

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	The effectiveness of workplace exercise interventions in the treatment of musculoskeletal disorders in office workers: A systematic review.
AUTHORS	Tersa Miralles, Carlos; Bravo, Cristina; Bellon, Filip; Pastells-Peiró, Roland; Rubinat Arnaldo, Esther; Rubí Carnacea, Francesc

VERSION 1 – REVIEW

REVIEWER	Elise Rivera Deakin University, Institute for Physical Activity and Nutrition (IPAN), School of Exercise and Nutrition Sciences
REVIEW RETURNED	12-Aug-2021

GENERAL COMMENTS	<p>A big thanks to the authors for the invitation to review this systematic review. It would be a good addition to the existing literature on this important topic and is nicely written. Overall, it is a strong review. My main suggestions would be to consider being more specific with some of the points made in the Introduction to enhance your rationale or even by being more specific when discussing studies (e.g sample size, design) in the Introduction. For the Methods, the countries in which the studies were conducted could be added to the table. This could also be a discussion point, particularly if the majority of the studies are from the same continent/region. Briefly summarising what constitutes narrative synthesis and best practices for performing it could be mentioned in the Methods. This would further add to the rigour of this appropriate analysis technique for this review. All in all, it is a strong review and these are minor suggestions for further improvement. In the attached file are additional comments.</p> <p>The reviewer provided a marked copy with additional comments. Please contact the publisher for full details.</p>
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REVIEWER	Venerando Rapisarda University of Catania, Occupational Medicine
REVIEW RETURNED	22-Aug-2021

GENERAL COMMENTS	As noted by the authors themselves, this cannot be a systematic but a narrative review. Therefore, I would remove the word "systematic" from the title.
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REVIEWER	Catherine Linaker MRC Lifecourse Epidemiology Unit, Medicine
REVIEW RETURNED	28-Sep-2021

GENERAL COMMENTS	The review is well explained and conducted, and the issue identified is pertinent and of concern. However, I am unsure whether it
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	<p>contributes importantly to our understanding of the effectiveness of workplace interventions since the pool of studies was discussed as: small, widely heterogeneous in terms of study methods and the authors concluded that further high-quality studies in this area are required before any reasonable analysis in future might be performed.</p> <p>The aim (to determine the effectiveness of workplace exercise interventions in the treatment of MSDs) was clearly documented, but it appears that the search was limited to neck and low back pain. Did the authors consider including a more comprehensive search of all upper limb pain with elbow, wrist and hand pain in the search criteria?</p> <p>The reference 22 noted the problem of significant heterogeneity in study characteristics (a review of physical exercise and back pain in office workers) and because of this, these authors could also only perform a qualitative summary. They also highlighted the need for further work of a high quality before any recommendations or firm conclusions can be made. I am unclear whether the current manuscript contributes more to these conclusions (which was admittedly focused on back pain in office workers and included RCTs and non RCTS).</p> <p>The introduction includes publications that investigate sedentary behaviour and chronic diseases (obesity, cardiovascular disease, metabolic syndrome refs 3,4,6,10,11) and mortality and I do not believe these warrant detailed inclusion when the focus of this review is specifically on musculoskeletal disorders. Reference 7 only reports on trends in insufficient physical activity and not severe risk factors for health.</p> <p>Many MSDs are complex conditions (especially low back pain) and numerous factors contribute to an individual's pain and possible disability (eg social and psychological issues both in and out of the workplace- for example: job satisfaction). Future studies might usefully collect such information.</p>
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VERSION 1 – AUTHOR RESPONSE

• Response to Reviewer 1 - Dr. Elise Rivera, Deakin University

- We thank the reviewer for her constructive and positive comments on our review. These comments have helped us improve the manuscript.

1. My main suggestions would be to consider being more specific with some of the points made in the Introduction to enhance your rationale or even by being more specific when discussing studies (e.g sample size, design) in the Introduction

- Considering all the comments related to the introduction, we have decided to focus more on musculoskeletal disorders and less on general health issues. As the comments in the text reviewed manuscript, we have reported the number of METs related to sedentary lifestyle and the METs in moderate and vigorous physical activities. We have also considered the guidelines proposed by the WHO for the minimum recommended physical activity levels.

We have deepened into the information of some studies, being more specific about the procedure and stats in references 14 and 16.

Also, in the last lines of the introduction, we have specified that the review is the first to analyze office workers who spend a large part of their working day in a seated position in any working sector.

2. For the Methods, the countries in which the studies were conducted could be added to the table. This could also be a discussion point, particularly if the majority of the studies are from the same continent/region

- In the "Methods" section, we have updated the table by putting the countries in which the study was developed. We found studies in different regions, but all of them were from middle-upper and high-income countries. We added in the discussion the limitation that only middle-upper and high-income countries met the review's inclusion criteria, which could affect the external validity of the results on page 19.

3. Briefly summarising what constitutes narrative synthesis and best practices for performing it could be mentioned in the Methods

- We have gone deeper into the narrative synthesis, explanation in the "Data Synthesis" section, specifying that the steps of Popay's Social Research Council guidance on the conduct of Narrative Synthesis were followed.

4. In the attached file are additional comments.

- We considered and modified the main document with all the additional comments proposed. In the "Abstract" section, we eliminated the word (therefore) and reworded the conclusion section. As aforementioned, we modified the "Introduction" section, following the recommendations and focusing on musculoskeletal disorders. Some of the paragraphs were eliminated and changed by other references.

In the "Discussion" section, we have added the pertinent changes in terms of grammar proposed, and in the "Conclusion" section, the suggested changes on using the word "suggesting" and not "concluding".

• Response to Reviewer 2 - Dr. Venerando Rapisarda, University of Catania

1. As noted by the authors themselves, this cannot be a systematic but a narrative review. Therefore, I would remove the word "systematic" from the title.

- To conduct this study, we followed the PRISMA statement for systematic reviews. We believe that the main difference with a narrative review is conducting a systematic search in which specific terms have been sought with a subsequent peer review of the articles following the inclusion and exclusion criteria that were previously defined. The fact of carrying out a narrative synthesis is due to the heterogeneity of the interventions of the various studies included, not being able to perform a meta-analysis. So to ensure that it meets the requirements, we have followed the steps of the Economic and Social Research Council guidance on the conduct of Narrative Synthesis and the SWiM Checklist as the Editor Office suggested to include in our review.

Response to reviewer 3 - Dr. Catherine Linaker, MRC Lifecourse Epidemiology Unit

1. I am unsure whether it contributes importantly to our understanding of the effectiveness of workplace interventions since the pool of studies was discussed as: small, widely heterogeneous in terms of study methods and the authors concluded that further high-quality studies in this area are required before any reasonable analysis in future might be performed.

- We agree that the studies performing a workplace exercise intervention to reduce musculoskeletal disorders are widely heterogeneous. There is no consensus on implementing the interventions, as there are many variables to consider, such as the type of exercises proposed, the duration of the break, in situ or web-based intervention, among other variables.

- Considering that a large part of the population suffers from musculoskeletal disorders, implementing therapeutic exercise as an evidence-based physiotherapy, is a feasible option to implement in the workplace. In our opinion, this review contributes to analysing the available information in the current literature when conducting scientific studies to solve this health concern. It is essential to consider the current literature's strengths and limitations to conduct studies with high methodological quality and low risk of bias.

2. The aim (to determine the effectiveness of workplace exercise interventions in the treatment of MSDs) was clearly documented, but it appears that the search was limited to neck and low back pain. Did the authors consider including a more comprehensive search of all upper limb pain with elbow, wrist and hand pain in the search criteria?

- When the search was conducted, we did not make a limitation by area of the body. Most of the studies analysed in the selection process; were focused on low back, neck and shoulder pain. However, we peer-reviewed all articles that met the inclusion criteria of any musculoskeletal disorder or pain in office workers with workplace exercise interventions.

3. The reference 22 noted the problem of significant heterogeneity in study characteristics (a review of physical exercise and back pain in office workers) and because of this, these authors could also only perform a qualitative summary. They also highlighted the need for further work of a high quality before any recommendations or firm conclusions can be made. I am unclear whether the current manuscript contributes more to these conclusions (which was admittedly focused on back pain in office workers and included RCTs and non RCTs).

- When making the modifications proposed in the "Introduction" section, we eliminated this paragraph from Waongenngarm's study because the results, as mentioned by the editor, were not well interpreted.

4. The introduction includes publications that investigate sedentary behaviour and chronic diseases (obesity, cardiovascular disease, metabolic syndrome refs 3,4,6,10,11) and mortality and I do not believe these warrant detailed inclusion when the focus of this review is specifically on musculoskeletal disorders. Reference 7 only reports on trends in insufficient physical activity and not severe risk factors for health.

- We have modified the "Introduction", considering the editor comment by eliminating the references and the information about general health issues related to sedentarism, since it is not mainly related to musculoskeletal pain, updating the information on sedentary lifestyles, office workers and musculoskeletal pain with new references.

5. Many MSDs are complex conditions (especially low back pain) and numerous factors contribute to an individual's pain and possible disability (eg social and psychological issues both in and out of the workplace- for example: job satisfaction). Future studies might usefully collect such information.

- We appreciate the comment and agree about the contribution of MSD being complex conditions. We are currently composing a study protocol, where we will develop a mixed methodology study. First with a qualitative phase in which we intend to know what the expectations of the pain of workers are related to biopsychosocial aspects through semi-structured interviews, and a quantitative phase through a randomised controlled trial in which we will consider the results of the first phase along with avoiding as much as possible the biases that we have found in the current literature of this systematic review.

VERSION 2 – REVIEW

REVIEWER	Elise Rivera Deakin University, Institute for Physical Activity and Nutrition (IPAN), School of Exercise and Nutrition Sciences
REVIEW RETURNED	19-Nov-2021

GENERAL COMMENTS	<p>Thank you for the opportunity to review this systematic review. Well done in comprehensively responding to each of the comments and points of feedback in the previous round of revisions. Overall, the systematic review is well written, and the Results and Discussion sections are strong. Some minor comments are provided, particularly around how to improve the Introduction further and correcting grammatical/spelling errors. This manuscript would make a valuable contribution to the evidence-base and provide a platform for future studies to build from.</p> <p>Page 4: Add a comma to line 49 so it reads "in recent years, increasing the time spent..."</p> <p>Page 4: Perhaps revise the wording in the sentence on lines 57-58 to something a bit more clear and compelling. For example "It is therefore critical for strategies to improve physical activity and reduce sedentary behaviour to enhance health."</p> <p>Pages 4-5: It would be good to add "for instance" or "for example" to the following sentence: "Performing exercise 3 to 5 times a week..".</p> <p>Page 5: perhaps you could have an introductory sentence starting the paragraph on line 7 to state what constitutes physical activity. Alternatively, in the sentence starting with "American and eastern Mediterranean.." you could state what physical inactivity is (here mention that it not meeting the recommended amount of activity as per physical activity guidelines and state the exact frequency, duration, intensity recommendations). The WHO guidelines are mentioned later on but may be better suited here.</p> <p>Page 5 line 21: amend to sentence to include 'from' after suffering. You can also delete "being" so it reads "disorders, one of the leading causes of health problems"</p> <p>Page 5 lines 24-28: If the prevalence is predicted to rise, it would be good to know what it currently is for comparison.</p> <p>Page 5 line 35: Reword to say "In a study by Kalinene"</p> <p>Page 5 line 39: add 'from' after suffering and before musculoskeletal</p> <p>Page 5 line 47: a full stop/period is missing at the end of the sentence</p> <p>Page 6 line 5: include 'spent' after time and before sitting</p> <p>Page 6 lines 8-12: It would be good to make clear that recommendations specify this amount of activity in a week. Alternatively, you could just introduce physical activity guidelines</p>
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	<p>here: " World Health Organization 2020 guidelines on physical activity and sedentary behaviour". This source is more up-to-date than the reference 19 in the review, which is from 2010. https://pubmed.ncbi.nlm.nih.gov/33239350/</p> <p>Page 10: Table one appears to repeat the headings: authors, country, participants, intervention vs control, relevant outcome. Perhaps you could just have this at the top of the table and not repeat it.</p> <p>Page 13: It would be good to be consistent with British vs American spelling (z vs s). For example, Line 7 says "randomised" and in the following lines, it is spelled "randomization".</p> <p>Page 16: line 29: correct typo (RCTsr)</p> <p>Page lines 34-37: Perhaps you could follow this up with at statement like: "This requires further investigation" as the point being made is based on two studies.</p> <p>Page 18 line 7: Referring to the review as "anterior" sounds a bit off. Could you reword and instead use "previous" or "aforementioned"?</p> <p>Page 19 lines 30-31: reword to something like "as a web-based program with push reminders, it is likely a feasible option for future interventions. In its current form, there are some grammatical errors.</p> <p>Page 56 - Data availability statement: Available is misspelled</p>
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REVIEWER	Catherine Linaker MRC Lifecourse Epidemiology Unit, Medicine
REVIEW RETURNED	12-Nov-2021

GENERAL COMMENTS	<p>The introduction has included a discussion of musculoskeletal symptoms rather than sedentary lifestyle and other adverse health outcomes. Discussion of sedentary behaviour and physical activity has been included in the opening paragraph but I think clarification is required in order that the reader fully understands the meaning of the text in order to differentiate the two terms.</p> <p>Also it is important to emphasise that limited research has been conducted into the association between sedentary behaviour and musculoskeletal pain- again I think clarification would be helpful in the text in the third paragraph of the introduction so that the reader fully comprehends this.</p> <p>I understand from the inclusion criteria that studies were excluded if interventions were prescribed at home or outside the office setting. Would this exclude studies which included a hybrid intervention of work exercises that could also be continued outside of work? It would be helpful if the authors could provide the rationale for excluding such studies.</p> <p>In terms of a broader discussion point for the review and for future studies: solely focusing on occupational behaviour may not provide an accurate assessment of a person's overall physical activity and leisure/home behaviours.</p> <p>A previous review by Kelly et al 2018 (doi: 10.1093/occmed/kqy054) has investigated the effectiveness of exercise therapy in the management of (work-related) musculoskeletal disorders in sedentary workers and might have usefully been referred to or discussed. The term work-related is rather unhelpful since it appears difficult to conclusively prove that disorders were caused by work (although symptoms may well have been made worse by work). The authors defined work-related upper limb disorders (WRULDs) as: an umbrella term used to cover a wide range of musculoskeletal</p>
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	<p>symptoms and pathological states of the upper quadrant from proximal joints (cervicothoracic, scapulothoracic, glenohumeral) to distal (elbow, wrist and hand). They used similar research criteria to the current review but the studies that were included were mainly published pre-2010.</p> <p>Finally, there are a number of typos and grammatical errors, particularly in the Tables.</p>
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VERSION 2 – AUTHOR RESPONSE

Response to Reviewer 3: Dr. Catherine Linaker:

The introduction has included a discussion of musculoskeletal symptoms rather than sedentary lifestyle and other adverse health outcomes. Discussion of sedentary behaviour and physical activity has been included in the opening paragraph, but I think clarification is required in order that the reader fully understands the meaning of the text in order to differentiate the two terms.

Also, it is important to emphasise that limited research has been conducted into the association between sedentary behaviour and musculoskeletal pain- again I think clarification would be helpful in the text in the third paragraph of the introduction so that the reader fully comprehends this.

- We improved the wording of the first and third paragraphs, considering the recommendations of the editors to specify the difference between the two terms to clarify the text for better comprehension for the readers.

I understand from the inclusion criteria that studies were excluded if interventions were prescribed at home or outside the office setting. Would this exclude studies which included a hybrid intervention of work exercises that could also be continued outside of work? It would be helpful if the authors could provide the rationale for excluding such studies

- We excluded some studies with a hybrid intervention and studies that do not specify where the exercise therapy was performed. We even contacted the corresponding author for more information about their interventions, who clarified that the participants could perform at work or home. We think that there is a suitable way to maintain the levels of physical activity of the workers. However, they cannot give detailed information if the benefits were from the workplace interventions or the other ones. We provided the rationale for excluding this type of study in the Discussion section on page 16.

In terms of a broader discussion point for the review and for future studies: solely focusing on occupational behaviour may not provide an accurate assessment of a person's overall physical activity and leisure/home behaviours.

- We agree that focusing on occupational behaviour does not accurately assess workers overall physical activity and leisure/home behaviours. However, implementing scheduled exercise in the workplace might help improve other aspects related to musculoskeletal disorders that can be worsened, such as awkward postures, body awareness, no rest pauses, or even psychological and social factors.

We answered in the manuscript together with the anterior question about hybrid interventions on page 16 in the Discussion section.

Response to Reviewer 1: Dr. Elise Rivera:

Thank you for the opportunity to review this systematic review. Well done in comprehensively responding to each of the comments and points of feedback in the previous round of revisions. Overall, the systematic review is well written, and the Results and Discussion sections are strong. Some minor comments are provided, particularly around how to improve the Introduction further and correcting grammatical/spelling errors. This manuscript would make a valuable contribution to the evidence-base and provide a platform for future studies to build from.

- Thank you very much for highlighting the spelling and grammatical errors; we have considered all the changes proposed to make it easier for the reader to understand the text. We had to eliminate some of the sentences that needed improvement (Pages 4-5), reducing the text by introducing new explanatory paragraphs proposed by reviewer 3 to make the reader understand the whole text and enrich the systematic review.