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Exercise therapy based on the level of low back pain of patients in primary care: a systematic review protocol

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ABSTRACT

Introduction

Low back pain (LBP) is among the health conditions that lead to the most disability worldwide. Guidelines aimed at management of LBP recommend non-invasive and non-pharmacological management, including patient education, advice to stay active, and exercise therapy; however, the guidelines offer no recommendation as to the allowable level of pain during exercise or how specific levels of pain should be reflected in the stage and progression of exercises or activities. The purpose of this review is to study the effect of differentiation of exercise guidance based on level of LBP in patients in primary care.

Methods and analysis

A systematic search will be performed in PubMed, EMBASE, CINAHL, PsychINFO, PEDRO, Cochrane, and PROSPERO from their inception until September 2017.

Published peer-reviewed human experimental and observational studies with quantitative or qualitative designs will be included. Two independent reviewers will identify papers by reviewing titles and abstracts. Papers passing the initial selection will be appraised by two reviewers, based on their full-texts. Furthermore, the reference lists of included studies will be snowballed for identification of other relevant studies. Data will be extracted using a standard extraction sheet by two independent reviewers. Disagreements will be resolved by discussion and consensus with a third reviewer. The methodological quality of studies will be assessed using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) risk of bias tool, or the Critical Appraisal Skills Programme (CASP). Results will be reported narratively. Search histories will be documented in Endnote X8 (Clarivate Analytics).

Ethics and dissemination

Ethical approval for this review was not required as primary data will not be collected. The results will be disseminated through a peer-reviewed international journal and conference presentations.

PROSPERO registration number: 42017074880

STRENGTHS AND LIMITATIONS OF THIS STUDY

- To our knowledge, this will be the first review to synthesise evidence for differentiation of advice given by healthcare professionals for exercise treatment of low back pain, based on the pain levels of patients.
- Patients with a broad range of pain intensity levels are treated in primary care; therefore, the findings of this study will be applicable to the heterogeneous group of patients with low back pain seen in clinical practice.
- Patients participating in exercise therapy for low back pain often experience pain; this review could uncover how different levels of pain can be addressed in this context.
- We expect studies included in the review to be heterogeneous in design and to exhibit varying methodological quality, which is a limitation of this review.

INTRODUCTION

Low back pain (LBP) is one of the most common pain conditions worldwide, with a life-time prevalence of 80%.[1] The prevalence of LBP is highest among women and individuals aged 40–80 years.[1] In the literature, LBP is traditionally defined accordingly to the duration of symptoms, where symptoms lasting less than 12 weeks are defined as acute or subacute LBP, and symptoms lasting more than 12 weeks as chronic LBP. [2, 3] In the majority of cases, the cause of LBP is unknown and only 1–5% of patients have a serious underlying condition, such as cancer, osteoporosis, fractures, systematic inflammatory disease, or other serious condition (red flags) causing the LBP.[4] The first-line management of LBP comprises a non-invasive and non-pharmacological treatment approach, including patient education, advice to stay active, exercise therapy, and manual therapy.[4–7] A Danish study showed that 35% of the adult population have had transient or continuous pain in the lower back in the last year. Furthermore, 21% indicated that they have had disabling LBP during the last 14 days.[8] LBP often develops into a chronic health condition, with an unpredictable pattern of acute episodes, remission, and recurrence. In Denmark with an estimated population of approximately 5.7 million, LBP is a socioeconomic burden to society.[8, 9] The cost of treatment of LBP is estimated at 457 million Euros and the costs of production loss due to short- and long-term LBP amount to an estimated annual 1 billion Euros in Denmark.[10] As LBP is the condition for which there are the most frequent consultations for professional advice in primary care,[11] there is a strong case for increased efforts to improve healthcare for patients with this condition.

Regardless of the duration of LBP, guidelines consistently recommend staying active and exercise therapy. However, guidelines offer no recommendation on how a specific level of pain should be reflected in the level and progression of exercises or activities; consequently, there is a substantial inter-patient variation in clinician recommendations for LBP management.[12] A recent review found that protocols using painful exercises offer a small but significant benefit over pain-free exercises in the short term, with moderate quality of evidence.[13] In the medium and long terms, there is no clear superiority of one treatment over another.[6] Therefore, pain during therapeutic exercise to treat chronic musculoskeletal pain need not be a barrier to exercise treatment participation.[13] Considering patients in two groups, those with and without pain, may be

impractical, whereas, considering patients as experiencing a continuum of different pain levels may better reflect the clinical situation.

It is possible that therapeutic exercise can modify the concentration of pain-relieving peptides and change cerebral neurological activities linked with pain processing in patients with musculoskeletal pain; however, the level of neuro-physical evidence supporting this relationship is very low.[14] Accepting pain during exercise can also be an important therapeutic approach for addressing fear-avoidance, since accepting pain can support physical recovery and diminish psychological fear of movement, which can worsen the physical condition.[14, 15]

An approach of targeting exercise advice based on a pain monitoring model, aligning the fluctuation of pain levels with the advice given, was effective for patients with Achilles tendinopathy.[16] The model included six levels of exercise therapy, ranging from "hardly any physical activity" to "hard or very hard exercise regularly". Choice of level was based on pain experienced during and after exercise. According to this model, pain was permitted to be between levels 0 and 5 on a scale from 0 to 10 during exercise, where 0 was no pain and 10 indicated the worst imaginable pain. Pain was allowed to reach 5 during exercise, but should subside by the next day to the pain level before exercise. If it did not, the patient was advised to shift to an easier exercise level.[16]

There is no evidence that one particular type of exercise therapy for LBP is clearly more effective than others. Moreover, we were unable to identify any systematic reviews evaluating the effect of guiding activity based on the level of LBP of patients in primary care. Thus, it remains unclear if the level of pain should be reflected in the treatment approach for this condition, or whether patients with different levels of pain will benefit from different exercise approaches.[6, 17–20]

Aim

The aim of this review is to identify studies evaluating the effect of differentiating exercise guidance for patients with LBP based on the patient's level of pain in primary care. The primary outcomes considered in this review will be pain and functional outcome measurements in LBP.

METHODS AND ANALYSIS

Study registration

This study is registered in PROSPERO (registration number: 42017074880).

Study conduct and reporting

This review will be conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) 2015 statement.[21]

Data sources

A pilot search has been conducted with the assistance of a librarian at Aalborg University Library with experience in searching for articles for systematic reviews. The pilot search was performed to qualify our search strategy. We will carry out systematic searches of PubMed, EMBASE, CINAHL, PsychINFO, PEDRO, Cochrane, and PROSPERO. The search strategy will be conducted using MeSH/Emtree headings, combined with free text words. We will include the following MeSH/Emtree/free text terms: 'low back pain', 'rehabilitation', 'physical therapy/medicine', and 'exercise therapy'. This will be followed by snowballing of the reference lists of included studies to identify possible articles that may not have been found in the initial search. Authors of included articles will be contacted if complete articles, or certain data such as data presented only in graphs, are not available. Studies published in English, Danish, Swedish, Norwegian, and German will be considered for inclusion in this review, and there will be no limitation on the time of publication.

Types of study

The review will include studies evaluating differential guidance for exercise and physical interventions for adults above the age of 18 in primary care, where differentiation was based on the pain levels of patients. Exercise and physical therapy is broadly defined as a regimen, or a plan, of physical activities designed and prescribed for specific therapeutic goals, with the purpose of restoring normal musculoskeletal function or reducing pain caused by disease or injury.[22, 23]

Data selection

We will include all published peer-reviewed human investigations, including both quantitative and qualitative studies, related to differential guidance on choice of exercise, based on the level of non-

specific or nerve root LBP for any duration. We will consider both experimental and observational quantitative study designs, including randomised controlled trials (RCTs), non-RCTs, quasi-experimental, before and after studies, and prospective and retrospective cohort studies. We will include qualitative studies based on interviews and/or workshops.

We will exclude studies with a primary focus on pharmacological intervention of LBP, studies including patients with red flags (cancer, osteoporosis, fractures, systematic inflammatory disease, or other serious conditions causing the LBP), studies performed outside primary healthcare, studies with pregnant women, children, and adolescents (< 18 years), reviews, audits, or service reports, conference posters or abstracts, and studies that were not peer-reviewed.

Selection of studies

Search results will be imported into Mendeley bibliographic software (Elsevier) and duplicates removed with the help of the "check for duplicates" tool. After removing duplicates, two identical libraries will be created for the two reviewers to select relevant articles independently.

A two-stage process will be undertaken. The initial search will identify papers by review of their titles and abstracts against the inclusion and exclusion criteria, and will be conducted by two members of the review team (JEJ and TA). Any disagreement will be resolved by team discussion and consensus with a third review member (AR). Papers passing the initial selection stage will be critically appraised by two team members (JEJ and TA) based on their full-texts. Again, disagreements will be resolved through team discussion and consensus. If further disagreement is an issue, a third team member will be involved (AR). The reference lists of the included studies will be snowballed for identification of further relevant papers. The search history will be documented in Endnote X8 (Clarivate Analytics).

Data extraction

We will tabulate characteristics of the included studies, including date of publication, country where the study was conducted, study design, study aim, setting, condition (acute/subacute or chronic LBP), intervention(s), number of participants, follow-up periods short-term (≤ 12 weeks), medium-term (>12 to < 52 weeks), and long-term (≥ 52 weeks), outcomes, author conclusions, and other (Supplementary file 1). Data from the included studies will be extracted by two independent

reviewers (JEJ and TA) using a standardised form to identify the above-mentioned characteristics of the included studies. Disagreements will be resolved through team discussion and consensus. If further disagreement is an issue, a third team member will be involved (AR). In the case of missing methodological information, the corresponding authors of the studies will be contacted.

Based on current literature, when possible, outcomes will be rescaled to 0 to 100-point scales. For example, a VAS score (0–10) of 4.5 (SD 1.2) will be rescaled to 45 (SD 12). For studies to be appropriate for inclusion in a meta-analysis on exercise therapy for LBP, we consider a 20-point scale for improvement in pain and a 10-point improvement scale for changes in functional outcomes to be clinically relevant. Statistical significance will be set at the 5% level. [24–26]

Outcome(s)

The primary outcomes considered in this review will be pain and functional outcomes. Other outcome measures will be regarded as secondary in this review.

We will measure the effect of exercise therapy guided by the participants pain levels where it is incorporated as either a primary or secondary outcome in the included studies. Outcomes may include, but will not be limited to:

1. Self-reported methods of pain level assessment, such as the visual analogue scale (VAS) or numerical pain rating (NPR).
2. Low back pain disability scores, such as the Roland-Morris Disability Questionnaire (RMDQ) or the Oswestry Disability Index (ODI).
3. Patient pain-related fear, such as the Pain Anxiety Symptoms Scale (PASS) or the Tampa Scale of Kinesiophobia (TSK).
4. Health related quality of life, such as the SF-36 (as measured by the general health sub-scale) or EuroQol.
5. The employment status.
6. Satisfaction with treatment received.

Risk of bias (quality) assessment

As we expect this review to include studies with both quantitative and qualitative designs, it will be necessary to apply more than one quality appraisal tool to review identified studies across different types of research design.

The quality of final evidence (QoE) in quantitative studies will be determined according to Grades of Recommendation, Assessment, Development and Evaluation (GRADE).[27] In the GRADE system, evaluating the QoE for each outcome of interest begins with determining the study design (e.g. randomised trial or observational study) and then assessing eight additional domains: risk of bias,[28] indirectness of evidence,[29] inconsistency of evidence,[30] imprecision of the estimated effect,[31] likelihood of publication bias,[32] the presence of a dose response effect, magnitude of the estimated effect, and issues around residual confounding.[33] After assessing all the mentioned domains, QoE per outcome is categorised as high, moderate, low, or very low.[34] The overall QoE will be determined by the QoE for each of the critical outcomes, and in most instances, the overall QoE will be based on the lowest QoE for any of the critical outcomes.

Appraisal of qualitative studies

Assessment of qualitative studies will be conducted using the worksheets provided by Critical Appraisal Skills Programme (CASP).[35] The process for assessment of methodological bias in individual studies will be performed in Microsoft Word, and the results will be presented as a risk of bias summary (review of the author's judgments about each risk of bias item for each study included).

Strategy for data synthesis

Qualitative research findings will be presented in a narrative form. Quantitative data will be synthesised based on ranges, descriptive analysis, and interpretations of results. As heterogeneity is expected, we anticipate describing quantitative findings narratively. Meta-analysis will be conducted if a group of studies is sufficiently homogeneous, in terms of the subjects involved, interventions, and outcomes, to provide a meaningful summary.[36] Meta-analyses will then be conducted to summarise data and produce more precise estimates of outcomes for studies considered sufficiently homogeneous to provide a meaningful combined estimate. The choice of

whether to conduct a meta-analysis will depend on the number of studies, the completeness of the reported outcomes, and judgment of the homogeneity among the results. Specifically, if a meta-analysis is based on a small number of studies, the estimate of between-studies variance may be substantially in error.[37]

ETHICS AND DISSEMINATION

Ethical approval for this review was not sought as primary data will not be collected. The results will be disseminated through a peer-reviewed international journal and conference presentations.

DISCUSSION

To our knowledge, this will be the first systematic review of the effect of basing exercise advice on the level of LBP of patients in primary care. A pain monitoring method often used in clinical practice is that suggested by Silbernagel et al. (2007) and Thomee (1997).[16, 38] This pain monitoring system documents pain and discomfort during the rehabilitation period, using the visual analogue scale (VAS) from 0 to 10. Pain reported up to a level of 2 was accepted as "safe", and pain levels from 3 to 5 were considered "acceptable", whereas, pain above 5 was considered to involve a "high risk". Pain should have subsided by the next morning. If pain did not subside, the level of the exercise program was lowered one step. Normal participation in physical activities during the treatment period using the pain monitoring system was accepted.[16, 38] However, these studies investigated achilles and patellofemoral pain, and it will be of interest to see if the model is also useful in LBP.

We will probably not be able to make pooled estimations of effects; therefore, the findings will likely be reported in a narrative form. However, we believe that the findings of this review will be both relevant and easily implemented in clinical practice. Results from this review will provide information which can support clinicians in decision-making regarding exercise therapy for patients with LBP. Furthermore, the review will suggest practical solutions for provision of the most effective exercise therapy for the treatment of LBP.

There is no consensus on the assessment of the validity and reliability of qualitative research; consequently, critical appraisal instruments differ.[39, 40] The Cochrane Collaboration recommends specific tools to assess the risk of bias in each included study in an intervention

review, a process that is facilitated by the use of appraisal instruments that address the specific features of the study design, and focusing on the extent to which results of included studies should be believed. Study quality assessment should focus on the quality of reporting, methodological rigour, and conceptual depth and bread of studies. Filtering, technical appraisal, and theoretical appraisal are the three main stages in a critical appraisal assessment.[41] Online appraisal instruments are available and easily accessible, and clearly define what is meant by each individual criterion listed.[39, 41] One of these tools is the CASP, originally produced by Dixon-Woods.[35, 42] By identifying common characteristics of qualitative research, Dixon-Woods produced a checklist of questions for assessing the clarity and appropriateness of the research question; the description and appropriateness of sampling, data collection, and data analysis; levels of support and evidence for claims; coherence between data, interpretation, and conclusions; and, finally, level of contribution of the paper.[42] These criteria led to the development of the 10 questions of the CASP checklist for qualitative studies.[35] The checklist provides some decision rules and instructions on how to interpret the criteria and reach a consensus, helping the reviewer to assess the rigor, credibility, and relevance of a study. Rigor, referring to whether the approach to the study is thorough and appropriate; credibility, referring to whether the findings are well presented and meaningful; and relevance, indicating the usefulness of the study's findings to the review.[42]

AUTHOR'S CONTRIBUTIONS

This study was conceptualised by JEJ and AR. JEJ drafted the manuscript. All authors contributed equally to the design of the study. The search strategy was developed by all authors. JEJ and TA will contribute to data collection. All the authors will contribute equally to the data analysis and interpretation for the review. All the authors will critically revise the review. All authors will read and approve the final manuscript.

FUNDING

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COMPETING INTERESTS

None declared.

OPEN ACCESS

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Extraction sheet for effect of exercise therapy based on the patients` level of low back pain in primary care: a systematic review

Author (Year)				
Country				
Study design				
Study aim				
Setting				
Condition (acute/subacute, chronic)				
Intervention(s)				
Number of patients				
Follow-up period				
Outcomes				
Author conclusion				
Other				

Author (Year)				
Country				
Study design				
Study aim				
Setting				
Condition (acute/subacute, chronic)				
Intervention(s)				
Number of patients				
Follow-up period				
Outcomes				
Author conclusion				
Other				

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

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification	1a	Identify the report as a protocol of a systematic review Page 2
Update	1b	If the protocol is for an update of a previous systematic review, identify as such N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number Page 2
Authors:		
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author Page 1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review Page 11
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments N/A
Support:		
Sources	5a	Indicate sources of financial or other support for the review Page 11
Sponsor	5b	Provide name for the review funder and/or sponsor Page 11
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol Page 11
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known Pages 4-5
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)

		Page 5
METHODS		
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review Pages 6-7
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage Page 6
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated Page 6
Study records:		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review Page 7
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis) Page 7
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators Pages 7-8
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications Pages 8, 11
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale Pages 8-9
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis Page 9
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised Pages 9-10
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ) Pages 9-10

	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression) N/A
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned Page 9
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies) N/A
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE) Page 9

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

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The effect of differentiating exercise guidance based on patient's level of low back pain in primary care – a mixed methods systematic review protocol

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The effect of differentiating exercise guidance based on patient's level of low back pain in primary care – a mixed methods systematic review protocol

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ABSTRACT

Introduction

Low back pain (LBP) is among the health conditions that lead to the most disability worldwide. Guidelines aimed at management of LBP recommend non-invasive and non-pharmacological management, including patient education, advice to stay active, and exercise therapy; however, the guidelines offer no recommendation as to the allowable level of pain during exercise or how specific levels of pain should be reflected in the stage and progression of exercises or activities. The purpose of this review is to study the effect of differentiation of exercise guidance based on level of LBP in patients in primary care.

Methods and analysis

A systematic search will be performed in PubMed, EMBASE, CINAHL, PsychINFO, PEDRO, Cochrane, and PROSPERO from their inception until September 2017.

Published peer-reviewed human experimental and observational studies with quantitative or qualitative designs will be included. Two independent reviewers will identify papers by reviewing titles and abstracts. Papers passing the initial selection will be appraised by two reviewers, based on their full-texts. Furthermore, the reference lists of included studies will be snowballed for identification of other relevant studies. Data will be extracted using a standard extraction sheet by two independent reviewers. Disagreements will be resolved by discussion and consensus with a third reviewer. The methodological quality of studies will be assessed using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) risk of bias tool, or the Critical Appraisal Skills Programme (CASP). Results will be reported narratively. Search histories will be documented in Endnote X8 (Clarivate Analytics).

Ethics and dissemination

Ethical approval for this review was not required as primary data will not be collected. The results will be disseminated through a peer-reviewed international journal and conference presentations.

PROSPERO registration number: CRD42017074880

STRENGTHS AND LIMITATIONS OF THIS STUDY

- To our knowledge, this will be the first review to synthesise evidence for differentiation of advice given by healthcare professionals for exercise treatment of low back pain, based on the pain levels of patients.
- Patients with a broad range of pain intensity levels are treated in primary care; therefore, the findings of this study will be applicable to the heterogeneous group of patients with low back pain seen in clinical practice.
- Patients participating in exercise therapy for low back pain often experience pain; this review could uncover how different levels of pain can be addressed in this context.
- We expect studies included in the review to be heterogeneous in design and to exhibit varying methodological quality, which is a limitation of this review.

INTRODUCTION

Low back pain (LBP) is one of the most common pain conditions worldwide, with a life-time prevalence of 80%.[1] The prevalence of LBP is highest among women and individuals aged 40–80 years.[1] In the literature, LBP is traditionally defined accordingly to the duration of symptoms, where symptoms lasting less than 12 weeks are defined as acute or subacute LBP, and symptoms lasting more than 12 weeks as chronic LBP. [2, 3] In the majority of cases, the cause of LBP is unknown and only 1–5% of patients have a serious underlying condition, such as cancer, osteoporosis, fractures, systematic inflammatory disease, or other serious condition (red flags) causing the LBP.[4] The first-line management of LBP comprises a non-invasive and non-pharmacological treatment approach, including patient education, advice to stay active, exercise therapy, and manual therapy.[4–7] A Danish study showed that 35% of the adult population have had transient or continuous pain in the lower back in the last year. Furthermore, 21% indicated that they have had disabling LBP during the last 14 days.[8] LBP often develops into a chronic health condition, with an unpredictable pattern of acute episodes, remission, and recurrence. In Denmark with an estimated population of approximately 5.7 million, LBP is a socioeconomic burden to society.[8, 9] The cost of treatment of LBP is estimated at 457 million Euros and the costs of production loss due to short- and long-term LBP amount to an estimated annual 1 billion Euros in Denmark.[10] As LBP is the condition for which there are the most frequent consultations for professional advice in primary care,[11] there is a strong case for increased efforts to improve healthcare for patients with this condition.

Regardless of the duration of LBP, guidelines consistently recommend staying active and exercise therapy. However, guidelines offer no recommendation on how a specific level of pain should be reflected in the level and progression of exercises or activities; consequently, there is a substantial inter-patient variation in clinician recommendations for LBP management.[12] A recent review found that protocols using painful exercises offer a small but significant benefit over pain-free exercises in the short term, with moderate quality of evidence.[13] In the medium and long terms, there is no clear superiority of one treatment over another.[13] Therefore, pain during therapeutic exercise to treat chronic musculoskeletal pain need not be a barrier to exercise treatment participation.[13] Considering patients in two groups, those with and without pain, may be

impractical, whereas, considering patients as experiencing a continuum of different pain levels may better reflect the clinical situation.

It is possible that therapeutic exercise can modify the concentration of pain-relieving peptides and change cerebral neurological activities linked with pain processing in patients with musculoskeletal pain; however, the level of neuro-physical evidence supporting this relationship is very low.[14] Accepting pain during exercise can also be an important therapeutic approach for addressing fear-avoidance, since accepting pain can support physical recovery and diminish psychological fear of movement, which can worsen the physical condition.[14, 15]

An approach of targeting exercise advice based on a pain monitoring model, aligning the fluctuation of pain levels with the advice given, was effective for patients with Achilles tendinopathy.[16] The model included six levels of exercise therapy, ranging from "hardly any physical activity" to "hard or very hard exercise regularly". Choice of level was based on pain experienced during and after exercise. According to this model, pain was permitted to be between levels 0 and 5 on a scale from 0 to 10 during exercise, where 0 was no pain and 10 indicated the worst imaginable pain. Pain was allowed to reach 5 during exercise, but should subside by the next day to the pain level before exercise. If it did not, the patient was advised to shift to an easier exercise level.[16]

There is no evidence that one particular type of exercise therapy for LBP is clearly more effective than others.[17] Moreover, we were unable to identify any systematic reviews evaluating the effect of guiding activity based on the level of LBP of patients in primary care. Thus, it remains unclear if the level of pain should be reflected in the treatment approach for this condition, or whether patients with different levels of pain will benefit from different exercise approaches.[6, 17–20]

Aim

The aim of this review is to identify studies evaluating the effect of differentiating exercise guidance for patients with LBP based on the patient's level of pain in primary care. The primary outcomes considered in this review will be pain and functional outcome measurements in LBP.

The review will address the following question:

What is the effect and potential cost-effectiveness of exercises for patients with LBP based on their specific levels of pain, in primary healthcare?

METHODS AND ANALYSIS

Study registration

This study is registered in PROSPERO (registration number: CRD42017074880).

Study conduct and reporting

This review will be conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) 2015 statement.[21]

Data sources

A pilot search has been conducted with the assistance of a librarian at Aalborg University Library with experience in searching for articles for systematic reviews. The pilot search was performed to qualify our search strategy. We will carry out systematic searches of PubMed [Supplementary file 1], EMBASE, CINAHL, PsychINFO, PEDRO, Cochrane, and PROSPERO from their inception until September 2017. The search strategy will be conducted using MeSH/Emtree headings, combined with free text words. We will include the following MeSH/Emtree/free text terms: 'low back pain', 'rehabilitation', 'physical therapy/medicine', and 'exercise therapy'. This will be followed by snowballing of the reference lists of included studies to identify possible articles that may not have been found in the initial search. Authors of included articles will be contacted if complete articles, or certain data such as data presented only in graphs, are not available. Studies published in English, Danish, Swedish, Norwegian, and German will be considered for inclusion in this review, and there will be no limitation on the time of publication.

Types of study

The review will include studies evaluating differential guidance for exercise and physical interventions for adults above the age of 18 in primary care, where differentiation was based on the pain levels of patients. Exercise and physical therapy is broadly defined as a regimen, or a plan, of physical activities designed and prescribed for specific therapeutic goals, with the purpose of restoring normal musculoskeletal function or reducing pain caused by disease or injury.[22, 23]

Data selection

We will include all published peer-reviewed human investigations, including both quantitative and qualitative studies, related to differential guidance on choice of exercise, based on the level of pain. We will consider both experimental and observational quantitative study designs, including randomised controlled trials (RCTs), non-RCTs, quasi-experimental, before and after studies, and prospective and retrospective cohort studies, and economic evaluations. We will include qualitative studies based on interviews and/or workshops. Studies of adults (≥18 years) treated in primary healthcare settings with non-specific LBP or nerve root LBP (including sciatica and/or radiculopathy) for any duration will be included.

We will exclude studies with a primary focus on pharmacological intervention of LBP, studies including patients with red flags (cancer, osteoporosis, fractures, systematic inflammatory disease, or other serious conditions causing the LBP), studies performed outside primary healthcare, studies with pregnant women, children, and adolescents (< 18 years), reviews, audits, or service reports, conference posters or abstracts, and studies that were not peer-reviewed.

Selection of studies

Search results will be imported into Mendeley bibliographic software (Elsevier) and duplicates removed with the help of the "check for duplicates" tool. After removing duplicates, two identical libraries will be created for the two reviewers to select relevant articles independently.

A two-stage process will be undertaken. The initial search will identify papers by review of their titles and abstracts against the inclusion and exclusion criteria, and will be conducted by two members of the review team (JEJ and TA). Any disagreement will be resolved by team discussion and consensus with a third review member (AR). Papers passing the initial selection stage will be critically appraised by two team members (JEJ and TA) based on their full-texts for final eligibility. Again, disagreements will be resolved through team discussion and consensus. If further disagreement is an issue, a third team member will be involved (AR). The reference lists of the included studies will be snowballed for identification of further relevant papers. The search history will be documented in Endnote X8 (Clarivate Analytics).

Data extraction

We will tabulate characteristics of the included studies, including date of publication, country where the study was conducted, study design, study aim, setting, condition (acute/subacute or chronic LBP), intervention(s), number of participants, follow-up periods short-term (≤ 12 weeks), medium-term (>12 to < 52 weeks), and long-term (≥ 52 weeks), outcomes, author conclusions, and other [Supplementary file 2]. Data from the included studies will be extracted by two independent reviewers (JEJ and TA) using a standardised form to identify the above-mentioned characteristics of the included studies. Disagreements will be resolved through team discussion and consensus. If further disagreement is an issue, a third team member will be involved (AR). In the case of missing methodological information, the corresponding authors of the studies will be contacted. Based on current literature, when possible, outcomes will be rescaled to 0 to 100-point scales. For example, a VAS score (0–10) of 4.5 (SD 1.2) will be rescaled to 45 (SD 12). For studies to be appropriate for inclusion in a meta-analysis on exercise therapy for LBP, we consider a 20-point scale for improvement in pain and a 10-point improvement scale for changes in functional outcomes to be clinically relevant. Statistical significance will be set at the 5% level. [24–26]

Outcome(s)

The primary outcomes will be the commonly applied domains - pain and function. [27-28] Other outcome domains will be regarded as secondary in this review.

We will measure the effect of exercise therapy guided by the participants pain levels where it is incorporated as either a primary or secondary outcome in the included studies. Outcomes may include, but will not be limited to:

1. Self-reported methods of pain level assessment, such as the visual analogue scale (VAS) or numerical pain rating (NPR).
2. Low back pain disability scores, such as the Roland-Morris Disability Questionnaire (RMDQ) or the Oswestry Disability Index (ODI).
3. Patient pain-related fear, such as the Pain Anxiety Symptoms Scale (PASS) or the Tampa Scale of Kinesiophobia (TSK).

4. Health related quality of life, such as the SF-36 (as measured by the general health sub-scale) or EuroQol.
5. The employment status.
6. Satisfaction with treatment received.
7. Fear avoidance due to LBP
8. Pain self-efficacy
9. Self-esteem because of LBP
10. Self-management of LBP

Risk of bias (quality) assessment

As we expect this review to include studies with both quantitative and qualitative designs, it will be necessary to apply more than one quality appraisal tool to review identified studies across different types of research design.

The quality of final evidence (QoE) in quantitative studies will be determined according to Grades of Recommendation, Assessment, Development and Evaluation (GRADE).[29] In the GRADE system, evaluating the QoE for each outcome of interest begins with determining the study design (e.g. randomised trial or observational study) and then assessing eight additional domains: risk of bias,[30] indirectness of evidence,[31] inconsistency of evidence,[32] imprecision of the estimated effect,[33] likelihood of publication bias,[34] the presence of a dose response effect, magnitude of the estimated effect, and issues around residual confounding.[35] After assessing all the mentioned domains, QoE per outcome is categorised as high, moderate, low, or very low.[36] The overall QoE will be determined by the QoE for each of the critical outcomes, and in most instances, the overall QoE will be based on the lowest QoE for any of the critical outcomes.

Appraisal of qualitative studies

Assessment of qualitative studies will be conducted using the worksheets provided by Critical Appraisal Skills Programme (CASP).[37] CASP provides a checklist of questions for assessing the clarity and appropriateness of the research question; the description and appropriateness of sampling, data collection, and data analysis; levels of support and evidence for claims; coherence

between data, interpretation, and conclusions; and, finally, level of contribution of the paper.[37]

The process for assessment of methodological bias in individual studies will be performed in Microsoft Word, and the results will be presented as a risk of bias summary (review of the author's judgments about each risk of bias item for each study included).

Strategy for data synthesis

Qualitative research findings will be presented in a narrative form. Quantitative data will be synthesised based on ranges, descriptive analysis, and interpretations of results. As heterogeneity is expected, we anticipate describing quantitative findings narratively. Meta-analysis will be conducted if a group of studies is sufficiently homogeneous, in terms of the subjects involved, interventions, and outcomes, to provide a meaningful summary.[38] Meta-analyses will then be conducted to summarise data and produce more precise estimates of outcomes for studies considered sufficiently homogeneous to provide a meaningful combined estimate. The choice of whether to conduct a meta-analysis will depend on the number of studies, the completeness of the reported outcomes, and judgment of the homogeneity among the results. Specifically, if a meta-analysis is based on a small number of studies, the estimate of between-studies variance may be substantially in error.[39]

ETHICS AND DISSEMINATION

Ethical approval for this review was not sought as primary data will not be collected. The results will be disseminated through a peer-reviewed international journal and conference presentations.

DISCUSSION

To our knowledge, this will be the first systematic review of the effect of basing exercise advice on the level of LBP of patients in primary care. A pain monitoring method often used in clinical practice is that suggested by Silbernagel et al. (2007) and Thomee (1997).[16, 40] This pain monitoring system documents pain and discomfort during the rehabilitation period, using the visual analogue scale (VAS) from 0 to 10. Pain reported up to a level of 2 was accepted as "safe", and pain levels from 3 to 5 were considered "acceptable", whereas, pain above 5 was considered to involve a "high risk". Pain should have subsided by the next morning. If pain did not subside, the

level of the exercise program was lowered one step. Normal participation in physical activities during the treatment period using the pain monitoring system was accepted.[16, 40] However, these studies investigated achilles and patellofemoral pain, and it will be of interest to see if the model is also useful in LBP.

We will probably not be able to make pooled estimations of effects; therefore, the findings will likely be reported in a narrative form. However, we believe that the findings of this review will be both relevant and easily implemented in clinical practice. Results from this review will provide information which can support clinicians in decision-making regarding exercise therapy for patients with LBP. Furthermore, the review will suggest practical solutions for provision of the most effective exercise therapy for the treatment of LBP.

There is no consensus on the assessment of the validity and reliability of qualitative research; consequently, critical appraisal instruments differ.[41, 42] The Cochrane Collaboration recommends specific tools to assess the risk of bias in each included study in an intervention review, a process that is facilitated by the use of appraisal instruments that address the specific features of the study design, and focusing on the extent to which results of included studies should be believed. Study quality assessment should focus on the quality of reporting, methodological rigour, and conceptual depth and bread of studies. Filtering, technical appraisal, and theoretical appraisal are the three main stages in a critical appraisal assessment.[43] Online appraisal instruments are available and easily accessible, and clearly define what is meant by each individual criterion listed.[41, 43] One of these tools is the CASP, consisting of 10 questions for qualitative studies.[37, 44] The checklist provides some decision rules and instructions on how to interpret the criteria and reach a consensus, helping the reviewer to assess the rigor, credibility, and relevance of a study. Rigor, referring to whether the approach to the study is thorough and appropriate; credibility, referring to whether the findings are well presented and meaningful; and relevance, indicating the usefulness of the study's findings to the review.[44]

AUTHOR'S CONTRIBUTIONS

This study was conceptualised by JEJ and AR. JEJ drafted the manuscript. All authors contributed equally to the design of the study. The search strategy was developed by all authors. JEJ and TA will contribute to data collection. All the authors will contribute equally to the data analysis and

interpretation for the review. All the authors will critically revise the review. All authors will read and approve the final manuscript.

FUNDING

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COMPETING INTERESTS

None declared.

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Search Strategy PubMed. Supplementary file 1

Sciatica [MeSH Terms])

OR Low back pain [MeSH Terms]))

OR ((low back pain)

OR sciatica)))

AND rehabilitation

OR physical medicine [MeSH Terms]

OR physical therapy [MeSH Terms]

OR (physical therapy)

OR physical medicine

OR rehabilitation [MeSH Terms]

AND Humans[Mesh]

AND Clinical Study[ptyp]

OR Clinical Trial[ptyp]

OR Comparative Study[ptyp]

OR Controlled Clinical Trial[ptyp]

OR Interview[ptyp]

OR Multicenter Study[ptyp]

OR Observational Study[ptyp]

OR Practice Guideline[ptyp]

AND Humans[Mesh]

Extraction sheet for effect of exercise therapy based on the patients` level of low back pain in primary care: a systematic review

Author (Year)				
Country				
Study design				
Study aim				
Setting				
Condition (acute/subacute, chronic)				
Intervention(s)				
Number of patients				
Follow-up period				
Outcomes				
Author conclusion				
Other				

Author (Year)				
Country				
Study design				
Study aim				
Setting				
Condition (acute/subacute, chronic)				
Intervention(s)				
Number of patients				
Follow-up period				
Outcomes				
Author conclusion				
Other				

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

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification	1a	Identify the report as a protocol of a systematic review Page 2
Update	1b	If the protocol is for an update of a previous systematic review, identify as such N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number Page 2
Authors:		
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author Page 1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review Page 11
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments N/A
Support:		
Sources	5a	Indicate sources of financial or other support for the review Page 11
Sponsor	5b	Provide name for the review funder and/or sponsor Page 11
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol Page 11
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known Pages 4-5
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)

		Page 5
METHODS		
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review Pages 6-7
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage Page 6
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated Suppl file 1
Study records:		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review Page 7
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis) Page 7
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators Pages 7-8
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications Pages 8, 11
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale Pages 8-9
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis Page 9
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised Pages 9-10
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ) Pages 9-10

	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression) N/A
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned Page 9
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies) N/A
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE) Page 9

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

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