PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Physical demand at work and sick leave due to low back pain - a cross sectional study
AUTHORS	Aavang Petersen, Jonathan; Kirkeskov, Lilli; Hansen, Bjarke; Begtrup, Luise; Flachs, Esben; Boesen, Mikael; Hansen, Philip; Bliddal, Henning; Kryger, Ann

VERSION 1 – REVIEW

REVIEWER	Eva Rasmussen Barr Karolinska Institutet, Dept of Neurobiology, Care Sciences and Society, Div of Physiotherapy, Stockholm, Sweden
REVIEW RETURNED	26-Oct-2018

GENERAL COMMENTS	Thank you for giving me the opportunity to review your manuscript. The authors have undertaken a study to investigate if self-reported physical demand at work, objective physical workload and fear avoidance beliefs are RISK FACTORS for sick leave in persons with LBP. The study is well written, and the method is clearly described. However, I have one huge problem with the design or how the design of the study is used.
	The independent variables, self-reported physical demand at work, objective physical workload and fear avoidance beliefs, are collected at baseline and the outcome number of sick days in the past of 12 months. If a research question concerns RISK of sick leave (future) as I understand the research question and how you use the design and interpret the results is not correct. A risk is a direction into the future, that is the exposures (independant factors) affect something that is measured in the long term not something that happen before you measure the exposure. The aim and result from this study can as I understand is a cross-sectional study and the association of the factors is the result but you cannot say anything about the causality, as the exposures are reported at baseline and the outcome is before (sick leave). Maybe number of days with sick leave is a risk factor to report higher levels of fear avoidance? The result as I understand it is that if you have an increased fear of movement at baseline – there is an association with a previous sick leave period not the other way around. Of course, if you have another hypothesis this must clearly be described and discussed as it might impact on future sick leave periods but that is something you do not know and therefore your exposures can never be discussed as risk factors for future sick leave.
	Some comments.
	Method
	"Participants responded to "How physically demanding is your current job?" and only those responding demanding or very demanding were included. Furthermore, the participants needed to

express concerns about the ability to maintain their current job and they had to have current employment for at least 30 hours/week."
For the passage above – how was the question asked and how did you explain physically demanding? In what way did they describe concern to maintain their current job. This need to be clarified.

Results
Risk factors for sick leave due to LBP
"High self-reported physical demand and high fear avoidance beliefs (FABQ-W>20) were both significantly associated with sick leave due to LBP ≥ 8 days"
In the above-mentioned passage your results are described as associations and that is what is. But you cannot call the exposures risk factors.
Discussion
DISCUSSION
Key results
"In this study, self-reported high physical demand at work and high fear avoidance were associated with sick leave due to LBP. Standing/walking time and total number of kg lifted in one day had no effect on sick leave due to LBP, whereas lifting over 20 kg several times a day (7.7 times per day) may have an importance"
In the above passage you can only say that self-reported high physical demand at work and high FABQ were associated with previous periods with sick leave. No can never have an effect of exposures in the hind sight that is standing/walking tim and total number of kg lifted in one day can be associated but never have an effect on something in the hindsight.
Page 13 "Our results confirmed the hypothesis that main risk factors for sick leave due to LBP were self-reported very physically demanding work and high fear avoidance and to a lesser degree objective" intensity of specific types of physical workloads. The poor correlation between JEM variables and self-reported physical demand supports this conclusion.
You cannot talk about risk factors in this paragraph.
Page 14, line 3
I do not understand you discuss sick leave because of LBP as a risk factor for a poor prognosis and say that this is in line with you results. Pls clarify.
Conclusion
Pls change the conclusion according to what I have discussed above.

REVIEWER	Emma Jonsson
	Quantify Research, Sweden
REVIEW RETURNED	08-Nov-2018

| GENERAL COMMENTS | Excellent paper. |

REVIEWER	A.M. Momsen
	DEFACTUM, Central Denmark Region, DK
REVIEW RETURNED	26-Nov-2018

| GENERAL COMMENTS | Very minor revisions required. |

	The conclusion in abstract and manuscript differ slightly, last sentence may be revised. Strength and limitations of this study - need revsions. Especially the first, second and third sentence, do not use abbreviations (JEM). In the Background - refer to Danish healthcare spendings instead of US. The Participants and setting section - revise. In Discussion, key results the wording, especially in second paragraph has to be revised. In Limitations: "Some limitations of the study need to be considered" - delete. In the section Interpretation the sentence "To some surprise..." - add reference(s). Fear avoidance beliefs - use the abbreviation (FAB) consequently - like "job exposurematrix" (JEM). Mistake in Table 2: "Fear avoidance behavior". In general information is presented both in text and tables. Revise.

VERSION 1 – AUTHOR RESPONSE

Author response to reviewer comments:

Reviewer 1 #:

#Reviewer comment 1.1

I have one huge problem with the design or how the design of the study is used.

The independent variables, self-reported physical demand at work, objective physical workload and fear avoidance beliefs, are collected at baseline and the outcome number of sick days in the past of 12 months. If a research question concerns RISK of sick leave (future) as I understand the research question and how you use the design and interpret the results is not correct. A risk is a direction into the future, that is the exposures (independant factors) affect something that is measured in the long term not something that happen before you measure the exposure. The aim and result from this study can as I understand is a cross-sectional study and the association of the factors is the result but you cannot say anything about the causality, as the exposures are reported at baseline and the outcome is before (sick leave). Maybe number of days with sick leave is a risk factor to report higher levels of fear avoidance? The result as I understand it is that if you have an increased fear of movement at baseline – there is an association with a previous sick leave period not the other way around. Of course, if you have another hypothesis this must clearly be described and discussed as it might impact on future sick leave periods but that is something you do not know and therefore your exposures can never be discussed as risk factors for future sick leave.

#Authors 1.1

We agree that the cross-sectional nature of the study limits the ability to investigate causality and thus talking about risk factors. We have not succeeded in making it clear that we investigate associations and not risks. We have made a revision of the paper and changed "risks" with "associations" and the following have been added to the Limitations section: "The study is based on cross-sectional baseline data from a randomized controlled trial with the aim of retaining participants with physically demanding work and LBP in their job. This limits our ability to investigate causality."

#Reviewer comment 1.2

Method

"Participants responded to "How physically demanding is your current job?" and only those responding demanding or very demanding were included. Furthermore, the participants needed to express concerns about the ability to maintain their current job and they had to have current employment for at least 30 hours/week."

For the passage above – how was the question asked and how did you explain physically demanding? In what way did they describe concern to maintain their current job. This need to be clarified.

#Authors 1.2

The question was stated as the following: "Hvor fysisk krævende synes du dit arbejde er?" in the telephone interview. Response categories were: "meget krævende, krævende, ikke så krævende, slet ikke krævende". The most accurate translation into English is: "How physically demanding is your current job?" Response categories were: "Very demanding, demanding, not very demanding, not at all demanding." No further guidance was given to the participants. We have now included all the response categories in the manuscript (participants and settings section).

Regarding concerns about the ability to maintain their current job was also addressed in the telephone interview and asked the following yes/no question: "Er du bekymret for ikke at kunne blive i/ vende tilbage til dit nuværende arbejde på grund af rygproblemer?" It can be translated into: "are you concerned that you may not stay in / return to your work due to back pain?".

"Potential participants were interviewed by telephone and screened for inclusion. Participants responded to "How physically demanding is your current job?" Response categories were: "Very demanding, demanding, not very demanding, not at all demanding." Only those responding demanding or very demanding were included. Furthermore, the participants needed to express concerns about the ability to maintain their current job (yes/no) and they had to have current employment for at least 30 hours/week."

#Reviewer comment 1.3

Results
Risk factors for sick leave due to LBP
"High self-reported physical demand and high fear avoidance beliefs (FABQ-W>20) were both significantly associated with sick leave due to LBP ≥ 8 days"
In the above-mentioned passage your results are described as associations and that is what is. But you cannot call the exposures risk factors.

#Authors 1.3

We agree with the reviewer that risk factors should be changed with associations. We have changed the heading to "Factors associated with sick leave due to LBP"

#Reviewer comment 1.4

Key results

"In this study, self-reported high physical demand at work and high fear avoidance were associated with sick leave due to LBP. Standing/walking time and total number of kg lifted in one day had no effect on sick leave due to LBP, whereas lifting over 20 kg several times a day (7.7 times per day) may have an importance"

In the above passage you can only say that self-reported high physical demand at work and high FABQ were associated with previous periods with sick leave. No can never have an effect of exposures in the hind sight that is standing/walking tim and total number of kg lifted in one day can be associated but never have an effect on something in the hindsight.

#Authors 1.4

Again, we agree with the comment. We have changed the section to: "In this study, self-reported high physical demand at work and high FAB were associated with sick leave due to LBP. Standing/walking time and total number of kg lifted in one day had no association with sick leave due to LBP, whereas lifting over 20 kg several times a day (7.7 times per day) may be associated. To some surprise, independent expert exposure assessments of workload did not modify the found association between self-reported high physical demand at work/ high FAB and sick leave.

#Reviewer comment 1.5

Page 13 "Our results confirmed the hypothesis that main risk factors for sick leave due to LBP were self-reported very physically demanding work and high fear avoidance and to a lesser degree objective" intensity of specific types of physical workloads. The poor correlation between JEM variables and self-reported physical demand supports this conclusion.

You cannot talk about risk factors in this paragraph.

#Authors 1.5

We agree with the reviewer's comment. We have changed the focus from "risk factors" to "associations":

Our results confirmed the hypothesis that sick leave due to LBP were associated with self-reported very physically demanding work and high FAB and to a lesser degree with "objective" intensity of specific types of physical workloads. The poor correlation between JEM variables and self-reported physical demand supports this conclusion.

#Reviewer comment 1.6

Page 14, line 3

I do not understand you discuss sick leave because of LBP as a risk factor for a poor prognosis and say that this is in line with you results. Pls clarify.

#Authors 1.6

We can see the unclarity, and have changed the section:

Participants with different duration of LBP have different prognostic outcome. It has been shown that FAB is associated with poor prognosis in LBP of any duration, but most strongly with subacute LBP.[8,27] Our results confirms the association between high FAB and sick leave although many of our participants in addition to a subacute period of LBP also had a longer history of LBP.

#Reviewer comment 1.7

Pls change the conclusion according to what I have discussed above.

#Authors 1.7

We have changed the conclusion accordingly: "Our study suggests that self-reported high physical demand at work and high fear avoidance are associated with sick leave due to LBP in individuals with

physically demanding jobs. We found no association between sick leave due to LBP and high physical workloads, except for number of heavy lifts measured by JEM. Interestingly, the high physical workloads did not modify the associations with sick leave in participants who rate their work as very demanding or with high fear avoidance scores. The poor correlation between JEM variables and self-reported physical demand indicates, that occupational interventions to reduce sick leave due to LBP should focus more on those with high self-reported physical demands and high fear avoidance, and less on individuals with the objectively highest physical workload."

Reviewer 2 #:

#Reviewer comment 2.1

Excellent paper.

#Authors 2.1

Thank you for the recommendation.

Reviewer 3 #:

#Reviewer comment 3.1

The conclusion in abstract and manuscript differ slightly, last sentence may be revised.

#Authors 3.1

We have revised both segments and made sure they are aligned.

#Reviewer comment 3.2

Strength and limitations of this study - need revisions. Especially the first, second and third sentence, do not use abbreviations (JEM).

#Authors 3.2

Thank you for a good observation. We have revised this section:

•   By using fear avoidance score and self-reported workload together with a job exposure matrix in the investigation of an association with sick leave, the validity problem with self-reported exposures has been reduced

•   The study population consisted of workers with low back pain and a physically demanding work, which is a clinically relevant sample of participants.

•   Workers with low back pain but no self-reported physically demanding work were not included in the study with risk of lacking contrast among the included participants and thus risk of underestimation of associations.

•   Use of job exposure matrices and dichotomizing of the exposure data without a golden standard regarding cut-off values entails risk of misclassification of exposure.

 We have also revised the paragraph "Limitations" as follows:

The study is based on cross-sectional baseline data from a randomized controlled trial with the aim of retaining participants with physically demanding work and LBP in their job. This limits our ability to investigate causality. The trial included only participants with self-reported physically demanding or very demanding work and concern about their ability to maintain their current job. The resulting FAB score and self-reported physical demands may consequently have been inflated and can result in a lacking contrast among the participants and therefore between the groups. An association was found, and the estimate is probably conservative. Furthermore, use of JEMs entails risk of misclassification of exposure,[23] as people with the same job title may have different exposure to physical workloads and using expert assessment of exposures at the occupational level may therefore miss potentially large individual differences and peak exposures. This can also lead to conservative estimates of associations.

#Reviewer comment 3.3

In the Background - refer to Danish healthcare spendings instead of US.

#Authors 3.3

We have changed the reference to : In Denmark, back pain is estimated to accumulate 4.8 billion DKr in annual loss of productivity.[3]

#Reviewer comment 3.4

The Participants and setting section - revise.

#Authors 3.4:

We agree, see reviewer comments 1.2.

#Reviewer comment 3.5

In Discussion, key results the wording, especially in second paragraph has to be revised.

#Authors 3.5: Thank you for the relevant comment. We have made the following changes to the paragraph:

In this study, self-reported high physical demand at work and high FAB were associated with sick leave due to LBP. Standing/walking time and total number of kg lifted in one day had no association with sick leave due to LBP, whereas lifting over 20 kg several times a day may be associated. To some surprise, independent expert exposure assessments of workload did not modify the found association between self-reported high physical demand at work/ high FAB and sick leave.

#Reviewer comment 3.6

In Limitations: "Some limitations of the study need to be considered" - delete.

#Authors 3.6:

We agree that the sentence is superfluous. It has been deleted.

#Reviewer comment 3.7

In the section Interpretation the sentence "To some surprise..." - add reference(s).

#Authors 3.7: This was our initial reaction that the results were contrary to our clinical experience. This section has been deleted.

#Reviewer comment 3.8

Fear avoidance beliefs - use the abbreviation (FAB) consequently - like "job exposure matrix" (JEM). Mistake in Table 2: "Fear avoidance behavior".

#Authors 3.8: Excellent spotted, we have revised the table:

Table 2: Crude and adjusted odds ratio for sick leave due to LBP according to self-rated physical demand, fear avoidance beliefs and physical demanding workloads, respectively.

	Unadjusted OR (95%CI)	P-value	Adjusted* OR (95%CI)	P-value
Self-rated physical demand				
Demanding	1		-	-
Very demanding	1.75 (1.10-2.75)	0.018	1.60(1.00-2.56)	0.050
Fear avoidance beliefs				
FABQ-W≤20+	1		-	-
FABQ-W>20+	2.75 (1.61-4.84)	<0.001	2.67 (1.55-4.73)	0.001
Physical demanding workloads				
Standing/walking > 5.44 hours/day	0.85 (0.5-1.34)	0.485	0.84 (0.53-1.33)	0.462
Lifting >650 kg/day	1.41 (0.90-2.23)	0.134	1.38 (0.87-2.18)	0.174
Number of heavy lifts > 7.7 times/day	1.60 (1.02-2.53)	0.041	1.57 (0.99-2.50)	0.056

* Adjusted for sex and age, + Fear-Avoidance Beliefs Questionnaire-in relation to Work

We have revised our use of abbreviation (FAB) and (FABQ-W). When discussing other studies, we use FAB instead of fear avoidance, e.g.: "The resulting FAB score and self-reported physical demands may consequently have been inflated probably resulting…", but in the results section we use the specific FABQ-W (work related) as opposed to FABQ-P (physical activity).

#Reviewer comment 3.9

In general information is presented both in text and tables. Revise.

#Authors 3.9: We may have an overlap between text and tables. We have reduced the overlap between text and tables to what we see as a minimum:

"Participant characteristics are shown in table 1. Overall there was a low rate of sick leave due to LBP with 89.2% participants having less than one month of sick leave during the last 12 months.

Participants reporting work as very physically demanding also had the lowest mean FAB, lowest current and average pain intensity and were more seldom smokers than participants reporting work as physically demanding.

Participants with a self-reported very physically demanding job were slightly, but significantly older compared to participants who only reported their job demanding. There were no significant differences regarding sex, BMI, JEM or educational level.

Factors associated with sick leave due to LBP

High self-reported physical demand and high fear avoidance beliefs (FABQ-W>20) were both significantly associated with sick leave due to LBP ≥ 8 days per year with OR 1.75 (95% CI 1.10-2.75) and 2.75 (95% CI 1.61-4.84), respectively. After adjustment for age and sex, there was still a strong association, see table 2.

There was a positive association of lifting loads over 20 kg more than 7.7 times per day measured by JEM, which was borderline statistically significant after adjustment. None of the other physical workloads were significantly associated with sick leave due to LBP. There was very low exposure to kneeling and whole-body vibration and thus these exposures were not included in the analyses.

Interactions

Physical demanding workloads did not modify the association between self-reported physical demand and sick leave due to LBP (table 3).

We repeated the analysis with other exposure levels (standing/walking > 6 hours/day, lifting a total of >1000 kg/day and lifting over 20kgs > 15 times/day) but this did not change the results.

Similar results of no modification effect of JEM variables were found between FABQ-W>20 and sick leave due to LBP, table 4.

There was a relatively poor correlation between self-reported physical demand and high fear avoidance beliefs (FABQ-W>20) (r= 0.29, P<0.0001). No correlation was found between self-reported physical demand and total kg lifted (r= -0.05, P=0.345), standing/walking time (r= 0.07, P=0.254) or lifting loads over 20kg (r= -0.05, P=0.349)."