

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Risk of transition from occasional neck/back pain to long-duration activity limiting neck/back pain: A cohort study on the influence of poor work ability and sleep disturbances in the working population in Stockholm County
<b>AUTHORS</b>	Holm, Lena; Bohman, Tony; Lekander, Mats; Magnusson, C; Skillgate, Eva

### VERSION 1 – REVIEW

<b>REVIEWER</b>	Francisco Alburquerque Sendín University of Córdoba and Maimonides Biomedical Research Institute of Cordoba (IMIBIC), Spain
<b>REVIEW RETURNED</b>	25-Oct-2019

<b>GENERAL COMMENTS</b>	<p>Dear authors, Congratulations for the high quality of the paper. It accomplishes the recommendations for observational analysis of the identification of risk factors in health-related issues. The paper is well written, and methodology is very clear. I only have a few considerations for you.</p> <p><b>INTRODUCTION</b></p> <p>- Page 5, Line 58: "... had acceptable predictive ability (13)". Is the word "ability" correct? I think the correct word is "validity".</p> <p><b>MATERIAL AND METHODS</b></p> <p>- A sample size estimation is lacking. Was the risk of type I error calculated?</p> <p>- Page 8, line 37: The list of exclusion criteria is too short. Why previous surgery, cancer, pregnancy,... were not considered as exclusion criteria?</p> <p>- Page 8, line 58: I think "Moderate" should be replaced by "Rather good". Further, why "Rather good" was considered as poor work ability? It is the third option among five answer possibilities.</p> <p><b>RESULTS</b></p> <p>- Tables 3 and 4: The term "troublesome" may induce an error of interpretation. Please check.</p> <p>- Along the text, there is no reference about the treatment of the back/neck pain episodes. Why? Could the information of treatment modify the results or their interpretation?</p> <p><b>DISCUSSION</b></p> <p>- Page 22, lines 29-46: All these data were not in the Results section. I think the authors should include them in the Results, or delete this paragraph.</p> <p>- Page 22, lines 48-58: Could therapeutic exercise be another solution or source of modification to poor work ability?</p>
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	- Page 22, line 58, to page 23, line 7: This sentence is too speculative. Why do the authors think that dialogue with the employer can improve the poor work ability?
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<b>REVIEWER</b>	Jonathan Hill Keele University, UK
<b>REVIEW RETURNED</b>	30-Oct-2019

<b>GENERAL COMMENTS</b>	This is a very interesting piece of research and I would like to congratulate the authors on a good epidemiological study for an important health problem.  There were a few minor typographical errors which may be easily sorted by some further proof reading.
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<b>REVIEWER</b>	Matteo Castaldo Aalborg University, Department of health Sciences and Technology, Aalborg
<b>REVIEW RETURNED</b>	06-Jan-2020

<b>GENERAL COMMENTS</b>	i consider your paper very interesting and well written, but some clarification needs to be made, to eliminate some confusion.  - The reviewer provided a marked copy with additional comments. Please contact the publisher for full details.
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### VERSION 1 – AUTHOR RESPONSE

#### Reviewer 1

<b>Reviewer Comments:</b>	<b>Response:</b>
INTRODUCTION - Page 5, Line 58: "... had acceptable predictive ability (13)". Is the word "ability" correct? I think the correct word is "validity".	Thank you form pointing this out. You are correct, and the wording has been changed to <i>validity</i>
MATERIAL AND METHODS - A sample size estimation is lacking. Was the risk of type I error calculated?	We did not do a priori sample size calculation. The data was already collected, and we merged two large subsamples of the Stockholm Public Health cohort in order to get sufficient power to complete the aim of the study.  <i>No changes have been made to the manuscript</i>
- Page 8, line 37: The list of exclusion criteria is too short. Why previous surgery, cancer, pregnancy,... were not considered as exclusion criteria?	Thank you for pointing this out. We did not seek to understand the causes of sleep disturbances or work ability and it is fully correct that these factors may in some instances also have had an impact on the outcome 4 years later, thus influenced the results. However, since we included persons with occasional NBP we may have included persons with specific, transient conditions, such as

	<p>pregnancy and recent surgery. We did not have access to such detailed information, and such factors may, if any have diluted our findings if they were associated with both the exposures and the outcome. However, we believe that the prevalence of such unmeasured potential confounders is relatively low in the overall cohort, and not likely to have a major impact.</p> <p><i>No changes have been made to the manuscript</i></p>
<p>- Page 8, line 58: I think “Moderate” should be replaced by “Rather good”.</p> <p>Further, why “Rather good” was considered as poor work ability? It is the third option among five answer possibilities.</p>	<p>Thank you for observing this.</p> <p>The meaning of the Swedish word “någorlunda” which was the response alternative is neutral and refers to moderate or fairly. ” “Rather good” is too positive. We have therefore changed all the labeling to “moderate” both in tables and in the text.</p> <p>We wanted to have the comparison group consisting of those who rated their work ability in positive wording, therefore we choose to let the middle option belong to the group “poor” work ability.</p>
<p><b>RESULTS</b>  - Tables 3 and 4: The term “troublesome” may induce an error of interpretation. Please check.</p> <p>- Along the text, there is no reference about the treatment of the back/neck pain episodes. Why? Could the information of treatment modify the results or their interpretation?</p>	<p>Thank you for observing this error. It has now been changed to “activity limiting” in accordance with the text in the manuscript.</p> <p>Unfortunately, we do not have any information about treatment of neck and/or back pain, We believe that it is less likely that other than with few exceptions, persons have ongoing treatment at baseline (occasional NBP up to a couple of days per month), thus it can not be a confounding factor.</p> <p>Treatment during follow-up, as well as many other prognostic factors may vary over time. We have no reason to believe that this differ between the exposed and un-exposed in the study. It is also important to note is that the long-term effects of treatment for NBP, including PT, is very modest. We have added a sentence in the Discussion section.</p>

<p>DISCUSSION</p> <p>- Page 22, lines 29-46: All these data were not in the Results section. I think the authors should include them in the Results, or delete this paragraph.</p> <p>- Page 22, lines 48-58: Could therapeutic exercise be another solution or source of modification to poor work ability?</p> <p>- Page 22, line 58, to page 23, line 7: This sentence is too speculative. Why do the authors think that dialogue with the employer can improve the poor work ability?</p>	<p>We have removed the details of the prevalence of sickness absence among cases and non- cases.</p> <p>The sentence now reads; <i>In the present study, we note that only 1/3 of the cases had a history of sickness absence in the year prior to the follow up,.....</i></p> <p>Yes, therapeutic exercise might be a way to improve persons physically and mental health which then also possible would prevent LNBP. We touch upon this in the Discussion – page 24 , first paragraph.</p> <p><i>...or that the individual takes their own responsibility for physical and mental health maintenances through self-care such as leisure time physical activity or similar actions.</i></p> <p>The sentence reads <i>Another option might be that the employee in dialogue with their employer investigates the possibilities of changes within the current job...</i></p> <p>Thus, the dialogue (which is common in Sweden,) may result in temporary or permanent changes within the current job in a way that may result in an improved work ability for the employee.</p> <p><i>No changes have been made to the manuscript</i></p>

Reviewer Comments:	Response:
<p>This is a very interesting piece of research and I would like to congratulate the authors on a good epidemiological study for an important health problem.</p> <p>There were a few minor typographical errors which may be easily sorted by some further proof reading.</p>	<p>Thank you for these positive comments.</p> <p>We have further proofread the manuscript and corrected the errors</p>

### Reviewer 3

Reviewer Comments:	Response:
<p><i>Sleep disturbances were self-reported current mild/severe disturbances.</i></p> <p>why you did not use a questionnaire, like the PSQI?</p>	<p>We agree that it would have been better if the exposure sleep disturbances would have been measured with a more precise questionnaire. We discuss this (as possible misclassification of the exposure) as a limitation of the study in Discussion section page. 25, second paragraph.</p> <p>The Stockholm Public Health Cohort is based on a comprehensive questionnaire covering several domains from Health and diseases, working conditions, lifestyle factors. Living condition, family and security etc. The questionnaire is 21 pages long and has more than 100 questions. Therefore, some of the domains and measure had to be generic and brief. Also, to be able to survey trends over time, these questions are seldom changed.</p> <p><i>No changes have been made to the manuscript</i></p>
<p>Concerning the outcome:</p> <p>“so there were people with 2 days/week and other with 5 days/week?”</p>	<p>Yes that is correct.</p> <p>In addition, the pain condition also had to result in activity limitations and had to be present during the past 6 months. That is how we define long duration activity limited NBP. As stated in the abstract and in the method section.</p>

	<i>No changes have been made to the manuscript</i>
Concerning confounding factors ven wheter they had PT or not in these 4 yrs?	<p>Whether they had a PT or not over the 4 years? No, we did not have any information about health care consultation or other interventions at baseline or at follow-up.</p> <p>and treatment during follow-up, as well as many other prognostic factors may vary over time. We have no reason to believe that this differ between the exposed and un-exposed in the study. Also important to note is that the long term effects of treatment for NBP, including PT, is very modest. We have added a discussion about this potential limitation in the manuscript. Page 25 Last row, and page 26 first section:</p> <p><i>During a four-year follow-up, time varying prognostic factors, among others treatment for NBP, may have had an impact on the risk of developing LNBP. Since these are present among exposed as well as un-exposed, the most likely effect of such factors would be a dilution of the associations reported.</i></p>
male and female??	<p>Yes, we have added this information on page 9 second paragraph. The sentence now reads</p> <p><i>Men and women, aged 18–60 who were participating in any of the three subsamples in 2010 were included if they reported NBP during the past six months up to a couple of days per month but not more often, and were responding to any of two items from the WAI; physical and mental capacity in relation to work demands (indicating that the persons were active in working life) at baseline</i></p>
diagnostic criteria used for the diagnosis of NBP?	<p>The present diagnostic criteria read: <i>NBP during the past six months up to a couple of days per month but not more often,</i></p> <p>We have added</p> <p><i>NBP was defined based on the questions ; “Have you had any pain in your upper back or neck in the preceding 6 months?”, and “Have you had any pain in your lower back in the preceding 6 months?”. Persons who responded “Yes, a couple of days per</i></p>

	<p><i>month or less frequent” to one or both of these questions fulfilled the criteria for NBP.</i></p> <p><i>Page 8 second paragraph</i></p>
<p>so to be included, they needed to have a light form of disability at baseline??</p>	<p>To be included they had to have occasional NBP up to a couple of days per month, /during the past 6 months, no matter if activity limiting or not.</p> <p><i>No changes have been made to the manuscript</i></p>
<p>no other exclusion criteria? ex. chronic pain, fibromyalgia, depression...</p>	<p>No. we did not exclude any specific diseases. Instead we tried to test for many confounding factors, including psychological stress, see table 1, Chronic pain would be excluded, since we included only persons with occasional pain.</p> <p><i>No changes have been made to the manuscript</i></p>
<p>Concerning the way sleep disturbances was measured “why you didn't use a questionnaire to assess this outcome? a question like this is too generic...</p>	<p>We agree that it would have been better if the exposure sleep disturbances would have been measures with a more precise questionnaire. This we also have discussed (as possible misclassification of the exposure) as a limitation of the study in Discussion section page 25, second paragraph.</p> <p>The Stockholm Public Health Cohort is based on a comprehensive questionnaire covering several domains from Health and diseases, working conditions, lifestyle factors. Living condition, family and security etc. The questionnaire is 21 pages long and has more than 100 questions. Therefore, some of the domains and measure had to be generic and brief.</p> <p><i>No changes have been made to the manuscript</i></p>
<p>Concerning the outcome: on page 9 “need a better specification of how was defined the transition to LNBP. In both terms</p>	<p>Unfortunately, such information was not included in the questionnaire.</p>

<p>of number of pain days, pain intensity, and scoring of questionnaires...”</p>	<p>We believe that reporting long-lasting pain (during the past 6 months prior to the follow up,) , at least <b>a couple of days per week , and resulting in a decreased work ability/restricted other daily activity”</b> is a valid way to report such conditions.</p> <p>We have published several papers with this definition of activity limiting NBP. E.g.</p> <p>Skillgate et al. Healthy lifestyle behaviour and risk of troublesome neck pain or low back pain among men and women. <i>Clinical Epidemiology</i> 2017 Oct ;(9); 491-500. doi: 10.2147/CLEP.S145264</p> <p>BohmanT , <b>et al.</b> E A healthy lifestyle behaviour and risk of long duration troublesome neck pain among men and women with occasional neck pain: a population-based cohort study. <i>BMJ Open</i> 2019;9:e031078. doi:10.1136/bmjopen-2019-031078</p> <p><i>No changes have been made to the manuscript.</i></p>
<p>Concerning Physical Acctivit Table 1. again the same, there are many questionnaires assessing this item (ex. IPAQ), why you reduced it to a single question?</p>	<p>We agree that there are better ways to assess physical activity, where you get detailed information or even Metabolic Equivalents (METs)</p> <p>The Stockholm Public Health Cohort is based on a comprehensive questionnaire covering several domains from Health and diseases, working conditions, lifestyle factors. Living condition, family and security etc. The questionnaire is 21 pages long and has more than 100 questions. Therefore, some of the domains and measure had to be generic and brief.</p> <p>We have added a sentence about this in the Discussion section, page 25, last paragraph.</p> <p><i>“There is also a risk of residual confounding due to unprecise measure of cofounding factors such as physical</i></p> <p><i>activity, sedentary leisure time activities and smoking, as well as unmeasured confounding</i></p>
<p>Page 18</p>	<p>To clarify, we write in the Method section that we included persons with occasional NBP, i.e. they all had NBP but only up to a couple of days per month during the 6 months preceding the baseline. The</p>



<p>In 2014, 1,056 (9%) of the 11,229 responders had developed LNBP”</p> <p>“ it's not clear if they all had NBP at baseline or if you included and followed-up also those who developed LNBP in the 4 yrs but had not pain at baseline””</p>	<p>outcome included only those who had developed LONG-DURATION and activity limiting NBP, defined as explained in the Method section, page 9, third paragraph, “ NBP during the 6 months preceding the follow up. And occurring a couple of days <b>per week</b> or more often, <b>and</b> resulting in a decreased work ability/restricted other daily activity”</p> <p>Thus, the outcome is a more severe form of NBP compared to the condition at baseline.</p> <p><i>No changes have been made to the manuscript</i></p>
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### VERSION 2 – REVIEW

<b>REVIEWER</b>	Francisco Alburquerque-Sendín University of Córdoba, Spain
<b>REVIEW RETURNED</b>	26-Feb-2020

<b>GENERAL COMMENTS</b>	All queries were properly addressed.
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<b>REVIEWER</b>	Castaldo, Matteo Aalborg Universitet, Health Science and Technology
<b>REVIEW RETURNED</b>	17-Feb-2020

<b>GENERAL COMMENTS</b>	<p>Dear authors, jut two issues needs to be addressed:</p> <ul style="list-style-type: none"> <li>- which are the exclusion criteria (e.g. any other chronic pain, severe depression...)</li> <li>- asking as inclusion criteria if they had NBP in the last 6 months, in a range from "one day" to "less than 90 days", puts together patients with very different levels of pain, disability and search of therapy for their NBP</li> </ul>
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### VERSION 2 – AUTHOR RESPONSE

#### Reviewer 1

<b>Reviewer Comments:</b>	<b>Response:</b>
Please state any competing interests or state 'None declared': None declared	<p>On Page 26 in the manuscript we have this declaration. We hope that this is sufficient</p> <p><b>COMPETING INTERESTS</b></p>

	<p>Dr:s Eva Skillgate and Lena Holm are scientific consultants at the Scandinavian College of Naprapathic Manual Medicine and members of their Scientific Board.</p> <p><i>No further changes have been made to the manuscript</i></p>
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**Reviewer 3**

<b>Reviewer Comments:</b>	<b>Response:</b>
<p>Please state any competing interests or state 'None declared': none declared</p>	<p>On Page 26 in the manuscript we have this declaration. We hope that this is sufficient</p> <p><b>COMPETING INTERESTS</b></p> <p>Dr:s Eva Skillgate and Lena Holm are scientific consultants at the Scandinavian College of Naprapathic Manual Medicine and members of their Scientific Board.</p>
<p>- asking as inclusion criteria if they had NBP in the last 6 months, in a range from "one day" to "less than 90 days", puts together patients with very different levels of pain, disability and search of therapy for their NBP</p>	<p>To be included they had to have occasional NBP up to a couple of days per month, /during the past 6 months, no matter if activity limiting or not.</p> <p>Thus 90 days would not be possible, rather up to about 12 days during the past 6 months. We agree that there might be persons with occasional disability, but our experience is that disability often is related to more frequent pau conditions. We did not have any information about pain intensity and such information would likely have been prone to misclassification, by asking 6 month back in time about pain intensity.</p> <p><i>No changes have been made to the manuscript</i></p>

- which are the exclusion criteria (e.g. any other chronic pain, severe depression...)

On page 7, rows 17-18 we have stated the only exclusion criteria, Sick leave more than 90 days during the past 12 months. This was an attempt to exclude persons with severe diseases affecting work ability.

Depression and other pain conditions were not exclusion criteria per se. Instead we controlled for mental problems by the use of GHQ12, measuring psychological stress, We also controlled for long-standing illness as described in table 1.

*No changes have been made to the manuscript*