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Occupational interventions for the prevention of back pain: Overview of systematic reviews

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ABSTRACT

Introduction: We conducted an overview of systematic reviews of interventions for the prevention of low back pain (LBP) that can be conducted in a workplace setting. *Methods:* An electronic literature search was performed in Medline, EMBASE, and the Cochrane Library. Published peer-reviewed systematic reviews and meta-analyses, which described interventions for the primary or secondary prevention of LBP applicable to a workplace setting, were eligible for inclusion. The methodological quality of the included systematic reviews was assessed with the AMSTAR tool. The primary outcome of interest was the incidence of LBP; secondary outcomes were LBP-associated absenteeism, activity interference, and costs related to LBP. *Results:* Twenty-eight eligible articles published between 1994 and 2016 were included in a qualitative synthesis following our screening of abstracts and full-text articles. The AMSTAR rating revealed 14 reviews of high, 10 of moderate, and 4 of low methodological quality. The identified interventions included workplace modifications (6 reviews, 10 studies, 6,751 subjects); shoe insoles (4 reviews, 6 studies, 2,356 subjects); and lumbar supports and other assistive devices (15 reviews, 18 studies, 60,678 subjects). Educational interventions investigated were back schools (10 reviews, 30 studies, 9,973 subjects); manual material handling techniques/advice (6 reviews, 24 studies, 10,505 subjects); and other forms of instruction including pamphlets, booklets, and other media (four reviews, 14 studies, 11,991 subjects). Exercise interventions, investigated in 12 reviews (35 studies, 19,330 subjects), showed moderate quality evidence of effectiveness for exercise interventions alone or in conjunction with educational interventions; no other type of intervention was consistently effective in the prevention of LBP or LBP-associated outcomes of interest. *Conclusions:* Our overview provides evidence of effectiveness for exercise with or without educational interventions in the prevention of LBP. *Practical applications:* Exercise interventions with or without educational interventions that can be applied in the workplace have the potential to prevent LBP.

1. Introduction

Non-specific low back pain (LBP) is a major public health concern, with a significant impact on productivity, work ability, and quality of life (Fan, 2016). The lifetime prevalence of non-specific LBP is 60–70% in industrialized countries with an annual adult incidence of 5% (Duthey, 2013). Work-related LBP was estimated to account for 37% of LBP globally, with a two-fold variation across different geographical regions (Punnett, 2005).

Non-specific LBP is the most important cause for the limitation of individual activities with subsequent work absenteeism globally, imposing a significant financial burden on healthcare systems and economies (Duthey, 2013). It has also been reported that 35% of all disability adjusted life years (DALYs) worldwide were linked to different occupational factors, and about 21.8 million DALYs globally were attributed to work-related LBP in 2010 (Driscoll, Jacklyn, Orchard, et al., 2014).

Low back pain is associated with a considerable socioeconomic burden. For instance, LBP was reported to be the most common cause of disability in young adults in the United Kingdom in a study carried out in 1996, causing more than 100 million workdays lost annually (Croft, Rigby, Boswell, Schollum, & Silman, 1993; Duthey, 2013). A survey in 1996 showed that the population of the United Kingdom was estimated at 58.2 million (Jefferies, 2005). At an estimated population size of 244.5 million (Population Estimates Program, Population Division, U.S. Census Bureau, n.d.), a 1988 study conducted in the United States demonstrated that LBP was responsible for about 149 million workdays lost per year (Guo, Tanaka, Halperin, & Cameron, 1999), with overall annual costs ranging from 100 to 200 billion US dollars (Katz, 2006; Rubin, 2007).

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Several factors including anthropometric characteristics, the nature and severity of physical work, working postures, and methods of manual lifting/handling have been linked to the development of LBP. In addition, other aspects such as lifestyle conditions and psychological factors (Duthey, 2013) may also be considered as independent risk factors for the development of LBP. Due to the multifaceted etiological nature of LBP, it can be a challenge to diagnose and treat (Duthey, 2013). Understanding the mechanism of LBP development may enable advancement of interventions to either prevent or treat this condition.

As non-specific LBP has a high global prevalence resulting in considerable health and socioeconomic consequences, together with the fact that currently available treatment options are not always satisfactory, preventive efforts therefore merit special attention (Luhmann, 2006). Interventions aimed at the prevention of LBP are desirable for the workplace setting - in principle, as prevention of pain is generally preferable to its treatment - and also because of the specific difficulty in treating already established LBP and the adverse effects of some analgesics that may impact alertness or cognition, and therefore safety at work. Many interventions such as education (e.g., back schools), exercise, lumbar supports (e.g., back belts), lifting techniques, insoles/foot orthoses, chair backrests and dynamic sitting, training of employees, and organizational interventions (Luhmann, 2006) have been suggested to prevent work-related LBP. Moreover, a number of systematic reviews have been carried out to evaluate the effectiveness of these interventions, either individually or in combination. Nevertheless, these systematic reviews may come to no definitive conclusion and sometimes offer contradictory conclusions on the same or similar interventions.

Therefore, we have conducted an overview of systematic reviews evaluating the effectiveness of various interventions carried out in the workplace or which could be carried out in such a setting to prevent work-related LBP. Based on the PRISMA statement (Liberati, Altman, Tetzlaff, et al., 2009) and the Cochrane Collaboration (Green et al., 2011) definitions, a systematic review seeks to address a clearly pre-formulated question that employs systematic and explicit methods to collate relevant research, and to collect and analyze data from the studies that satisfy a pre-defined set of eligibility criteria. A systematic review may or may not include meta-analysis, which refers to the use of statistical techniques to combine the results of included studies. The summaries and conclusions of systematic reviews are intended to inform, for example, on the effectiveness or lack thereof of an intervention. An overview of systematic reviews, as employed in the present study, seeks to compile and summarize data from various systematic reviews regarding an intervention. For the purposes of this study, the term workplace interventions may include changes made at the workplace to modify body function (physical or mental), activity, participation, environmental factors (physical, social or attitudinal), personal factors, or a combination of these. This is in keeping with previous work that defined intervention approaches based on the International Classification of Functioning, Disability and Health (ICF, under the WHO, 2001) (Aas, Tuntland, Holte, et al., 2011).

The present overview of systematic reviews, thus, aims to assess the evidence for the various workplace interventions employed to prevent the development of back pain, as reviewed in the published medical literature and aims to provide recommendations for occupational health practice.

2. Methods

2.1. Searching

An electronic literature search was conducted in Medline (Ovid), EMBASE (Ovid), and the Cochrane Library. The last search date was April 20th 2017. The search strategies and study selection are outlined in the Appendix. We considered reviews published in English or German.

2.2. Inclusion criteria

To be included in the analysis, articles had to be published peer-reviewed systematic reviews or meta-analyses (i.e., numerical evidence syntheses). Additionally, the reviews had to describe interventions, which pertained to primary or secondary prevention of LBP and were performed in, or applicable to, an occupational setting (i.e., the workplace). Articles in the gray literature were excluded. Also considered ineligible were pharmacological interventions to treat LBP. Guidelines on low back pain prevention per se were excluded, however guidelines based on systematic reviews were screened further to assess if the systematic reviews satisfied our inclusion criteria. Two reviewers (DS, RB) independently selected articles in accordance with the above-mentioned criteria that had been determined a priori. Discrepancies were resolved with the help of another reviewer (SS).

2.3. Quality assessment of the systematic reviews and data extraction

The methodological quality of included reviews was evaluated using the Assessment of Methodological Quality of Systematic Reviews (AMSTAR) guideline (Shea, Hamel, Wells, et al., 2009), which consisted of 11 criteria, each given a rating of 'yes' (1), 'no' (0), 'can't answer' (0) or 'not applicable' (0). A review was considered high quality when the total score was 8–11; a total score of 4–7 was considered moderate quality, while a score of 0–3 was low quality. Data on the authors, date of publication, number of studies and subjects, subjects' baseline characteristics, preventive modality, as well as the reviewer authors' main results and conclusions were extracted from the included reviews. Data extracted by one reviewer (DS) were independently verified by a second reviewer (MZ). A third reviewer (SS) arbitrated discrepancies.

2.4. Data synthesis

Due to the heterogeneity in the study subjects' baseline characteristics, types of intervention, and outcome measures, quantitative meta-analysis was not deemed suitable. Therefore, a descriptive, qualitative knowledge synthesis was conducted. Reviews were categorized based on intervention type, outcome measure, and baseline characteristics. Additionally, to facilitate data synthesis, interventions were considered as primary or secondary prevention in accordance with subjects' baseline characteristics and outcome measures reported. Interventions aimed at subjects with no history of back pain were categorized as primary prevention; when subjects had previous back pain, but did not demonstrate current back pain at study baseline, interventions were considered secondary prevention. We assigned to a third category of mixed primary and secondary prevention those reviews where review authors did not explicitly describe subjects' baseline characteristics in that regard. Furthermore, when a review described interventions for both LBP prevention and treatment, we only extracted data related to prevention.

3. Results

The electronic searches yielded 925 hits and 13 additional records were obtained from the references lists of the included reviews; 838 records were screened after deduplication. Following abstract screening, 66 full-text review articles were selected for further evaluation; examining these full-text articles resulted in the exclusion of 38 articles, thus leaving 28 systematic reviews that were included in our overview (Fig. 1). The publication dates of the included reviews ranged from 1994 to 2016.

All review articles were systematic reviews with or without meta-analyses with 27 articles in English and one in German. The main reasons for exclusion were that articles were narrative reviews, not systematic reviews, that interventions were therapeutic rather than preventive or that some of the articles were previous versions of

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