0.42, favoring PNE compared to no PNE, whereas the addition of PNE to physical therapy interventions demonstrated larger benefits (weighted mean difference, 3.94). Study heterogeneity precluded definitive assessments of long-term (12-month) outcomes. Another systematic review,[102] which included some of the same studies as the aforementioned meta-analysis, reported similar findings. Notably, none of the included studies that used PNE alone found improvements in pain, whereas 5 of the 6 studies that combined PNE with another intervention like exercise or manual therapy found significant reductions in pain.

II An RCT[23] (n = 56) in patients with chronic LBP found a moderate or large short-term benefit of PNE combined with multimodal therapeutic exercise compared to therapeutic exercise alone for pain intensity and disability at 3 months.

II An RCT[139] (n = 36) compared 4-week outcomes of PNE plus manual therapy to traditional patient education plus manual therapy. Pain neuroscience education plus manual therapy demonstrated moderate or large short-term benefits for changes in pain severity and the physical functioning subscale of the Medical Outcomes Study 36-Item Short-Form Health Survey.

Evidence Update

There were 2 systematic reviews (1 with a meta-analysis) and 3 RCTs that met the criteria for inclusion. The included evidence supports the use of PNE as an education strategy for chronic LBP. However, pain and disability improvements were mostly associated with small effect sizes and greatest when PNE was combined with exercise or manual therapy interventions.

2021 Recommendation

A Physical therapists should deliver PNE alongside other physical therapy interventions, such as exercise or manual therapy, to patients with chronic LBP.

Education Compared to Other Active Treatments

I An RCT (n = 701) by Lamb et al[97] found small benefits of a group cognitive behavioral intervention compared to a brief session of best-practice advice to remain active supplemented by "The Back Book" for measures of disability at 3, 6, and 12 months. There was no benefit of the cognitive behavioral intervention over education for pain intensity.

I An RCT[112] (n = 86) of adults with chronic LBP found small to moderate benefits of Pilates compared to an educational booklet containing information about the anatomy of the spine and LBP and recommendations regarding posture and movements involved in activities of daily living. Improvements in pain intensity and disability favored the Pilates group following a 6-week intervention, but benefits were no longer significantly different by 6-month follow-up.

I An RCT[138] (n = 320) of predominantly low-income, racially diverse adults with chronic LBP found no additional benefit of yoga or physical therapy compared to education using "The Back Pain Helpbook" for disability at 12 weeks. Yoga was not better than education for pain intensity, but physical therapy demonstrated a small benefit over education alone.

I Sherman et al[148] performed an RCT (n = 229) comparing yoga, stretching, and the use of "The Back Pain Helpbook" among adults with chronic LBP. Yoga demonstrated small benefits over the education self-care group for function and symptoms. At 26 weeks, function for the yoga group remained superior. Significantly more participants in the yoga and stretching groups had clinically meaningful improvements in symptoms and disability compared with the education self-care group at 12 weeks.

I An RCT[161] (n = 54) found moderate benefits of Pilates training compared to education using a pamphlet that had information on posture, physical activity, and exercise. Between-group mean differences in disability score changes were 3.2 ± 4.1 on the RMDQ and 12.3 ± 18.5 on the ODI, and the current pain VAS score change was 1.4 ± 2.3.

II An RCT[26] (n = 159) of adults with chronic LBP comparing the combination of Kundalini yoga and strength training to self-care advice using "The Back Book" alone found moderate benefit of exercise compared to use of "The Back Book" alone for change in back pain intensity (using the Chronic Pain Grade Scale) at 6-month follow-up. No benefits were found for disability for yoga and strength training over the educational approach alone.

II An RCT[62] (n = 75) of adults with chronic LBP reported moderate-to-large benefits of a patient-led goal-setting intervention compared to advice to exercise for improving outcomes in disability and pain intensity. Group differences in improvement were greater in the intervention group at posttreatment and 4 and 12 months, with moderate-to-high effect sizes.

Evidence Update

Many RCTs evaluated patient education as a control intervention, often by using "The Back Book." There were 7 RCTs that compared patient education to physically active interventions, including yoga, stretching, Pilates, and strength training.[26,62,97,112,138,148,161] Results largely supported small or moderate benefits of the active treatment over educational interventions, with the size of the effect depending on the study end point.

2021 Recommendation

A Physical therapists should use active treatments (eg, yoga, stretching, Pilates, and strength training) instead of stand-alone educational interventions for patients with chronic LBP.

EDUCATION FOR POSTOPERATIVE LBP

General Education

I An RCT[11] (n = 86) of patients undergoing laminectomy found moderate to large benefits of a targeted cognitive behavioral therapy–based rehabilitation approach compared to a general postoperative education program for back and leg pain intensity, disability, and pain interference at 3 months after surgery, but not immediately posttreatment.

II An RCT[136] (n = 96) of patients undergoing lumbar fusion found no additional benefit of a preoperative cognitive behavioral intervention compared to standard preoperative education for pain or disability 1 year following surgery. However, the reduction in disability was achieved much faster in the cognitive behavioral intervention group.

II An RCT (n = 129) by Claus et al[32] of adults undergoing first-time discectomy found no additional benefit of education using a biopsychosocial evidence-based booklet compared to a biomedical-based booklet for pain intensity or disability outcomes 2 months following surgery.

II One RCT (n = 338)[110] found no significant differences in pain or disability outcomes over 12 months among patients receiving education using the "Your Back Operation" booklet, education plus rehabilitation, rehabilitation alone, or usual care following discectomy or lateral nerve root decompression surgery. The educational content of the booklet aimed to reduce uncertainty around surgery, promote positive beliefs, encourage early reactivation, and provide practical advice on self-management.

Evidence Update

Collectively, these findings suggest that education may confer similar benefits to those of cognitive behavioral therapy–focused treatment when delivered in the preoperative time frame, but not when delivered in the postoperative period. Given the difference in treatment parameters, content, and surgical populations among these studies, no formal recommendations related to education are made regarding the comparative benefits of active treatment versus patient education in the preoperative or postoperative period.

2021 Recommendation

B Physical therapists may use general education (eg, postsurgical precautions, exercise, and resuming physical activity) for patients with LBP following lumbar spine surgery. This recommendation applies to those undergoing discectomy or decompression surgery. No specific recommendation is provided for education for patients undergoing other surgical procedures (eg, spinal fusion) due to lack of evidence.

KEY POINTS FOR PATIENT EDUCATION

Acute LBP

- Active patient education strategies, including information on biopsychosocial contributors to pain and self-management techniques, have evidence that they reduce pain and disability in patients with acute LBP.

Chronic LBP

- Patient education should not be used as a stand-alone treatment to reduce pain and disability in patients with chronic LBP, but can be combined with other interventions such as exercise and manual therapy.

Postoperative LBP

- Patient education has primarily been studied post lumbar decompression or discectomy surgery.
- No evidence supports education for patients undergoing other surgical procedures (eg, spinal fusion).

Evidence Maps

Acute Low Back Pain




Exercise	Manual and Other Directed Therapies	Classification Systems	Patient Education
Should Use (Level I and/or Level II RCTs)			
	• Thrust or nonthrust joint mobilization		
May Use (Single Level I RCT or Small-Sample Level II RCTs With Short Follow-up Times)			
With Leg Pain: • Muscle strengthening and endurance • Specific trunk activation	• Soft tissue mobilization • Massage	• Treatment-based classification	• Active education and advice • Biopsychosocial contributors to pain • Self-management techniques • Favorable natural history
Can Use (Single Level II RCT)			
• General exercise training		• Mechanical Diagnosis and Therapy	
Knowledge Gaps (Level I RCTs Needed)			
Movement Control: • Trunk mobility • Aerobic exercises • Multimodal exercises	• Neural tissue mobilization • Dry needling • Traction	• Cognitive functional therapy • Prognostic risk stratification • Pathoanatomic-based classification • Movement system impairment	• Pain neuroscience education

FIGURE 2. Evidence map for acute low back pain interventions depicting the overall evidence landscape for the 2021 update to the low back pain clinical practice guideline. Grade A–level evidence corresponds with "should use" and is in blue, grade B–level evidence corresponds with "may use" and is in green, and grade C–level evidence corresponds with "can use" and is in orange. Knowledge gaps are summarized in purple. Abbreviation: RCT, randomized clinical trial.

Chronic Low Back Pain




Exercise	Manual and Other Directed Therapies	Classification Systems	Patient Education
Should Use (Level I and/or Level II RCTs)			
• General exercise training • Muscle strengthening and endurance • Specific trunk activation • Aerobic • Aquatic • Multimodal --- **With Movement Control Impairment:** • Specific trunk activation • Movement control --- **For Older Adults:** • General exercise training	• Thrust or nonthrust joint mobilization		• Pain neuroscience education not as a stand-alone treatment • Active treatment (yoga, stretching, Pilates, and strength training)
May Use (Single Level I RCT or Small-Sample Level II RCTs With Short Follow-up Times)			
• Movement control • Trunk mobility --- **With Leg Pain:** • Specific trunk activation • Movement control	• Soft tissue mobilization • Massage --- **With Leg Pain:** • Thrust or nonthrust joint mobilization • Neural tissue mobilization	• Mechanical Diagnosis and Therapy • Prognostic risk stratification • Pathoanatomic-based classification	• Active education not as a stand-alone treatment --- **Postoperative:** • General education (following discectomy or decompression)
Can Use (Single Level II RCT)			
Postoperative: • General exercise training	• Dry needling	• Treatment-based classification • Movement system impairment • Cognitive functional therapy	
Knowledge Gaps (Level I RCTs Needed)			
• Comparisons of different approaches • Optimal dosing parameters • Targeted delivery	• Comparisons of manual therapy and active treatments • Value of manual therapy in multimodal approaches	• Direct comparisons of different classification systems	

FIGURE 3. Evidence map for chronic low back pain interventions depicting the overall evidence landscape for the 2021 update to the low back pain clinical practice guideline. Grade A–level evidence corresponds with "should use" and is in blue, grade B–level evidence corresponds with "may use" and is in green, and grade C–level evidence corresponds with "can use" and is in orange. Knowledge gaps are summarized in purple. Abbreviation: RCT, randomized clinical trial.

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APPENDIX A

MASTER SEARCH TABLES

Searches Conducted on June 25, 2020 in PubMed

Classification

Search	Query	Total, n
1	("back pain/classification"[MeSH] OR "Back Injuries/classification"[Mesh:NoExp] OR "spinal diseases/classification"[MeSH:noexp] OR "intervertebral disc degeneration/classification"[MeSH] OR "intervertebral disc displacement/classification"[MeSH] OR "spondylarthritis/classification"[MeSH:noexp] OR "spondylarthropathies/classification"[MeSH:noexp] OR "spondylosis/classification"[MeSH] OR "spinal stenosis/classification"[MeSH] OR "sciatic neuropathy/classification"[MeSH] OR start back[tiab])	1295
2	(("back pain"[MESH] OR "back injuries"[MeSH:noexp] OR "spinal diseases"[MeSH:noexp] OR "intervertebral disc degeneration"[MESH] OR "intervertebral disc displacement"[MESH] OR "spondylarthritis"[MeSH:noexp] OR "osteoarthritis, spine"[MESH] OR "spondylarthropathies"[MESH:noexp] OR "spondylosis"[MESH] OR "spinal stenosis"[MESH] OR "sciatic neuropathy"[MESH] OR "lumbar vertebrae"[MESH] OR "intervertebral disc"[MESH] OR "zygapophyseal joint"[MESH]) OR (("musculoskeletal pain"[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179453
3	(((accuracy*[tiab] OR "algorithms"[MeSH:noexp] OR algorithm*[tiab] OR classif*[tiab] OR clinical exam*[tiab] OR physical exam*[tiab] OR screening[tiab] OR cluster*[tiab] OR cohort*[tiab] OR "cohort studies"[MeSH:noexp] OR subgroup*[tiab] OR subtype*[tiab] OR diagnose[tiab] OR diagnosing[tiab] OR "models, statistical"[Mesh] OR predict*[tiab] OR prognos*[tw] OR reliab*[tiab] OR sensitivity analys*[tiab] OR "sensitivity and specificity"[MeSH] OR specificity[tiab] OR "severity of illness index"[Mesh] OR valid*[tiab] OR validation studies[pt] OR "treatment failure"[MeSH]) AND (chiropract*[tw] OR physical therap*[TW] OR physiotherap*[TW] OR "physical therapy modalities"[MeSH] OR primary care[tw] OR primary health care[tw] OR primary healthcare[tw])) OR back screen*[tiab] OR categorize[tiab] OR categorization[tiab] OR "classification"[MeSH] OR classification based[tiab] OR classification scheme*[tiab] OR classification system*[tiab] OR clinical decision*[tiab] OR clinical pathway*[tiab] OR clinical prediction*[tiab] OR "cluster analysis"[MeSH] OR cluster analys*[tiab] OR "decision making"[MeSH] OR decision rule*[tiab] OR decision support[tiab] OR "decision Support Techniques"[MeSH] OR diagnostic classification[tiab] OR "diagnostic self evaluation"[MeSH] OR disability evaluation*[tiab] OR "exercise test"[MeSH] OR exercise test*[tiab] OR movement test*[tiab] OR ICF[tiab] OR mechanical diagnosis[tiab] OR "medical history taking"[MeSH:noexp] OR history taking[tiab] OR Mckenzie[tiab] OR "movement/classification"[Mesh] OR movement system*[tiab] OR "palpation"[MeSH:noexp] OR "physical examination"[MeSH:noexp] OR predictive model*[tiab] OR stratif*[tiab] OR sub classification*[tiab] OR subclassification*[tiab] OR sub group*[tiab] OR subgrouping*[tiab] OR targeted treatment*[tiab] OR (classif*[TIAB] AND ("disability evaluation"[MeSH] OR evidence based[tiab] OR functioning[tiab] OR gait[tiab] OR impairment*[tiab] OR mechanism*[tiab] OR motor control*[tiab] OR "movement"[MeSH] OR movement*[tiab] OR walking[tiab] OR pathoanatom*[tiab] OR psychological[tiab] OR psychosocial[tiab] OR rehabilitation[tiab] OR treatment based[tiab] OR cognitive[tiab] OR multidimensional[tiab] OR clinical[tiab])) OR (subgroup*[tiab] AND ("disability evaluation"[MeSH] OR exercise*[tiab] OR manipulation*[tiab] OR impairment*[tiab] OR "movement"[MeSH] OR movement*[tiab] OR prognos*[tiab] OR predictor*[tiab] OR rehabilitation[tiab] OR treatment based[tiab] OR cognitive[tiab] OR multidimensional[tiab] OR clinical[tiab])))	1348047
4	1 OR (2 AND 3)	15476
5	"Randomized Controlled Trials as Topic"[Mesh] OR "Meta-analysis as topic"[Mesh] OR "Randomized Controlled Trial"[pt] OR "Placebos"[Mesh] OR "Meta-Analysis"[pt] OR "Systematic Review"[pt] OR "Controlled Clinical Trial"[pt] OR "Practice Guideline" [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR "single blind"[tiab] OR "single blinded"[tiab] OR "double blind"[tiab] OR "double blinded"[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR "meta analysis"[tiab] OR "meta synthesis"[tiab] OR "meta analyses"[tiab] OR "meta syntheses"[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR "meta analytic"[tiab] OR metaanalytic[tiab] OR "umbrella review"[tiab] OR "umbrella reviews"[tiab] OR "scoping review"[tiab] OR "scoping reviews"[tiab] OR "rapid review"[tiab] OR "rapid reviews"[tiab] OR "practice guideline"[tiab] OR "clinical guideline"[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND ("inclusion criteri*"[tiab] OR "exclusion criteri*"[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2236737
6	4 AND 5	3924

APPENDIX A

Manual and Other Directed Therapies

Search	Query	Total, n
1	((“back pain”[MESH] OR “back injuries”[MeSH:noexp] OR “spinal diseases”[MeSH:noexp] OR “intervertebral disc degeneration”[MESH] OR “intervertebral disc displacement”[MESH] OR “spondylarthritis”[MeSH:noexp] OR “osteoarthritis, spine”[MESH] OR “spondylarthropathies”[MESH:noexp] OR “spondylosis”[MESH] OR “spinal stenosis”[MESH] OR “sciatic neuropathy”[MESH] OR “lumbar vertebrae”[MESH] OR “intervertebral disc”[MESH] OR “zygapophyseal joint”[MESH]) OR ((“musculoskeletal pain”[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179435
2	“Physical Therapy Modalities”[Mesh:NoExp] OR “Musculoskeletal Manipulations”[Mesh] OR “Chiropractic”[Mesh] OR “Acupuncture Therapy”[Mesh:NoExp] OR manipulat*[tiab] OR manual therap*[tiab] OR mobilisation*[tiab] OR mobilization*[tiab] OR bodywork*[tiab] OR chiropract*[tiab] OR craniosacral therap*[tiab] OR massag*[tiab] OR meridian therap*[tiab] OR omt[tiab] OR reflexology*[tiab] OR dry needling[tiab] OR acupressure[tiab] OR acupuncture[tiab]	328221
3	“Randomized Controlled Trials as Topic”[Mesh] OR “Meta-analysis as topic”[Mesh] OR “Randomized Controlled Trial”[pt] OR “Placebos”[Mesh] OR “Meta-Analysis”[pt] OR “Systematic Review”[pt] OR “Controlled Clinical Trial”[pt] OR “Practice Guideline” [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR “single blind”[tiab] OR “single blinded”[tiab] OR “double blind”[tiab] OR “double blinded”[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR “meta analysis”[tiab] OR “meta synthesis”[tiab] OR “meta analyses”[tiab] OR “meta syntheses”[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR “meta analytic”[tiab] OR metaanalytic[tiab] OR “umbrella review”[tiab] OR “umbrella reviews”[tiab] OR “scoping review”[tiab] OR “scoping reviews”[tiab] OR “rapid review”[tiab] OR “rapid reviews”[tiab] OR “practice guideline”[tiab] OR “clinical guideline”[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND (“inclusion criteri*”[tiab] OR “exclusion criteri*”[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2236738
4	1 AND 2 AND 3	3024

Trunk Coordination

Search	Query	Total, n
1	((“back pain”[MESH] OR “back injuries”[MeSH:noexp] OR “spinal diseases”[MeSH:noexp] OR “intervertebral disc degeneration”[MESH] OR “intervertebral disc displacement”[MESH] OR “spondylarthritis”[MeSH:noexp] OR “osteoarthritis, spine”[MESH] OR “spondylarthropathies”[MESH:noexp] OR “spondylosis”[MESH] OR “spinal stenosis”[MESH] OR “sciatic neuropathy”[MESH] OR “lumbar vertebrae”[MESH] OR “intervertebral disc”[MESH] OR “zygapophyseal joint”[MESH]) OR ((“musculoskeletal pain”[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179453
2	(“physical therapy modalities”[Mesh Terms:noexp] OR “exercise therapy”[MeSH] OR “exercise movement techniques”[MeSH:noexp] OR ((exercise*[tiab] OR exercising[tiab] OR program*[tiab] OR train*[tiab]) AND (“abdominal muscles”[MeSH:noexp] OR back muscle*[tiab] OR “paraspinal muscles”[MeSH] OR paraspinal[tiab] OR multifidus[tiab] OR transversus[tiab] OR trunk[tiab] OR coordination[tiab] OR dynamic[tiab] OR endurance[tiab] OR extension[tiab] OR isometric*[tiab] OR motor control[tiab] OR “muscle contraction”[MeSH] OR resistance[tiab] OR stabili*[tiab] OR strengthen*[tiab] OR targeted[tiab])) OR active exercise*[tiab] OR back exercise*[tiab] OR exercise intervention*[tiab] OR exercise therapy[tiab] OR therapeutic exercise*[tiab] OR Alexander[tiab] OR dynamic sit*[tiab] OR functional restoration[tiab] OR functional technique*[tiab] OR lateral slid*[tiab] OR motor training[tiab] OR multidisciplinary rehabilitation[tiab] OR (neuromuscular[tiab] AND facilitation[tiab]) OR Swiss ball*[tiab] OR biofeedback[tiab] OR feedback[tiab] OR reeducation[tiab])	427257
3	“Randomized Controlled Trials as Topic”[Mesh] OR “Meta-analysis as topic”[Mesh] OR “Randomized Controlled Trial”[pt] OR “Placebos”[Mesh] OR “Meta-Analysis”[pt] OR “Systematic Review”[pt] OR “Controlled Clinical Trial”[pt] OR “Practice Guideline” [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR “single blind”[tiab] OR “single blinded”[tiab] OR “double blind”[tiab] OR “double blinded”[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR “meta analysis”[tiab] OR “meta synthesis”[tiab] OR “meta analyses”[tiab] OR “meta syntheses”[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR “meta analytic”[tiab] OR metaanalytic[tiab] OR “umbrella review”[tiab] OR “umbrella reviews”[tiab] OR “scoping review”[tiab] OR “scoping reviews”[tiab] OR “rapid review”[tiab] OR “rapid reviews”[tiab] OR “practice guideline”[tiab] OR “clinical guideline”[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND (“inclusion criteri*”[tiab] OR “exclusion criteri*”[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2237149
4	1 AND 2 AND 3	2913

APPENDIX A

Centralization

Search	Query	Total, n
1	(("back pain"[MESH] OR "back injuries"[MeSH:noexp] OR "spinal diseases"[MeSH:noexp] OR "intervertebral disc degeneration"[MESH] OR "intervertebral disc displacement"[MESH] OR "spondylarthritis"[MeSH:noexp] OR "osteoarthritis, spine"[MESH] OR "spondylarthropathies"[MESH:noexp] OR "spondylosis"[MESH] OR "spinal stenosis"[MESH] OR "sciatic neuropathy"[MESH] OR "lumbar vertebrae"[MESH] OR "intervertebral disc"[MESH] OR "zygapophyseal joint"[MESH]) OR (("musculoskeletal pain"[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179451
2	("Exercise Movement Techniques"[Mesh:NoExp] OR "Exercise Therapy"[Mesh] OR "Physical Therapy Modalities"[Mesh:NoExp] OR ((flexion[tiab] OR extension[tiab] OR therapeut*[tiab]) AND exercis*[tiab]) OR active therap*[tiab] OR centralisation*[tiab] OR centralization*[tiab] OR directional preference*[tiab] OR exercise movement techni*[tiab] OR exercise treatment*[tiab] OR lateral shift*[tiab] OR lateral translation*[tiab] OR mckenzie*[tiab] OR MDT[tiab] OR mechanical diagnosis[tiab] OR muscle energy technique*[tiab] OR neuromuscular facilitat*[tiab] OR postural correct*[tiab] OR repeated exercis*[tiab] OR repeated procedure*[tiab] OR resistance training[tiab])	114974
3	"Randomized Controlled Trials as Topic"[Mesh] OR "Meta-analysis as topic"[Mesh] OR "Randomized Controlled Trial"[pt] OR "Placebos"[Mesh] OR "Meta-Analysis"[pt] OR "Systematic Review"[pt] OR "Controlled Clinical Trial"[pt] OR "Practice Guideline" [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR "single blind"[tiab] OR "single blinded"[tiab] OR "double blind"[tiab] OR "double blinded"[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR "meta analysis"[tiab] OR "meta synthesis"[tiab] OR "meta analyses"[tiab] OR "meta syntheses"[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR "meta analytic"[tiab] OR metaanalytic[tiab] OR "umbrella review"[tiab] OR "umbrella reviews"[tiab] OR "scoping review"[tiab] OR "scoping reviews"[tiab] OR "rapid review"[tiab] OR "rapid reviews"[tiab] OR "practice guideline"[tiab] OR "clinical guideline"[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND ("inclusion criteri*"[tiab] OR "exclusion criteri*"[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2237084
4	1 AND 2 AND 3	2339

Mobilization

Search	Query	Total, n
1	(("back pain"[MESH] OR "back injuries"[MeSH:noexp] OR "spinal diseases"[MeSH:noexp] OR "intervertebral disc degeneration"[MESH] OR "intervertebral disc displacement"[MESH] OR "spondylarthritis"[MeSH:noexp] OR "osteoarthritis, spine"[MESH] OR "spondylarthropathies"[MESH:noexp] OR "spondylosis"[MESH] OR "spinal stenosis"[MESH] OR "sciatic neuropathy"[MESH] OR "lumbar vertebrae"[MESH] OR "intervertebral disc"[MESH] OR "zygapophyseal joint"[MESH]) OR (("musculoskeletal pain"[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179435
2	("Physical Therapy Modalities"[Mesh:NoExp] OR ((nerve[tiab] OR neural[tiab]) AND (mobilization[tiab] OR mobilisation[tiab])) OR nerve glid*[tiab] OR nerve stretch*[tiab] OR nerve tension[tiab] OR nerve therapy[tiab] OR nerve treatment[tiab] OR neural gliding[tiab] OR neural tension[tiab] OR neural therap*[tiab] OR neural treatment[tiab] OR slump stretch[tiab] OR neurodynamic*[tiab] OR straight leg raise*[tiab])	40550
3	"Randomized Controlled Trials as Topic"[Mesh] OR "Meta-analysis as topic"[Mesh] OR "Randomized Controlled Trial"[pt] OR "Placebos"[Mesh] OR "Meta-Analysis"[pt] OR "Systematic Review"[pt] OR "Controlled Clinical Trial"[pt] OR "Practice Guideline" [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR "single blind"[tiab] OR "single blinded"[tiab] OR "double blind"[tiab] OR "double blinded"[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR "meta analysis"[tiab] OR "meta synthesis"[tiab] OR "meta analyses"[tiab] OR "meta syntheses"[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR "meta analytic"[tiab] OR metaanalytic[tiab] OR "umbrella review"[tiab] OR "umbrella reviews"[tiab] OR "scoping review"[tiab] OR "scoping reviews"[tiab] OR "rapid review"[tiab] OR "rapid reviews"[tiab] OR "practice guideline"[tiab] OR "clinical guideline"[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND ("inclusion criteri*"[tiab] OR "exclusion criteri*"[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2236738
4	1 AND 2 AND 3	1006

APPENDIX A

Traction

Search	Query	Total, n
1	(("back pain"[MESH] OR "back injuries"[MeSH:noexp] OR "spinal diseases"[MeSH:noexp] OR "intervertebral disc degeneration"[MESH] OR "intervertebral disc displacement"[MESH] OR "spondylarthritis"[MeSH:noexp] OR "osteoarthritis, spine"[MESH] OR "spondylarthropathies"[MESH:noexp] OR "spondylosis"[MESH] OR "spinal stenosis"[MESH] OR "sciatic neuropathy"[MESH] OR "lumbar vertebrae"[MESH] OR "intervertebral disc"[MESH] OR "zygapophyseal joint"[MESH]) OR (("musculoskeletal pain"[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179451
2	"Traction"[Mesh] OR decompression therap*[tiab] OR traction*[tiab]	23442
3	"Randomized Controlled Trials as Topic"[Mesh] OR "Meta-analysis as topic"[Mesh] OR "Randomized Controlled Trial"[pt] OR "Placebos"[Mesh] OR "Meta-Analysis"[pt] OR "Systematic Review"[pt] OR "Controlled Clinical Trial"[pt] OR "Practice Guideline" [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR "single blind"[tiab] OR "single blinded"[tiab] OR "double blind"[tiab] OR "double blinded"[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR "meta analysis"[tiab] OR "meta synthesis"[tiab] OR "meta analyses"[tiab] OR "meta syntheses"[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR "meta analytic"[tiab] OR metaanalytic[tiab] OR "umbrella review"[tiab] OR "umbrella reviews"[tiab] OR "scoping review"[tiab] OR "scoping reviews"[tiab] OR "rapid review"[tiab] OR "rapid reviews"[tiab] OR "practice guideline"[tiab] OR "clinical guideline"[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND ("inclusion criteri*"[tiab] OR "exclusion criteri*"[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2237083
4	1 AND 2 AND 3	239

Patient Education

Search	Query	Total, n
1	(("back pain"[MESH] OR "back injuries"[MeSH:noexp] OR "spinal diseases"[MeSH:noexp] OR "intervertebral disc degeneration"[MESH] OR "intervertebral disc displacement"[MESH] OR "spondylarthritis"[MeSH:noexp] OR "osteoarthritis, spine"[MESH] OR "spondylarthropathies"[MESH:noexp] OR "spondylosis"[MESH] OR "spinal stenosis"[MESH] OR "sciatic neuropathy"[MESH] OR "lumbar vertebrae"[MESH] OR "intervertebral disc"[MESH] OR "zygapophyseal joint"[MESH]) OR (("musculoskeletal pain"[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179453
2	("patient education as topic"[MeSH:noexp] OR education[tiab] OR educational[tiab] OR advice[tiab] OR counsel*[tiab] OR coach*[tiab] OR "behavior therapy"[MeSH:noexp] OR behavioural therap*[tiab] OR "cognitive therapy"[MeSH:noexp] OR (cognitive[tiab] AND therapy[tiab]) OR cognitive behavio*[tiab] OR "conditioning, operant"[MeSH] OR operant[tiab] OR behavior chang*[tiab] OR behaviour chang*[tiab] OR behavioral chang*[tiab] OR behavioural chang*[tiab] OR group therap*[tiab] OR ((interdisciplinary[tiab] OR multidisciplinary[tiab] or multi disciplinary[tiab]) AND rehabilitation[tiab]) OR psychologically informed[tiab] OR neuroscience[tiab] OR goal setting[tiab] OR motivation*[tiab] OR reassurance[tiab] OR coping[tiab] OR problem solving[tiab] OR "self care"[MeSH:noexp] OR self care[tiab] OR self management[tiab] OR stay active[tiab] OR staying active[tiab] OR (home[tiab] AND exercise*[tiab]) OR back school*[tiab] OR information provision*[tiab] OR book*[tiab] OR brochure*[tiab] OR leaflet*[tiab] OR pamphlet*[tiab] OR therapeutic alliance[tiab] OR "professional-patient relations"[Mesh:noexp] OR "physician-patient relations"[Mesh Terms] OR (psychological*[TW] AND (physical therap*[TW] OR physiotherap*[TW])) OR start back[tiab])	1204496
3	"Randomized Controlled Trials as Topic"[Mesh] OR "Meta-analysis as topic"[Mesh] OR "Randomized Controlled Trial"[pt] OR "Placebos"[Mesh] OR "Meta-Analysis"[pt] OR "Systematic Review"[pt] OR "Controlled Clinical Trial"[pt] OR "Practice Guideline" [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR "single blind"[tiab] OR "single blinded"[tiab] OR "double blind"[tiab] OR "double blinded"[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR "meta analysis"[tiab] OR "meta synthesis"[tiab] OR "meta analyses"[tiab] OR "meta syntheses"[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR "meta analytic"[tiab] OR metaanalytic[tiab] OR "umbrella review"[tiab] OR "umbrella reviews"[tiab] OR "scoping review"[tiab] OR "scoping reviews"[tiab] OR "rapid review"[tiab] OR "rapid reviews"[tiab] OR "practice guideline"[tiab] OR "clinical guideline"[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND ("inclusion criteri*"[tiab] OR "exclusion criteri*"[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2237149
4	1 AND 2 AND 3	2608

APPENDIX A

Progressive Endurance

Search	Query	Total, n
1	(("back pain"[MESH] OR "back injuries"[MeSH:noexp] OR "spinal diseases"[MeSH:noexp] OR "intervertebral disc degeneration"[MESH] OR "intervertebral disc displacement"[MESH] OR "spondylarthritis"[MeSH:noexp] OR "osteoarthritis, spine"[MESH] OR "spondylarthropathies"[MESH:noexp] OR "spondylosis"[MESH] OR "spinal stenosis"[MESH] OR "sciatic neuropathy"[MESH] OR "lumbar vertebrae"[MESH] OR "intervertebral disc"[MESH] OR "zygapophyseal joint"[MESH]) OR (("musculoskeletal pain"[MeSH:noexp] OR musculoskeletal pain[TIAB]) AND (back[TIAB] OR spine[TIAB] OR spinal[TIAB])) OR spinal pain*[TIAB] OR back disorder*[TIAB] OR back injur*[TIAB] OR back pain[TIAB] OR back pains[TIAB] OR backache*[TIAB] OR back ache*[TIAB] OR back strain*[TIAB] OR back sprain*[TIAB] OR failed back[TIAB] OR lumbago[TIAB] OR ((lumbar[TIAB] OR lumbosacral*[TIAB] OR lumbo sacral*[TIAB] OR lower back[TIAB]) AND (pain[tiab] OR pains[tiab] OR painful[tiab] OR stenosis[TIAB] OR stenoses[TIAB] OR radiculopathy[TIAB] OR instability[TIAB] OR instabilities[TIAB] OR strain[TIAB] OR strains[tiab])) OR lumbar dysfunction[TIAB] OR ((disc[TIAB] OR discs[TIAB] OR disk[TIAB] OR disks[TIAB]) AND (herniated[TIAB] OR herniation[TIAB] OR herniations[TIAB] OR degenerative[TIAB] OR degeneration[TIAB] OR prolapse*[TIAB])) OR coccydynia[TIAB] OR spondylarth*[TIAB] OR spondylisthesis[TIAB] OR spondylo*[TIAB] OR sciatica[TIAB] OR facet joint*[TIAB] OR zygapophyseal joint*[TIAB])	179453
2	("physical therapy modalities"[MeSH:noexp] OR "exercise therapy"[Mesh Terms] OR "exercise"[MeSH:noexp] OR "exercise movement techniques"[MeSH:noexp] OR "physical conditioning, human"[Mesh Terms] OR "physical fitness"[MeSH] OR "walking"[MeSH:noexp] OR "tai ji"[Mesh Terms] OR "yoga"[Mesh Terms] OR physical activity[tiab] OR exercise[tiab] OR exercises[tiab] OR exercising[tiab] OR graded activit*[tiab] OR physical conditioning[tiab] OR (physical[tiab] AND training[tiab]) OR active rehab*[tiab] OR activity based[tiab] OR fitness[tiab] OR aerobic[tiab] OR walking[tiab] OR strength train*[tiab] OR resistance train*[tiab] OR tai chi[tiab] OR pilates[tiab] OR stretching[tiab] OR aquatic[tiab])	715702
3	"Randomized Controlled Trials as Topic"[Mesh] OR "Meta-analysis as topic"[Mesh] OR "Randomized Controlled Trial"[pt] OR "Placebos"[Mesh] OR "Meta-Analysis"[pt] OR "Systematic Review"[pt] OR "Controlled Clinical Trial"[pt] OR "Practice Guideline" [Publication Type] OR systematic[subset] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR placebo[tiab] OR randomly[tiab] OR "single blind"[tiab] OR "single blinded"[tiab] OR "double blind"[tiab] OR "double blinded"[tiab] OR systematic[tiab] OR systematically[tiab] OR meta-analysis[tiab] OR meta-synthesis[tiab] OR meta-analyses[tiab] OR meta-syntheses[tiab] OR "meta analysis"[tiab] OR "meta synthesis"[tiab] OR "meta analyses"[tiab] OR "meta syntheses"[tiab] OR metaanalysis[tiab] OR metaanalyses[tiab] OR meta-analytic[tiab] OR "meta analytic"[tiab] OR metaanalytic[tiab] OR "umbrella review"[tiab] OR "umbrella reviews"[tiab] OR "scoping review"[tiab] OR "scoping reviews"[tiab] OR "rapid review"[tiab] OR "rapid reviews"[tiab] OR "practice guideline"[tiab] OR "clinical guideline"[tiab] OR ((review[tiab] OR reviews[tiab] OR reviewed[tiab] OR search[tiab] OR searches[tiab] OR searched[tiab] OR searching[tiab] OR handsearch[tiab] OR handsearched[tiab]) AND ("inclusion criteri*"[tiab] OR "exclusion criteri*"[tiab] OR references[tiab] OR papers[tiab] OR articles[tiab] OR publications[tiab] OR studies[tiab] OR trials[tiab] OR datasets[tiab] OR databases[tiab]))	2237149
4	1 AND 2 AND 3	3850

Searches Conducted on June 25, 2020 in Embase

Classification

Search	Query	Total, n
1	('backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*')	248715
2	(accuracy*:ab,ti OR 'algorithm'/de OR 'classification algorithm'/de OR algorithm*:ab,ti OR classif*:ab,ti OR 'clinical exam*':ab,ti OR 'physical exam*':ab,ti OR screening:ab,ti OR cluster*:ab,ti OR cohort*:ab,ti OR 'cohort analysis'/de OR subgroup*:ab,ti OR diagnose:ab,ti OR diagnosing:ab,ti OR 'statistical model'/de OR predict*:ab,ti OR prognos* OR reliability:ab,ti OR 'sensitivity analys*':ab,ti OR 'sensitivity and specificity'/de OR specificity:ab,ti OR 'severity of illness index'/de OR validat*:ab,ti OR validity*:ab,ti OR 'treatment failure'/de AND (chiropract* OR 'physical therap*' OR physiotherap* OR 'physiotherapy'/exp OR 'primary care' OR 'primary health care' OR 'primary healthcare') OR 'classification'/de OR 'clinical classification'/de OR 'international classification of impairments, disabilities and handicaps'/de OR 'nursing classification'/exp OR 'back screen*':ab,ti OR categorize:ab,ti OR categorization:ab,ti OR (classif*:ab,ti AND ('disability'/exp OR 'evidence based':ab,ti OR functioning:ab,ti OR gait OR impairment*:ab,ti OR mechanism*:ab,ti OR 'motor activity'/de OR 'motor control*':ab,ti OR movement* OR walking OR pathoanatom*:ab,ti OR psychological:ab,ti OR psychosocial:ab,ti OR rehabilitation:ab,ti OR 'treatment based':ab,ti OR cognitive:ab,ti OR multidimensional:ab,ti OR clinical:ab,ti)) OR 'classification based':ab,ti OR 'classification scheme*':ab,ti OR 'classification system*':ab,ti OR 'clinical decision*':ab,ti OR 'clinical pathway*':ab,ti OR 'clinical prediction*':ab,ti OR 'cluster analysis'/de OR 'cluster analys*':ab,ti OR 'decision making'/exp OR 'decision rule*':ab,ti OR 'decision support':ab,ti OR 'decision support system'/de OR 'diagnostic classification':ab,ti OR 'self evaluation'/de OR 'disability evaluation*':ab,ti OR 'exercise test'/de OR 'exercise test*':ab,ti OR 'movement test*':ab,ti OR icf:ab,ti OR 'mechanical diagnosis':ab,ti OR 'anamnesis'/de OR 'history taking':ab,ti OR mckenzie:ab,ti OR 'movement system*':ab,ti OR 'palpation'/de OR 'physical examination'/de OR 'predictive model*':ab,ti OR stratif*:ab,ti OR 'sub classification*':ab,ti OR subclassification*:ab,ti OR (subgroup*:ab,ti AND ('disability'/exp OR 'exercise'/exp OR exercise*:ab,ti OR manipulation*:ab,ti OR impairment*:ab,ti OR 'movement (physiology)'/exp OR movement*:ab,ti OR prognos*:ab,ti OR predictor*:ab,ti OR rehabilitation:ab,ti OR cognitive:ab,ti OR multidimensional:ab,ti OR clinical:ab,ti)) OR 'sub group*':ab,ti OR subgrouping*:ab,ti OR 'targeted treatment*':ab,ti)	2179445

Table continues on page CPGcpg44.

APPENDIX A

Search	Query	Total, n
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	8059

Manual and Other Directed Therapies

Search	Query	Total, n
1	'backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*'	248715
2	'manipulative medicine'/exp OR mobilization*:ab,ti OR mobilisation*:ab,ti OR manipulat*:ab,ti OR acupressure:ab,ti OR acupuncture:ab,ti OR 'applied kinesiology':ab,ti OR 'manual therap*' OR bodywork*:ab,ti OR chiropract* OR massag*:ab,ti OR 'dry needling':ab,ti OR reflexolog*:ab,ti	372540
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	4147

Trunk Coordination

Search	Query	Total, n
1	'backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*'	248715
2	'physiotherapy'/de OR 'kinesiotherapy'/exp OR 'exercise* intervention':ab,ti OR 'exercise* therap*':ab,ti OR 'alexander*':ab,ti OR 'dynamic sit':ab,ti OR 'functional restoration*':ab,ti OR 'functional technique*':ab,ti OR 'lateral slid*':ab,ti OR 'motor train*':ab,ti OR 'multidisciplinary rehabilitation*':ab,ti OR (neuromuscular NEAR/5 facilitation):ab,ti OR 'feedback':ab,ti OR 'reeducation':ab,ti OR (exercise*:ab,ti OR exercising:ab,ti OR program*:ab,ti OR train*:ab,ti AND ('abdominal wall musculature'/exp OR 'paraspinal muscle'/exp OR 'muscle contraction'/exp OR 'back muscle*':ab,ti OR paraspinal:ab,ti OR multifidus:ab,ti OR transversus:ab,ti OR trunk:ab,ti OR coordination:ab,ti OR dynamic:ab,ti OR endurance:ab,ti OR extension:ab,ti OR isometric*:ab,ti OR 'motor control':ab,ti OR resistance:ab,ti OR stabili*:ab,ti OR strengthen*:ab,ti OR targeted:ab,ti)) OR 'abdominal wall musculature'/exp OR 'exercise'/de OR 'resistance training'/exp OR 'coordination':ab,ti OR 'core strength*':ab,ti OR 'dynamic sitting*':ab,ti OR 'exercise*':ab,ti OR 'multifidus muscle*':ab,ti OR 'strengthening':ab,ti OR 'transversus abdominis':ab,ti OR 'trunk stabilization*':ab,ti	1089799

Table continues on page CPGcpg45.

APPENDIX A

Search	Query	Total, n
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	7113

Centralization

Search	Query	Total, n
1	'backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*'	248715
2	'physiotherapy'/de OR 'kinesiotherapy'/de OR 'movement therapy'/de OR 'dynamic exercise'/de OR 'isokinetic exercise'/de OR 'isometric exercise'/de OR 'muscle training'/de OR 'neuromuscular facilitation'/de OR 'open kinetic chain exercise'/de OR 'static exercise'/de OR 'stretching exercise'/de OR centralization*:ab,ti OR mckenzie*:ab,ti OR centralisation*:ab,ti OR 'therapeut* exercis*':ab,ti OR 'flexion exercis*':ab,ti OR 'extension exercis*':ab,ti OR 'postural correct*':ab,ti OR 'active therap*':ab,ti OR 'directional preference*':ab,ti OR 'stabilization exercis*' OR 'stabilisation exercis*' OR 'lateral shift*':ab,ti OR 'lateral translation*':ab,ti OR 'mechanical diagnosis':ab,ti OR 'muscle energy technique*':ab,ti OR 'neuromuscular facilitat*':ab,ti OR 'repeated exercis*':ab,ti OR 'resistance train*'	17420
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	4429

Mobilization

Search	Query	Total, n
1	'backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*'	248715
2	'physiotherapy'/de OR ((nerve OR neural) NEAR/5 (mobilization OR mobilisation)):ab,ti OR ((nerve OR neural) NEAR/1 (glid* OR stretch* OR tension OR therap* OR treatment)):ab,ti OR 'lower limb traction':ab,ti OR 'limb mobilization':ab,ti OR neurodynamic*:ab,ti OR 'straight leg rais*':ab,ti OR neurostimulat*:ab,ti OR 'spinal cord stimulat*':ab,ti	106930

Table continues on page CPGcpg46.

APPENDIX A

Search	Query	Total, n
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	3676

Traction

Search	Query	Total, n
1	'backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*'	248715
2	traction* OR 'decompression therap*':ab,ti OR 'distraction manipulation*':ab,ti OR drx9000:ab,ti OR 'inversion therap*':ab,ti OR 'gravity inversion*':ab,ti OR 'pneumatic vest*':ab,ti OR 'vertebral axial decompression*':ab,ti	35680
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	453

Patient Education

Search	Query	Total, n
1	'backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*'	248715

Table continues on page CPGcpg47.

APPENDIX A

Search	Query	Total, n
2	'patient education'/exp OR 'doctor patient relation'/exp OR 'behavior therapy'/de OR 'cognitive therapy'/exp OR 'instrumental conditioning'/exp OR 'self care'/de OR (cognitive:ab,ti AND therap*:ab,ti) OR (psychological* AND ('physical therap*' OR physiotherap*)) OR (interdisciplinary NEAR/5 rehabilitation):ab,ti OR (multidisciplinary NEAR/5 rehabilitation):ab,ti OR ('multi disciplinary' NEAR/5 rehabilitation):ab,ti OR (home NEAR/5 exercise):ab,ti OR education*:ab,ti OR advice:ab,ti OR counsel*:ab,ti OR coach:ab,ti OR 'behavioural therap*':ab,ti OR 'behavioral therap*':ab,ti OR 'cognitive behavio*':ab,ti OR operant:ab,ti OR 'behavior chang*':ab,ti OR 'behaviour chang*':ab,ti OR 'behavioral chang*':ab,ti OR 'behavioural chang*':ab,ti OR 'group therap*':ab,ti OR 'neuroplasticity':ab,ti OR 'goal setting':ab,ti OR motivation*:ab,ti OR reassurance:ab,ti OR coping:ab,ti OR 'problem solving':ab,ti OR 'self care':ab,ti OR 'self management':ab,ti OR 'stay active':ab,ti OR 'staying active':ab,ti OR 'back school*':ab,ti OR 'information provision*':ab,ti OR book*:ab,ti OR brochure*:ab,ti OR leaflet*:ab,ti OR pamphlet*:ab,ti OR 'therapeutic alliance':ab,ti OR 'start back':ab,ti OR 'consumer health information'/de OR 'health education'/de OR 'health literacy'/de OR 'active manage*':ab,ti OR 'behaviour modification*':ab,ti OR 'behavior modification*':ab,ti OR 'behaviour* approach*':ab,ti OR 'behavior* approach*':ab,ti OR 'behaviour* treatment*':ab,ti OR 'behavior* treatment*':ab,ti OR 'cognitive treatment*':ab,ti OR ('fear avoidance':ab,ti AND training:ab,ti) OR 'health information':ab,ti OR 'neuroscience approach':ab,ti OR 'patient instruction*':ab,ti OR 'patient train*':ab,ti OR 'provision of information':ab,ti OR 'psychological treatment*':ab,ti	1657543
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	5104

Progressive Endurance

Search	Query	Total, n
1	'backache'/de OR 'failed back surgery syndrome'/de OR 'discogenic pain'/de OR 'diskitis'/de OR 'intervertebral disk degeneration'/de OR 'lumbar disk hernia'/exp OR 'low back pain'/de OR 'musculoskeletal pain'/de OR 'spondylosis'/de OR 'spine disease'/de OR 'vertebral canal stenosis'/de OR 'lumbar spinal stenosis'/de OR 'spondylolysis'/de OR 'spondylosis'/de OR 'sciatic neuropathy'/de OR 'back disorder*' OR 'back injur*' OR 'back sprain*' OR 'failed back' OR (('disc' OR 'discs' OR 'disk' OR 'disks') NEAR/4 ('herniated' OR 'herniation' OR 'herniations' OR 'degenerative' OR 'degeneration' OR 'prolapse*' OR 'protrusion*')) OR (('lumbar' OR 'lumbosacral*' OR 'lumbo sacral*' OR 'lower back' OR 'low back') NEAR/4 ('pain' OR 'pains' OR 'painful' OR 'stenosis' OR 'stenoses' OR 'radiculopath*' OR 'instability' OR 'instabilities' OR 'strain*' OR 'strains*')) OR 'spondylo*' OR 'sciatica' OR 'Coccydynia' OR 'intervertebral disk'/de OR 'lumbar vertebra'/de OR 'fifth lumbar vertebra'/de OR 'first lumbar vertebra'/de OR 'forth lumbar vertebra'/de OR 'second lumbar vertebra'/de OR 'third lumbar vertebra'/de OR 'spondylarthritis'/de OR 'spondyloarthropathy'/de OR 'spondylolisthesis'/de OR 'zygapophyseal joint'/de OR 'back pain*' OR 'backache*' OR 'back ache*' OR 'spinal pain' OR 'Zygapophyseal Joint*' OR 'Facet joint*'	248715
2	'physiotherapy'/de OR 'kinesiotherapy'/exp OR 'exercise'/de OR 'walking'/de OR 'active rehab*':ab,ti OR 'activity based':ab,ti OR 'aerobic exercis*':ab,ti OR 'exercis* therap*':ab,ti OR 'fitness train*':ab,ti OR 'graded activit*':ab,ti OR 'physical conditioning':ab,ti OR pilates:ab,ti OR 'resistance training':ab,ti OR 'strength training':ab,ti OR stretching:ab,ti OR yoga:ab,ti OR 'endurance'/exp OR accelerometer:ab,ti OR 'active physical therap*':ab,ti OR 'aggressive rehabilitation':ab,ti OR aquatic:ab,ti OR 'exercise adherence':ab,ti OR exercis*:ab,ti OR hydrotherap*:ab,ti OR 'physical activit*':ab,ti OR 'physical fitness':ab,ti OR strengthening:ab,ti	900759
3	'randomized controlled trial'/exp OR 'randomized controlled trial topic'/exp OR 'meta analysis'/exp OR 'meta analysis topic'/exp OR 'systematic review topic'/exp OR 'practice guideline'/exp OR 'controlled clinical trial'/exp OR randomized:ab,ti OR randomised:ab,ti OR randomization:ab,ti OR randomisation:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR 'single blind':ab,ti OR 'single blinded':ab,ti OR 'double blind':ab,ti OR 'double blinded':ab,ti OR systematic:ab,ti OR systematically:ab,ti OR meta-analysis:ab,ti OR meta-synthesis:ab,ti OR meta-analyses:ab,ti OR meta-syntheses:ab,ti OR 'meta analysis':ab,ti OR 'meta synthesis':ab,ti OR 'meta analyses':ab,ti OR 'meta syntheses':ab,ti OR metaanalysis:ab,ti OR metaanalyses:ab,ti OR meta-analytic:ab,ti OR 'meta analytic':ab,ti OR metaanalytic:ab,ti OR 'umbrella review':ab,ti OR 'umbrella reviews':ab,ti OR 'scoping review':ab,ti OR 'scoping reviews':ab,ti OR 'rapid review':ab,ti OR 'rapid reviews':ab,ti OR 'practice guideline':ab,ti OR 'clinical guideline':ab,ti OR ((review:ab,ti OR reviews:ab,ti OR reviewed:ab,ti OR search:ab,ti OR searches:ab,ti OR searched:ab,ti OR searching:ab,ti OR handsearch:ab,ti OR handsearched:ab,ti) AND ('inclusion criteri*':ab,ti OR 'exclusion criteri*':ab,ti OR references:ab,ti OR papers:ab,ti OR articles:ab,ti OR publications:ab,ti OR studies:ab,ti OR trials:ab,ti OR datasets:ab,ti OR databases:ab,ti))	3430175
4	1 AND 2 AND 3	7193

APPENDIX A

Searches Conducted on June 25, 2020 in CINAHL

Classification

Search	Query	Total, n
1	((MM "Back Pain+/CL" OR MM "Back Injuries/CL" OR MM "Spinal Diseases/CL" OR MM "Intervertebral Disk Displacement/CL" OR MM "Spondylarthritis/CL" OR MM "Osteoarthritis, Spine/CL" OR MM "Spondylarthropathies/CL" OR MM "Spondylosis+/CL" OR MM "Spinal Stenosis/CL" OR MM "Neuralgia+/CL" OR MM "Sacroiliac Joint Dysfunction/CL" OR "start back")	700
2	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77425
3	((("accuracy*" OR MH "Algorithms" OR "algorithm*" OR "classif*" OR MH "Clinical Assessment Tools" OR "clinical exam*" OR "physical exam*" OR MH "Functional Assessment+" OR "screening" OR "cluster*" OR "cohort*" OR MH "Prospective Studies" OR "subgroup*" OR "subtype*" OR "diagnose" OR "diagnosing" OR MH "Diagnosis, Musculoskeletal" OR MH "Models, Statistical" OR MH "Cox Proportional Hazards Model" OR MH "Linear Regression+" OR MH "Logistic Regression+" OR "predict*" OR MH "Predictive Value of Tests" OR TX "prognos*" OR "reliab*" OR MH "Reliability and Validity+" OR "sensitivity analys*" OR MH "Sensitivity and Specificity" OR MH "ROC Curve" OR "specificity" OR MH "Severity of Illness" OR "valid*" OR MH "Validation Studies" OR MH "Treatment Failure") AND (MH "Chiropractic+" OR TX "chiropract*" OR TX "physical therap*" OR TX "physiotherap*" OR MH "Physical Therapy+" OR MH "Physicians, Family" OR MH "Primary Health Care" OR TX "primary care" OR TX "primary health care" OR TX "primary healthcare")) OR "back screen*" OR "categorize" OR "categorization" OR MH "Classification+" OR "classification based" OR "classification scheme*" OR "classification system*" OR "clinical decision*" OR MH "Critical Path" OR "clinical pathway*" OR "clinical prediction*" OR MH "Cluster Analysis" OR "cluster analys*" OR MH "Cluster Sample+" OR MH "Decision Making" OR MH "Decision Making, Clinical" OR "decision rule*" OR "decision support" OR MH "Decision Support Techniques" OR "diagnostic classification" OR MH "Self Assessment" OR "disability evaluation*" OR MH "Exercise Test+" OR "exercise test*" OR MH "Movement/EV" OR "movement test*" OR "ICF" OR "mechanical diagnosis" OR MH "Patient History Taking+" OR "history taking" OR "Mckenzie" OR "movement system*" OR MH "Palpation" OR MH "Physical Examination" OR MH "Chiropractic Assessment" OR MH "Geriatric Assessment+" OR MH "Physical Therapy Assessment" OR "predictive model*" OR "stratif*" OR "sub classification*" OR "subclassification*" OR "sub group*" OR "subgrouping*" OR "targeted treatment*" OR ("classif*" AND (MH "disability evaluation+" OR "evidence based" OR "functioning" OR "gait" OR "impairment*" OR "mechanism*" OR "motor control*" OR MH "Movement+" OR "movement*" OR "walking" OR "pathoanatom*" OR "psychological" OR "psychosocial" OR "rehabilitation" OR "treatment based" OR "cognitive" OR "multidimensional" OR "clinical")) OR ("subgroup*" AND (MH "Disability Evaluation+" OR MH "exercise+" OR "exercise*" OR "manipulation*" OR "impairment*" OR MH "Movement+" OR "movement*" OR "prognos*" OR "predictor*" OR "rehabilitation" OR "cognitive" OR "multidimensional" OR "clinical")))))	662949
4	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	969590
5	1 OR (2 AND 3)	18303
6	4 AND 5	5616

APPENDIX A

Manual and Other Directed Therapies

Search	Query	Total, n
1	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77277
2	(MH "Physical Therapy" OR MH "Manual Therapy+" OR MH "Joint Mobilization" OR MH "Motion Therapy, Continuous Passive" OR MH "Chiropractic+" OR MH "Acupuncture+" OR "manipulat*" OR "manual therap*" OR "mobilisation*" OR "mobilization*" OR "bodywork*" OR "chiropract*" OR "craniosacral therap*" OR "massag*" OR "meridian therap*" OR "omt" OR "reflexology*" OR "dry needling" OR "acupressure" OR "acupuncture")	149976
3	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	970179
4	1 AND 2 AND 3	3160

Trunk Coordination

Search	Query	Total, n
1	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77277
2	(((MH "Physical Therapy" OR "physical therap*" OR "physiotherap*") AND "exercis*") OR MH "Therapeutic Exercise+" OR (("exercise*" OR "exercising" OR "program*" OR "train*") AND (MH "Abdominal Muscles+" OR "abdominal muscle*" OR "back muscle*" OR "core" OR MH "Multifidus Muscles" OR "multifidus" OR "paraspinal" OR "transversus" OR "trunk" OR "coordination" OR "dynamic" OR "endurance" OR "extension" OR "isometric*" OR "motor control" OR MH "Muscle Contraction" OR "resistance" OR "stabili*" OR "strengthen*" OR "targeted")) OR "abdominal exercise*" "active exercise*" OR "back exercise*" OR "exercise intervention*" OR "exercise therap*" OR "therapeutic exercise*" OR "Alexander" OR "core stabili*" OR "dynamic sit*" OR "functional restoration" OR "functional technique*" OR MH "Functional Training" OR "lateral slid*" OR "motor training" OR "multidisciplinary rehabilitation" OR ("neuromuscular" AND "facilitation") OR "Swiss ball*" OR "biofeedback" OR "feedback" OR "reeducation")	195780
3	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	970179
4	1 AND 2 AND 3	2217

APPENDIX A

Centralization

Search	Query	Total, n
1	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77277
2	(MH "Therapeutic Exercise+" OR (("flexion" OR "extension" OR "therapeut*") AND "exercis*") OR ((MH "Physical Therapy" OR "physical therap*" OR "physiotherap*") AND ("exercis*" OR MH "Posture+" OR "posture")) OR "active therap*" OR "centralisation*" OR "centralization*" OR "directional preference*" OR "exercise movement techni*" OR "exercise treatment*" OR ("extension" N3 "intervention*") OR "lateral shift*" OR "lateral translation*" OR "mckenzie*" OR "MDT" OR "mechanical diagnosis" OR "muscle energy technique*" OR "neuromuscular facilitat*" OR "postural correct*" OR "repeated exercis*" OR "repeated procedure*" OR "resistance training")	84272
3	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	970179
4	1 AND 2 AND 3	1902

Mobilization

Search	Query	Total, n
1	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77277
2	((("nerve" OR "neural") AND ("mobilization" OR "mobilization")) OR ("mobili*" N5 "sciatic") OR "nerve flossing" OR "nerve glid*" OR "nerve stretch*" OR "nerve tension" OR "nerve therapy" OR "nerve treatment" OR "neural glid*" OR "neural tension" OR "neural therap*" OR "neural treatment" OR "slump stretch*" OR "neurodynamic*" OR "passive movement*" OR "leg raise*")	2051
3	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	970179
4	1 AND 2 AND 3	157

APPENDIX A

Traction

Search	Query	Total, n
1	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77277
2	(MH "Traction" OR "decompression therap*" OR "traction*")	4939
3	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	970179
4	1 AND 2 AND 3	162

Patient Education

Search	Query	Total, n
1	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77277
2	MH "Patient Education" OR "education" OR "educational" OR "advice" OR "counsel*" OR "coach*" OR "activating therap*" OR MH "Behavior Therapy+" OR "behavioural therap*" OR ("cognitive" AND "therapy") OR "cognitive behavio*" OR "operant" OR "behavior chang*" OR "behaviour chang*" OR "behavioral chang*" OR "behavioural chang*" OR "behavioural Intervention*" OR "behavior modification*" OR "group therap*" OR (("interdisciplinary" OR "multidisciplinary" or "multi disciplinary") AND "rehabilitation") OR "psychologically informed" OR "neuroscience" OR "goal setting" OR "motivation*" OR "reassurance" OR "coping" OR "problem solving" OR MH "Self Care" OR "self care" OR "self management" OR "stay active" OR "staying active" OR "active management" OR ("home" N5 "exercise*") OR "back school*" OR "information provision*" OR "book*" OR "brochure*" OR "leaflet*" OR "pamphlet*" OR "therapeutic alliance" OR MH "Professional-Patient Relations" OR MH "Physician-Patient Relations" OR (TX "psychological*" AND (TX "physical therap*" OR TX "physiotherap*")) OR "start back"	1250888
3	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	970179
4	1 AND 2 AND 3	2850

APPENDIX A

Progressive Endurance

Search	Query	Total, n
1	(MH "Back Pain+" OR MH "Back Injuries" OR MH "Spinal Diseases" OR MH "Intervertebral Disk Displacement" OR MH "Spondylarthritis" OR MH "Osteoarthritis, Spine" OR MH "Spondylarthropathies" OR MH "Spondylosis+" OR MH "Spinal Stenosis" OR MH "Neuralgia+" OR MH "Sacroiliac Joint Dysfunction" OR MH "Lumbar Vertebrae" OR MH "Intervertebral Disk" OR MH "Zygapophyseal Joint" OR ("musculoskeletal pain*" AND ("back" OR "spine" OR "spinal")) OR "spinal pain*" OR "back disorder*" OR "back pain" OR "back pains" OR "back injur*" OR "backache*" OR "back ache*" OR "back strain*" OR "back sprain*" OR "failed back" OR "lumbago" OR (("lumbar" OR "lumbosacral*" OR "lumbo sacral*" OR "lower back") N5 ("pain" OR "pains" OR "painful" OR "stenosis" OR "stenosis" OR "radiculopathy" OR "instability" OR "instabilities" OR "strain" OR "strains")) OR "lumbar dysfunction" OR (("disc" OR "discs" OR "disk" OR "disks") N5 ("herniated" OR "herniation" OR "herniations" OR "degenerative" OR "degeneration" OR "prolapse*")) OR "coccydynia" OR "spondylarth*" OR "spondylisthesis" OR "spondylo*" OR "sciatica" OR "facet joint*" OR "zygapophyseal joint*")	77277
2	(MH "Physical Therapy" OR MH "Therapeutic Exercise+" OR MH "Exercise+" OR MH "Physical Endurance+" OR MH "Physical Fitness+" OR MH "Recreation+" OR MH "Tai Chi" OR MH "Yoga+" OR "exercise" OR "exercises" OR "exercising" OR "graded activit*" OR "physical activity" OR "physical conditioning" OR ("physical" N5 "training") OR "active physical therapy" OR "active rehab*" OR "activity based" OR "fitness" OR "aerobic" OR "walking" OR "pedometer*" OR "endurance train*" OR "strength train*" OR "resistance train*" OR "tai chi" OR "pilates" OR "stretching" OR "aquatic")	384385
3	(MH "Randomized Controlled Trials+") OR (MH "Systematic Review") OR (MH "Meta Analysis") OR (MH "Meta Synthesis") OR (MH "Systematic Review") OR (MH "Placebos") OR (ZT "randomized controlled trial") OR (ZT "Systematic Review") OR (ZT "Meta Analaysis") OR (ZT "Practice Guideline") OR (MH "Placebos") OR randomized OR randomised OR randomization OR randomisation OR placebo OR randomly OR "single blind" OR "single blinded" OR "double blind" OR "double blinded" OR systematic OR systematically OR meta-analysis OR meta-synthesis OR meta-analyses OR meta-syntheses OR "meta analysis" OR "meta synthesis" OR "meta analyses" OR "meta syntheses" OR metaanalysis OR metaanalyses OR meta-analytic OR "meta analytic" OR metaanalytic OR "umbrella review" OR "umbrella reviews" OR "scoping review" OR "scoping reviews" OR "rapid review" OR "rapid reviews" OR "practice guideline" OR "clinical guideline" OR ((review OR reviews OR reviewed OR search OR searches OR searched OR searching OR handsearch OR handsearched) AND ("inclusion criteri*" OR "exclusion criteri*" OR references OR papers OR articles OR publications OR studies OR trials OR datasets OR databases))	970179
4	1 AND 2 AND 3	3445

APPENDIX B

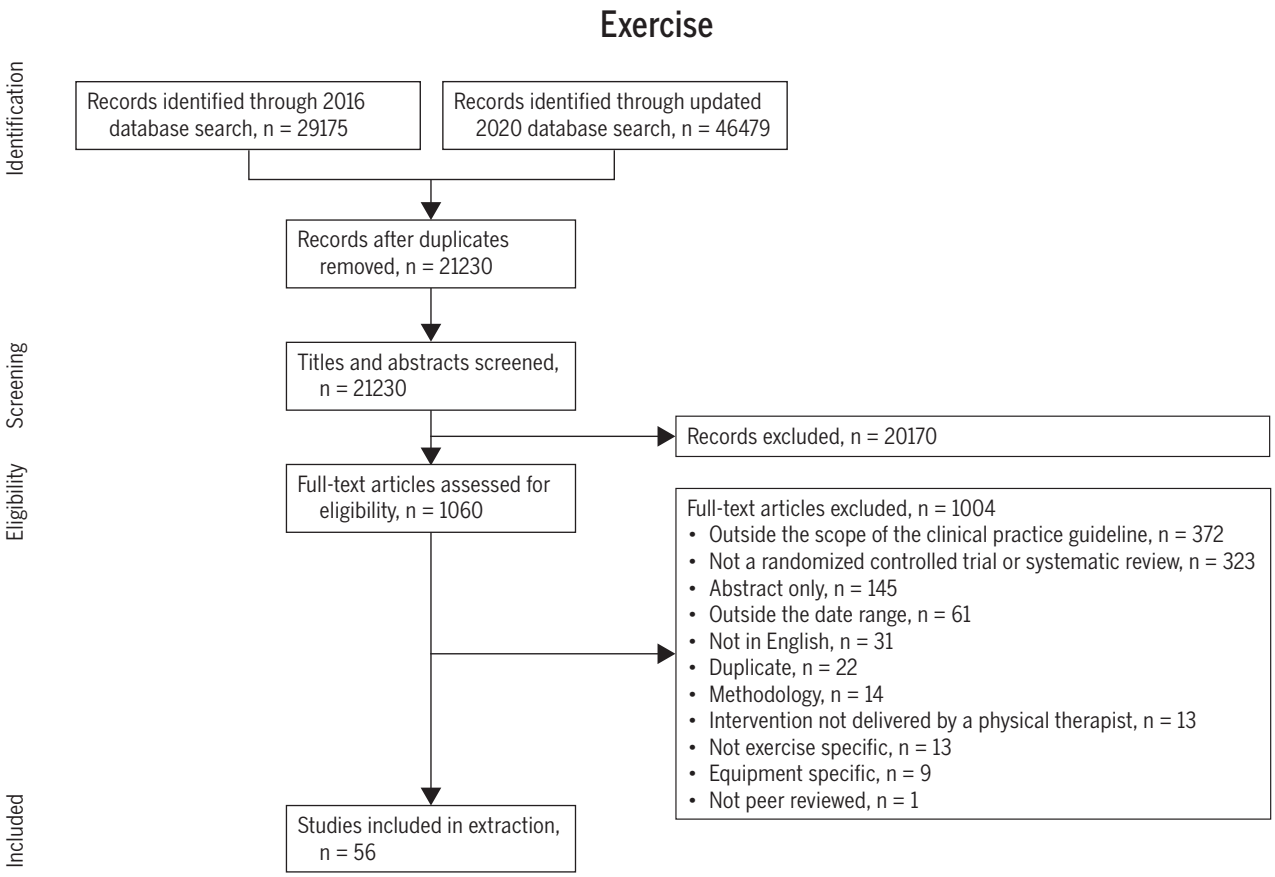
TABLE OF RESULTS

	Exercise		Manual and Other Directed Therapies[a]		Classification Systems		Patient Education	
Database (Platform)	**2016 Search, n**	**2020 Search, n**	**2016 Search, n**	**2020 Search, n**	**2016 Search, n**	**2020 Search, n**	**2016 Search, n**	**2020 Search, n**
PubMed (National Library of Medicine)	5582	9102	2741	4269	2961	3924	1138	2608
Embase (Elsevier)	16584	18735	7527	8276	8415	8059	4221	5104
CINAHL (EBSCO)	4709	7564	2753	3479	4651	5616	1944	2850
Cochrane Library (Wiley)	2300	11078	2056	7403	646	3291	634	6039

[a]*Manual and Other Directed Therapies includes the searches for mobilization and traction.*

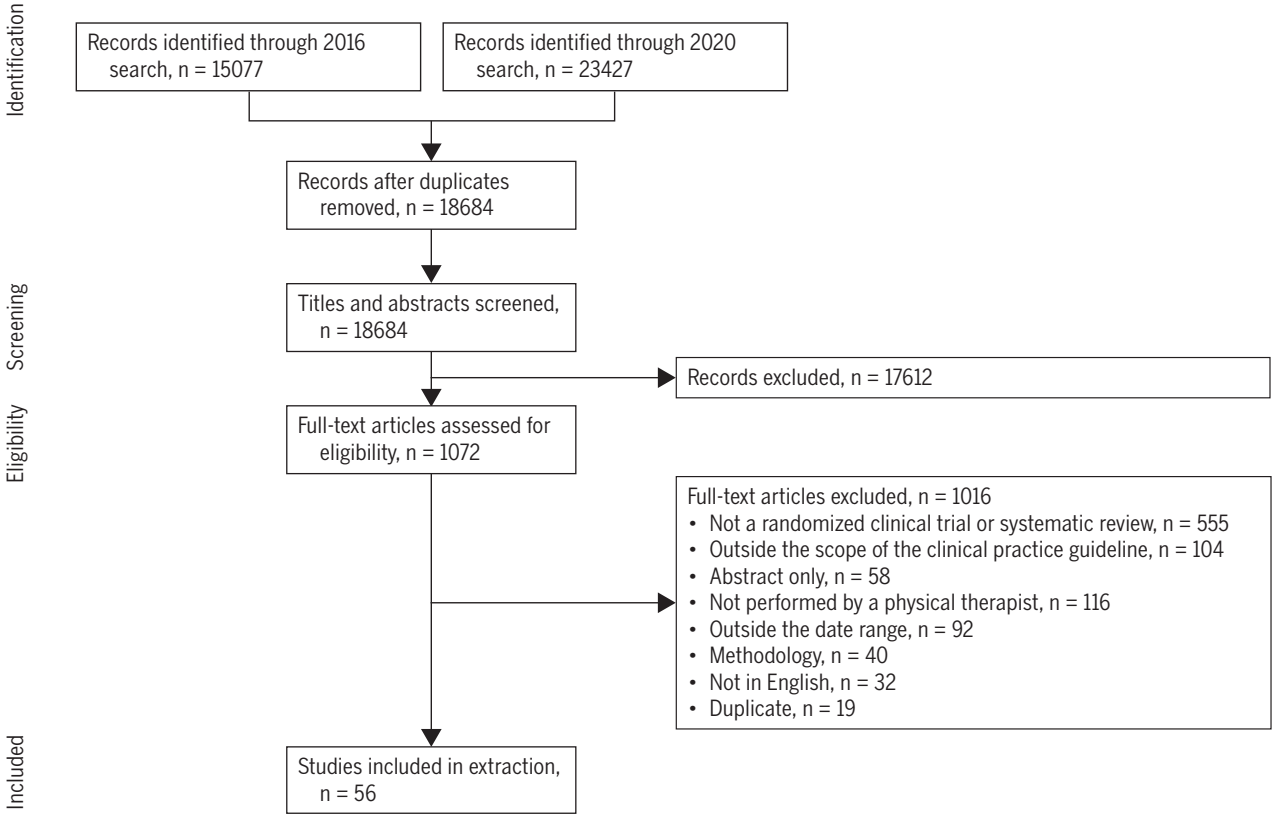
APPENDIX C

PRISMA FLOW DIAGRAMS



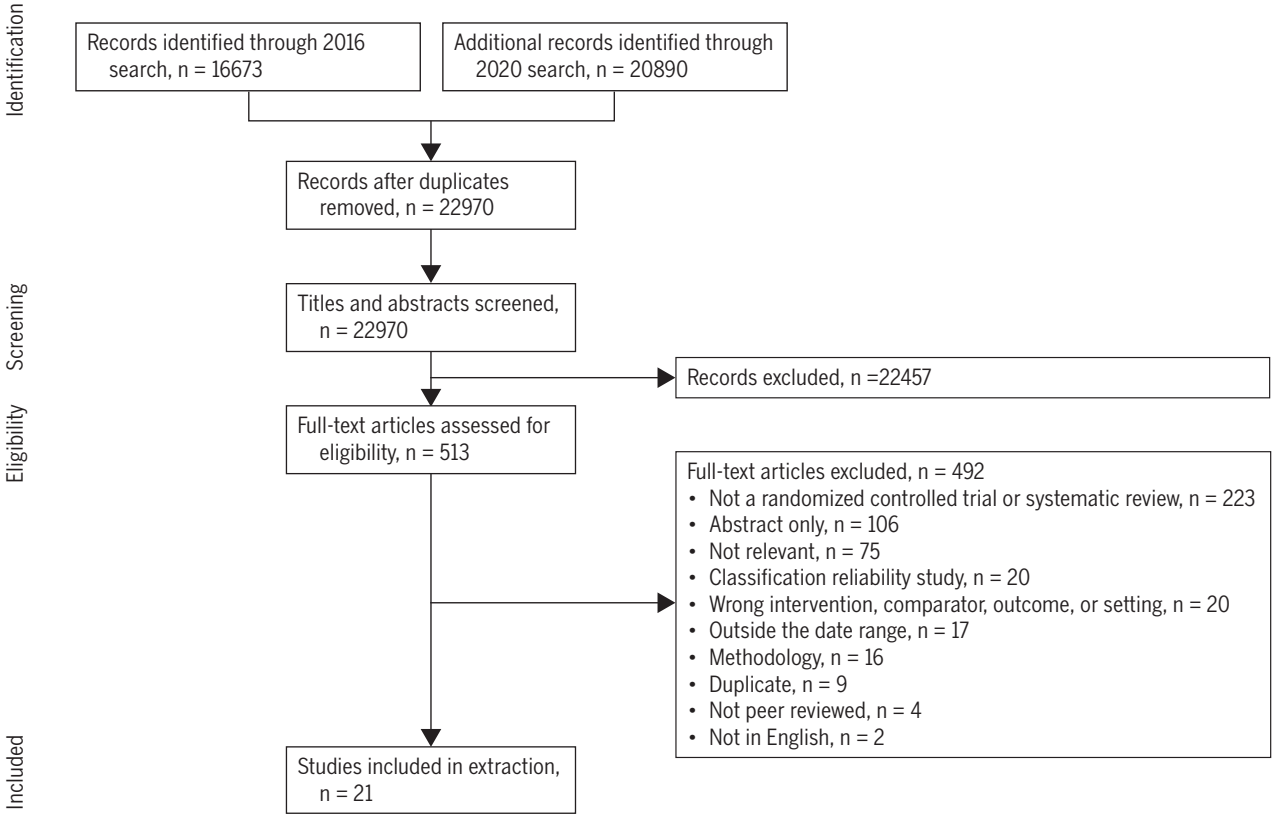
APPENDIX C

Manual and Other Directed Therapies

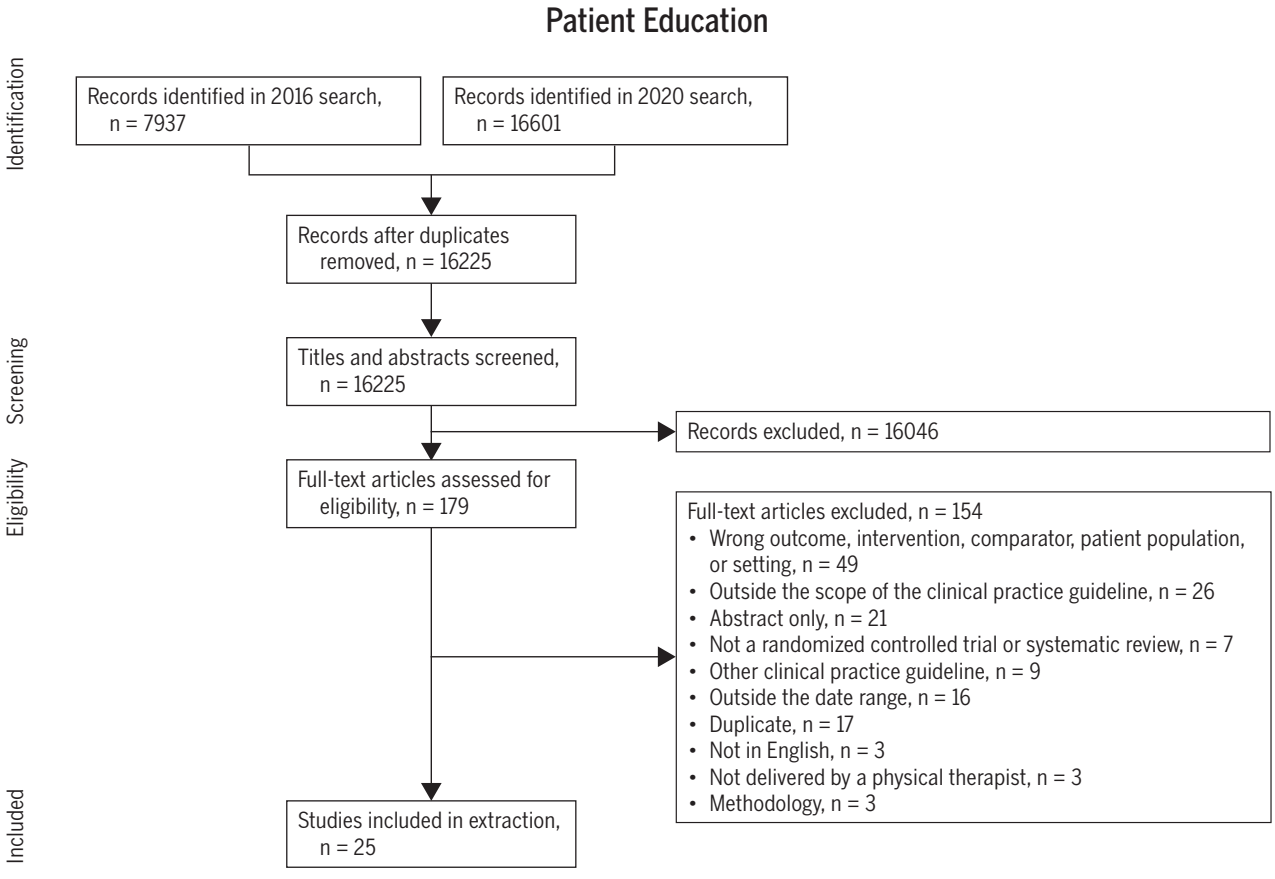


APPENDIX C

Classification Systems



APPENDIX C



APPENDIX D

ARTICLE INCLUSION AND EXCLUSION CRITERIA FOR ARTICLE SCREENING/FULL-TEXT REVIEW

Patient/Subject Characteristics

Include:

- Studies using data from humans
- Subjects over 18 years of age
- Subjects with low back pain, defined with search terms as "nonspecific low back pain," "mechanical low back pain," "lumbosacral segmental/spinal instability" (including spondylolisthesis), "lumbosacral somatic dysfunction," "lumbosacral sprain," "lumbosacral strain flatback syndrome," "intervertebral disc degeneration" and/or "herniation," "lumbar radiculopathy," or "sciatica"

Exclude:

- Studies of patients with a condition outside the diagnosis of musculoskeletal low back pain (eg, tumor, fracture, kidney dysfunction, ankylosing spondylitis)

Article Characteristics

Include:

- English
- Published from December 1, 2010 to present
- Articles reporting analysis of data: systematic reviews, meta-analyses, randomized clinical trials
- Articles reporting patient-centered outcomes, including disability, pain, physical function, ability to work or participate in social activities, etc

Exclude:

- Study protocols
- Observational, experimental, and quasi-experimental cohort studies
- Cross-sectional studies
- Case reports
- Case series
- Conference abstracts, press releases, newsletters, editorial letters, commentaries, opinions
- Articles published in non–peer-reviewed publications (eg, theses)

Topics Included

Intervention: Diagnosis/Classification

Include:

Articles that analyze data on classification of people with low back pain to inform physical therapy treatment. This may include treatment-based classification systems, acuity-based systems, prognostic risk stratification approaches, and the current CPG's ICF-based classification system (low back pain with mobility deficits, low back pain with movement coordination impairments, low back pain with related lower extremity pain, low back pain with radiating pain, low back pain with related generalized pain, and low back pain with related cognitive or affective tendencies).

Intervention: Manual Therapy

Include:

Skilled hand movements and skilled passive movements of joints and soft tissue (thrust and nonthrust) within the scope of physical therapy practice. Manual therapy techniques may include the following:

- Traction: an intervention that uses manually or mechanically applied forces with the intention of stretching and distracting the spine
- Massage
  - Connective tissue massage
  - Therapeutic massage
- Mobilization/manipulation
  - Soft tissue
  - Spinal and peripheral joints
- Dry needling: an intervention that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points and muscular and connective tissues for the management of neuromusculoskeletal pain and movement impairments. Dry needling is a technique used to treat dysfunctions in skeletal muscle, fascia, and connective tissue, and to diminish persistent peripheral nociceptive input and reduce or restore impairments of body structure and function, leading to improved activity and participation

APPENDIX D

- Neural tissue mobilization: manual therapy techniques intended to enhance the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces, thereby allowing reduced intrinsic pressures on the neural tissue and thus promoting optimum physiologic function

Exclude:
- Articles using "acupuncture"
- Articles on direct traction using pins or wires inserted through bone
- Articles that report on soft tissue mobilization and stretching without targeting nerve mobility

Intervention: Exercise

Include:
Therapeutic exercise may include the following within the scope of physical therapy practice:
- Aerobic capacity/endurance conditioning or reconditioning
  - Aquatic programs
  - Increased workload over time
  - Movement efficiency and energy conservation training
  - Walking and wheelchair propulsion programs
- Flexibility exercises
  - Muscle lengthening
  - Range of motion
  - Stretching
- Strength, power, and endurance training for head, neck, limb, pelvic floor, trunk, and ventilatory muscles
  - Active assistive, active, and resistive exercises (including concentric, dynamic/isotonic, eccentric, isokinetic, isometric, and plyometric)
  - Aquatic programs
  - Standardized, programmatic, or complementary exercise approaches (eg, yoga, Pilates, etc)
  - Task-specific performance training

Centralization and Directional Preference Exercises

Include:
- Repeated movements
  - Centralization
  - Directional preference
  - McKenzie therapy
  - Flexion-based exercise
  - Extension-based exercise

Exclude:
- Articles on complementary movement therapy approaches such as yoga, Pilates, or tai chi if these interventions are delivered by other health care providers

Intervention: Patient Education and Counseling

Include:
Education and counseling interventions specifically directed toward the management of low back pain that include counseling or patient education as the sole intervention studied. Examples of accepted education or counseling approaches are:
- Pathology or health condition
- Performance enhancement
- Psychosocial influences on treatment (eg, fear-avoidance beliefs, behavior change techniques)
- Risk factors for pathology or health condition, impairments in body function and structure, activity limitations, and participation restrictions
- Delivery of psychologically informed physical therapy

Exclude:
- Education or counseling outside the scope of physical therapy practice and/or delivered by other health care providers
- Education or counseling that was not specific to management of low back pain and instead was directed toward general health practices (eg, nutrition, weight loss)

Abbreviations: CPG, clinical practice guideline; ICF, International Classification of Functioning, Disability and Health.

APPENDIX E

LEVEL-OF-EVIDENCE TABLE[a]

Level	Intervention/Prevention	Pathoanatomic/Risk/Clinical Course/ Prognosis/Differential Diagnosis	Diagnosis/Diagnostic Accuracy	Prevalence of Condition/ Disorder	Exam/Outcomes
I	Systematic review of high-quality RCTs High-quality RCT[b]	Systematic review of prospective cohort studies High-quality prospective cohort study[c]	Systematic review of high-quality diagnostic studies High-quality diagnostic study[d] with validation	Systematic review, high-quality cross-sectional studies High-quality cross-sectional study[e]	Systematic review of prospective cohort studies High-quality prospective cohort study
II	Systematic review of high-quality cohort studies High-quality cohort study[c] Outcomes study or ecological study Lower-quality RCT[f]	Systematic review of retrospective cohort study Lower-quality prospective cohort study High-quality retrospective cohort study Consecutive cohort Outcomes study or ecological study	Systematic review of exploratory diagnostic studies or consecutive cohort studies High-quality exploratory diagnostic studies Consecutive retrospective cohort	Systematic review of studies that allows relevant estimate Lower-quality cross-sectional study	Systematic review of lower-quality prospective cohort studies Lower-quality prospective cohort study
III	Systematic reviews of case-control studies High-quality case-control study Lower-quality cohort study	Lower-quality retrospective cohort study High-quality cross-sectional study Case-control study	Lower-quality exploratory diagnostic studies Nonconsecutive retrospective cohort	Local nonrandom study	High-quality cross-sectional study
IV	Case series	Case series	Case-control study		Lower-quality cross-sectional study
V	Expert opinion	Expert opinion	Expert opinion	Expert opinion	Expert opinion

Abbreviation: RCT, randomized clinical trial.

[a]*Adapted from Phillips B, Ball C, Sackett D, et al. Oxford Centre for Evidence-Based Medicine: levels of evidence (March 2009). Available at: https://www.cebm.ox.ac.uk/resources/levels-of-evidence/oxford-centre-for-evidence-based-medicine-levels-of-evidence-march-2009. Accessed June 30, 2020.*

[b]*High quality includes RCTs with greater than 80% follow-up, blinding, and appropriate randomization procedures.*

[c]*High-quality cohort study includes greater than 80% follow-up.*

[d]*High-quality diagnostic study includes consistently applied reference standard and blinding.*

[e]*High-quality prevalence study is a cross-sectional study that uses a local and current random sample or censuses.*

[f]*Weaker diagnostic criteria and reference standards, improper randomization, no blinding, and less than 80% follow-up may add bias and threats to validity.*