

# Sedentary work: a risk factor for LBP?

a systematic review

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## Abstract

**Background.** Nowadays, sitting has become the most common posture at the workplace. Prolonged sitting at work is usually considered a risk factor for the development of low back pain. However, several previous reviews have not found evidence to support this statement. It could be argued that prior reviews studied an abundant variety of occupations. Often these occupations involved heavy lifting, sitting in an awkward position and other strenuous activities. This study will focus on a smaller portion of the population of workers who spend most of their time sitting at work. No recent systematic review has focused solely on the association between sedentary work and low back pain. The objective of this study is to determine whether sedentary work should be considered a risk factor for the development of low back pain. **Methods.** only articles written in English or Dutch, published between May 2004 and November 2015, were considered for this review. Literature was retrieved via a computerized search of several scientific databases, such as PubMed and Medline. A comprehensive definition of sedentary work was created, to ensure only relevant articles were selected. The Newcastle-Ottawa Scale was used to assess methodological quality. Results were scaled by use of a best evidence synthesis. **Results.** 905 articles were initially identified through database searching. Duplicates and irrelevant articles were excluded based on title and abstract. A total of 66 articles were considered for a full text review. Finally, six articles met the inclusion criteria and were therefore assessed during the methodological quality appraisal. Three studies were prospective cohorts, while the others were cross-sectional. One high quality cross-sectional study showed a significant association between sedentary work and the development of low back pain. All other studies reported no significant relation. **Discussion.** No evidence was found to support that sedentary work should be considered a risk factor for the development of low back pain. However, no definite conclusion can be assigned to this systematic review due to the limited amount of literature available at this point in time. An official definition of sedentary work could lead to an increased possibility of obtaining a definite conclusion.

Keywords: Sedentary work · Low back pain (LBP) · epidemiology · systematic review

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## Introduction

Low back pain (LBP) remains the leading work related health problem in Europe.<sup>(1)</sup> Over a quarter of the working population in all industrialized countries suffers from an episode of LBP each year, while the estimated lifetime prevalence lies between 60-80%.<sup>(2)(3)</sup> Moreover, patients with activity-limiting LBP are likely to have recurrent episodes<sup>(4)(5)</sup>, which are associated with preponderant disability and tend to be longer in duration.<sup>(6)</sup> Besides personal suffering, LBP is likely to cause impaired quality of work and disability. This leads to significant socio-economic burden on both individuals and society as a whole.<sup>(7)(8)</sup> Consequently, in 2007 back pain induced a yearly expense equivalent to 0,6% of the gross national product in the Netherlands, adding up to a total of 3,5 billion euro.<sup>(9)</sup>

LBP may arise from any of a number of anatomical structures in the area between the inferior margin of the 12<sup>th</sup> rib and gluteal folds. These include bones, ligaments, muscles and neurological structures. However, only in a minority of cases, the specific cause for LBP can be revealed. Therefore, 85-95% of all LBP cases are a-specific in nature.<sup>(10)(11)</sup> There are however several factors associated with an increased risk of developing LBP, of which some are modifiable and some are not. It is commonly recognised that certain occupational exposures do increase the risk of developing LBP, including heavy or frequent lifting, bending, twisting and whole body vibrations.<sup>(12)(13)(14)(15)(16)(17)(3)</sup> Less frequently, prolonged sitting is included as an occupational risk factor for LBP.<sup>(18)(19)</sup>

Due to swift advances made in technology over the past decades, sitting has become the most common posture at the workplace.<sup>(20)</sup> Approximately 75% of all workers in industrial countries have a so-called “sedentary job”, which requires prolonged sitting bouts.<sup>(21)</sup> Although sitting and sedentary behaviour are often named in the same breath, they are not identical. Sedentary behaviour is defined as activities in a sitting or lying position, while having a metabolic rate between 1.0 and 1.5 MET.<sup>(22)</sup> Since all sitting activities have a consumption rate between 1.0 and 2.5 MET, sedentary behaviour and sitting do clearly overlap.<sup>(23)</sup> Depending on posture, activities such as reading, administration and computer work may therefore be considered sedentary behaviour. Moreover, it is argued that our modern lifestyle increases the tendency of having a sedentary lifestyle altogether.<sup>(24)</sup>

Multiple studies have tried to analyse the association between sitting and LBP by focussing on biomechanics. Although many studies have been done on this subject, evidence seems to be fairly contradictory. Multiple studies have shown that sitting causes increased intradiscal pressure, possibly leading to insufficient nutrition of the intervertebral discs.<sup>(25)(26)(16)</sup> However, a prior study has re-evaluated intradiscal pressure, and found that in certain sitting positions the pressure is in fact lower than during erect standing.<sup>(27)</sup> Unfortunately, these studies only seem to have investigated sitting behaviour in general, without specifying if it may be considered sedentary or not.

No recent systematic review has focused solely on the association between sedentary work and LBP. A Previous systematic review has investigated the relationship between LBP and a sedentary lifestyle. However, it concluded that having a sedentary lifestyle is not associated with an increased risk of developing LBP.<sup>(28)</sup> Other reviews which focussed on sitting at work as a risk factor for LBP, included a wide range of professions.<sup>(2)(29)</sup> Many of these professions, although performed in a sitting position, cannot be considered sedentary work. These systematic reviews found no evidence to support that occupational sitting by itself was associated with an

increased risk for the development of LBP.<sup>(2)(29)</sup> This raises the question if previous studies and current prevention manners for LBP are directed to the appropriate target group.

The aim of this paper is to identify whether there is an association between sedentary behaviour at work and LBP. Understanding the interaction between sedentary behaviour at work and LBP, may lead to prevention programs which potentially reduce the high prevalence rate of occupational LBP. Therefore, this paper intends to use more comprehensive criteria during the assessment of studies. By doing so, this systematic review aims to answer the following question: To what extent can sedentary work be considered a risk factor for LBP?

## **Methods**

### Search and screening strategy

The literature search for this systematic review was performed in the period of September 2015 – November 2015. Relevant literature was retrieved via a computerized search of scientific databases, including PubMed, MEDLINE and PEDRO. For this systematic review, only articles written in English or Dutch, published between May 2004 and November 2015, were considered. This period of time was chosen since a recent systematic review focusing on sitting at work and its association with LBP included studies up until May 2004.

Search terms were derived from the research question, and based on population, outcome and intervention. Search terms therefore included the following primary keywords: Sedentary work, LBP and prevalence. Secondary search term included all synonyms for sedentary work, LBP as a MESH term, and terms such as effect, risk factor and cause. A complete PubMed search syntax can be found in appendix I.

Only studies that describe the presence of LBP in sedentary occupational groups were included. Since sedentary work is a relatively new term, many studies did not describe their participation group as such. Moreover, an official definition for what sedentary work comprises, has not yet been given. Therefore this systematic review made use of the following made-up definition for sedentary work, modified from a definition by an American law firm<sup>(30)</sup> : *A job that requires prolonged sitting for more than half of a normal working day. Certain amount of walking and standing is allowed, but only occasionally. A job may only be considered sedentary if no heavy lifting is required. Only occasionally the employee is allowed to lift or carry light objects, such as files, articles and small tools. Any jobs that require a high amount of energy consumption due to the need of maintaining an awkward sitting position may not be considered sedentary.*

All studies included in this review therefore explicitly mentioned sedentary work, or otherwise needed to comply with the given definition. Furthermore, only studies that investigated the relationship between sedentary work and the frequency of LBP were included. Consequently, studies that measured the severity of LBP as a result of sedentary work were excluded. Studies that included students or minors as participants in a sedentary occupational group were excluded.

### Selection procedure

All retrieved articles were reviewed based on their titles. Any study that based on its title may have investigated the relationship between sedentary work and LBP was saved. During the next phase, these studies were screened

on their abstract, using the previously mentioned inclusion and exclusion criteria. This was followed by a full text review of all potentially relevant studies. Furthermore, the bibliographies of included studies were hand searched for relevant articles, using the snowball method.

### Quality assessment

Unfortunately, there seems to be lack of consensus about which quality assessment tool is best to use in systematic reviews that include prospective cohort studies. However, the Cochrane handbook has pointed out two assessment tools as most useful, namely the Newcastle-Ottawa scale (NOS) and the Downs and Black instrument<sup>[31]</sup>. This review made use of the NOS, since it has an adapted version for both cross sectional and case-control studies. Therefore all studies that were included for this review, could be assessed via the same quality assessment tool. An example of the NOS can be found in the appendix II.

The NOS has been designed to assess the quality of all nonrandomized studies, including cohorts. It implies a 'star system', in which studies are assessed on three main topics: selection, comparability and outcome. Each topic has several subtopics for which a star can be awarded. A maximum of 9 stars can be obtained by each study. A score between 7 and 9 stars indicates high quality, a score of 4 to 6 moderate quality, and a score below 4 stars indicates low methodological quality.

### Data extraction

All relevant information of the different studies was extracted and presented in a data-extraction table. This table will include information about the (first) author, year of publication, study design, study population, sample characteristics, exposure, recall period and a relative risk indication. The data extraction table includes a legend.

### Data analysis

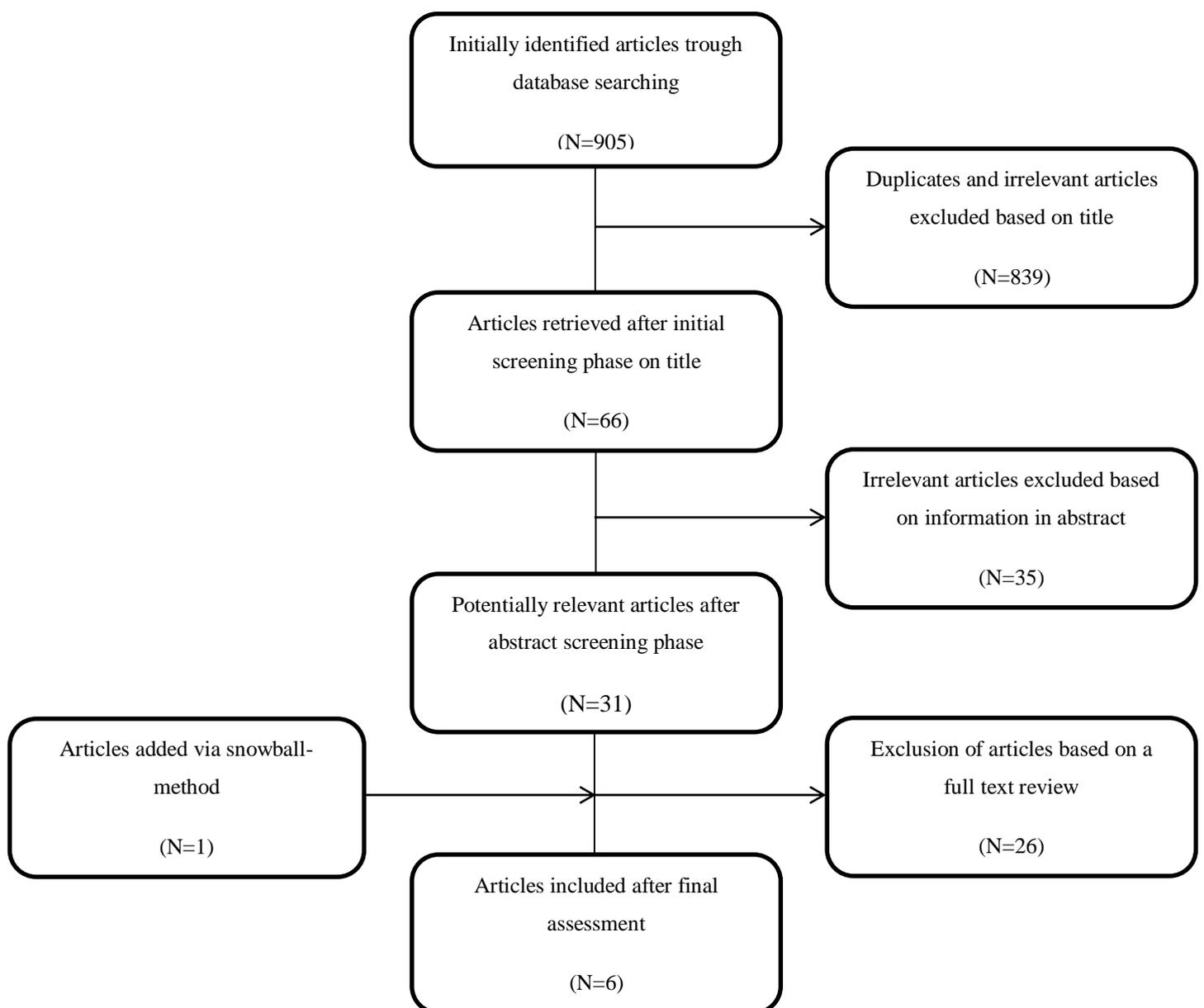
Due to the heterogeneity in study populations and recall period of LBP, it was not possible to pool data from all included studies. However, in order to answer the research question, not only the outcome measures of each study had to be taken into consideration. Furthermore, the level of evidence of each study needed to be evaluated to give a proper conclusion. Therefore a best-evidence synthesis was performed. The levels of evidence were modified from a previous systematic review, which investigated the association between sedentary lifestyle and LBP.<sup>(28)</sup> A total of 5 levels were derived from the amount of studies, the study design and their methodological quality. Level 1 indicates strong evidence, while level 5 indicates no evidence.

1. Strong evidence: consistent findings in at least two high quality cohort studies.
2. Moderate evidence: consistent findings in one high quality cohort study and two or more high quality cross-sectional studies.
3. Limited evidence: consistent findings in one high quality cohort study or two or more high quality cross-sectional studies.
4. Conflicting evidence: Inconsistent findings among multiple studies.
5. No evidence: One or less studies (not high quality prospective cohort) provided statistically significant data for association.

## Results

### Selection procedure

The initial search yielded a total of 905 articles for further review (figure 1). After the exclusion of articles based on their title, and subsequently abstracts, 31 articles were selected for a full text review. Of these, nineteen investigated the relationship between sitting at work and LBP, but failed to meet the criteria for 'sedentary work'. Moreover, seven studies used the intensity as opposed to the frequency of LBP as outcome measure. A total of 26 articles were therefore excluded during this last stage of the selection procedure. One study was then added via use of the snowball method. Hence, six studies met the inclusion criteria and were included in the quality assessment.



**Figure 1:** Flowchart

## Quality assessment

This study made use of the NOS to evaluate the methodological quality of all included studies. The standard version was used for all included prospective cohort studies, while an adapted version of the NOS was used for the included cross-sectional studies. Based on the results of this quality appraisal, one of the prospective cohort studies was considered of high methodological quality.<sup>(31)</sup> The other two prospective cohort studies evaluated were both considered of moderate quality.<sup>(32)(33)</sup> Table 1a shows the complete evaluation of all prospective cohorts studied in this systematic review.

**Table 1a:** Quality assessment of prospective cohort studies using the Newcastle-Ottawa Scale

Reference	Selection				Comparability		Outcome			Total stars	Quality
	1	2	3	4	1a	1b	1	2	3		
Ramond-Roquin et al. <sup>31</sup>	★	★	-	★	★	★	-	★	★	7	high
Juul-Kristensen et al. <sup>32</sup>	-	★	-	-	★	★	-	★	-	4	Moderate
Hestbaek et al. <sup>33</sup>	★	★	-	-	★	★	-	-	-	4	Moderate

Regarding the cross-sectional studies included in this review, one was considered of high quality.<sup>(34)</sup> The remaining two cross-sectional studies were both considered of moderate quality.<sup>(35)(36)</sup> Table 1b shows the complete evaluation of all cross-sectional studies included for this systematic review.

**Table 1b.** Methodological quality assessment of cross-sectional studies using the Newcastle-Ottawa Scale

Reference	Selection				Comparability		Outcome		Total stars	Quality	
	1	2	3	4	1a	1b	1 (max 2 stars)	2			
Pengying et al. <sup>34</sup>	★	★	★	-	★	★	★	-	★	7	high
Inoue et al. <sup>35</sup>	-	★	★	-	★	★	★	-	★	6	moderate
Spyropoulos et al. <sup>36</sup>	★	★	-	★	★	★	★	-	-	6	moderate

## Data extraction

The six articles included in this review all represented a certain group of sedentary workers. Two studies investigated a population of office workers<sup>(32)(36)</sup>, while the other studies investigation a population of military recruits<sup>(33)</sup>, school teachers<sup>(34)</sup>, employees of a manufacturing company<sup>(35)</sup>, or a sample of the general working population.<sup>(31)</sup> All studies were executed in well developed countries. Altogether, this review evaluated the frequency of LBP in relation to sedentary work of 10384 participants. These and all other relevant information concerning the cohort can be found in table 2.

**Table 2:** Data extraction table; sedentary work as a risk factor for low back pain

Reference	Study design, Follow-up period	Study population	Sample characteristics			Exposure description	Recall period of LBP	Risk indicator OR (95% CI)		P- value
			Sample size	RR	Mean age			Univariate	Multivariate	
Ramond- Roquin et al. <sup>31</sup> France, 2015	Prospective cohort 5 years	Sample general working population	2161	60.8%	39.9	Driving nonindustrial vehicles ≥ 4 hrs. daily	Previous week	1.28 (0.89-1.85)	-	0.19
Juul- Kristensen et al. <sup>32</sup> Denmark, 2004	Prospective cohort 21 months	Office workers	3361	77%	-	Using the computer for almost all working hrs.	Previous 12 months	1.25 (0.80-1.95)	1.11 (0.61-2.02)	0.51 <sup>u</sup> 0.73 <sup>m</sup>
Hestbaek et al. <sup>33</sup> Denmark, 2005	Prospective cohort 3 months	military recruits	1711	58%	20.57	Sedentary occupation	Previous 3 months	0.84 (0.59-1.20)	-	-
Inoue et al. <sup>35</sup> Japan, 2014	Cross- sectional	Employees manufacturing company	1330	99.9%	40.0	Computer use ≥4hrs daily	Previous week	1.08 (0.82-1.44)	-	0.62
Pengying et al. <sup>34</sup> China, 2012	Cross- sectional	School teachers	1050	85.0%	32.2	Prolonged sitting at work ≥4hrs daily	Previous 12 months	1.60* (1.22-2.10)	1.42* (1.01-2.02)	<0.05
Spyropoulos et al. <sup>36</sup> Greece, 2007	Cross- sectional	Office workers	771	84.0%	44.5	Occupational sitting time ≥6hrs daily	lifetime	1.52 (0.82-2.83)	1.59 (1.06-2.37)	0.18

**Legend**

OR: Odds Ratio

LBP: Low Back Pain

Hrs: Hours

RR: Response Rate

CI: Confidence Interval

\* Wald test, p&lt;0.05

<sup>u</sup> P-value for univariate-  
analyses<sup>m</sup> P-value for multivariate-  
analysesData analysis

Five studies received odds ratios above 1.0, and therefore showed a tendency towards sedentary work as a risk factor for LBP.<sup>(31)(32)(34)(35)(36)</sup> However, only one cross-sectional study showed a significantly positive association between sedentary work and the frequency of LBP.<sup>(34)</sup> The remaining cohorts found no significant association between LBP and sedentary work. In line with the hereinabove described best evidence synthesis, this study has therefore found no evidence to support the hypothesis that sedentary work is a risk factor for LBP.

Besides the primary outcome measure, studying the association between sedentary work and the frequency of LBP, this systematic review has considered several secondary outcome measurements. These included certain kinds of sedentary work, such as driving industrial vehicles<sup>(31)</sup> and computer work.<sup>(34)</sup> Moreover, certain variables of sedentary work, including sitting without the possibility to stand up<sup>(32)</sup> and working with or without adjustable back support<sup>(36)</sup> were taken into consideration. These secondary outcome measures were taken from the included articles. Data of these secondary outcome measures can be found in appendix III.

One high quality prospective cohort study showed that there is a significant relationship between driving industrial vehicles and LBP.<sup>(31)</sup> Therefore providing limited evidence that sedentary work with exposure to whole body vibrations (WBV) is associated with increased risk of LBP. Another moderate quality cross-sectional study showed significant positive influence of the presence of an adjustable back support and the development of LBP in office workers.<sup>(36)</sup>

#### IV. Discussion

This systematic review has investigated the association between sedentary work and LBP. By doing so, it aimed to answer the following research question; to what extent is sedentary work a risk factor for LBP? Only one high quality cross-sectional study showed a statistically significant association between sedentary work and the frequency of LBP among participants.<sup>(34)</sup> Although four other studies<sup>(31)(32)(35)(36)</sup> revealed that sedentary work was associated with a higher probability of developing LBP (OR>1), none of these studies were proven statistically significant. Therefore, no conclusive evidence was found to support that sedentary work is a risk factor for developing LBP.

Due to the fact that no previous systematic review has focused exclusively on the association between sedentary work and the presence of LBP, no direct comparison can be made. Therefore this study will attempt to compare its results to a review that investigated the relationship between having a sedentary *lifestyle* and developing LBP.<sup>(28)</sup> It was concluded that having a sedentary lifestyle is not associated with an increased risk of LBP. Therefore, its findings are in line with the results of this systematic review. Moreover, a study by Hartvigsen et al stated that regardless of the widespread opinion linking sitting at work to LBP, studies have consistently failed to demonstrate a statistically significant association between the two.<sup>(2)(29)</sup>

Furthermore, this study took several co-exposures of sedentary work that were described in the included studies into consideration. These included: WBV, the possibility to stand up at will, and the lack of an adjustable back support. One high quality prospective cohort study showed a significant relationship between driving industrial vehicles and LBP.<sup>(31)</sup> This is confirmed by findings of Lis et al, who stated that occupational sitting in combination with WBV did increase the association with LBP.<sup>(29)</sup> Another moderate quality cross-sectional study showed a significant influence of an adjustable back support on the development of LBP in office workers.<sup>(36)</sup>

Arguably the biggest limitation of this systematic review is the lack of an official definition of sedentary work within the medical field. Until now, most studies have focused solely on the association between sitting at work and LBP. However, several systematic reviews have revealed that sitting at work itself does not seem to increase the risk of developing LBP.<sup>(2)(29)(28)</sup> This seems to be due to the fact that sitting is a relatively large domain. Often, no distinction is made between the different circumstances of occupational sitting in studies, let alone the possible co-exposures such as heavy lifting or WBV. Without a proper definition for sedentary work, studies will most likely continue investigating sitting as a whole, while investigating subgroups such as sedentary work would be more specific and therefore more beneficial. Unfortunately the definition used in this systematic review failed to provide specific criteria for the amount of standing, walking and breaks allowed during sedentary work.

By focusing on sedentary work instead of sitting at work, this systematic review attempted to target a smaller portion of all employees spending most of their time at work sitting. In contrary to previous systematic reviews, only jobs that complied to a set of comprehensive criteria which defined sedentary work were included. Therefore, several occupations were excluded in comparison with previous reviews. Many of these occupations included sitting in awkward positions, heavy lifting, or other strenuous work. These co-exposures could have been responsible for the reported LBP of participants by itself, therefore causing biased results. One of the main strengths of this review is therefore a more focused, narrowed down investigation of the effects of sitting on the development of LBP. As a result, prevention measures can be aimed at a more specific target group.

Taking the quality assessment for this systematic review into consideration, there seem to be certain common weaknesses among the included studies. All included prospective studies could not be awarded for two items within the NOS.<sup>(31)(32)(33)</sup> Both the ascertainment of exposure and the assessment of outcome seem to be insufficient within these three studies. The fact that all these studies made use of questionnaires to ensure the ascertainment of exposure and the outcome assessment, could be seen as a shortcoming. Moreover, not much research has been done about sedentary behavior at work and its possible consequences on LBP. Unfortunately, at this point in time there seems to be few relevant literature available.

This systematic review has contributed to the understanding of the relationship between sedentary work and the development of LBP. Moreover, This review has taken the first steps towards more comprehensive criteria for sedentary work, opening the door for an official definition within the medical field. Several arguments were given to support that future studies should not focus on the effects of sitting at work in general, but instead narrow its focus to a specific aspect of occupational sitting. As mentioned hereinabove, previous research has shown that sitting at work alone is not a risk factor for LBP. In practice this should have implications for recommended prevention manners. Prevention manners should not be aimed at occupational sitting in general, but on specific aspects within sitting work.

## **V. Conclusion**

No evidence was found to support that sedentary work should be considered a risk factor for the development of LBP. However, no definite conclusion can be assigned to this systematic review due to the limited amount of literature available at this point in time. An official definition of sedentary work could lead to an increased possibility of obtaining a definite conclusion. Moreover, this systematic review recommends that future studies use a more narrowed down approach, by focusing only on certain aspect or subgroups of occupational sitters.

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## Appendix

### I. PubMed Syntax (132)

((((((((LBP[Title/Abstract] OR "Low back pain"[Title/Abstract] OR Lumbago[Title/Abstract] "Low back pain" [MeSH Terms])) AND (Epidemiology[Title/Abstract] OR Risk[Title/Abstract] OR Cause[Title/Abstract] OR Effect[Title/Abstract] OR "Risk Factor"[Title/Abstract])) AND ("Sedentary Work"[Title/Abstract] OR "Sedentary Job"[Title/Abstract] OR Office[Title/Abstract] OR Computer[Title/Abstract] OR Driver[Title/Abstract] OR "White Collar"[Title/Abstract] OR "Sitting at work"[Title/Abstract] OR "Occupational sitting"[Title/Abstract])) AND "english"[Language]) AND ("2005/05/01"[Date - Publication] : "2015/11/01"[Date - Publication])))

### II. Newcastle-Ottawa Scales

#### Newcastle-Ottawa Scale adapted for Cross-Sectional Studies

<b>Selection: (Maximum 4 stars)</b>	
Representativeness of the Sample	a. Truly representative of the average in the target population * (all subjects or random sampling)
	b. Somewhat representative of the average in the target population * (non-random sampling)
	c. Selected group of users
	d. No description of the sampling strategy
Sample Size	a. Justified and satisfactory. *
	b. No justified
Non-respondents	a. Comparability between respondents and non-respondents characteristics is established, and the response rate is satisfactory. *
	b. The response rate is unsatisfactory, or the comparability between respondents and non-respondents is unsatisfactory
	c. No description of the response rate or the characteristics of the responders and the non-responders
Ascertainment of the exposure (risk factor)	a. Validated measurement tool. *
	b. Non-validated measurement tool, but the tool is available or described. *
	c. No description of the measurement tool.
<b>Comparability: (Maximum 2 stars)</b>	
The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled	a. The study controls for the most important factor (select one) *
	b. The study control for any additional factor. *

Outcome: (Maximum 3 stars)	
Assessment of the outcome	a. Independent blind assessment. **
	b. Record linkage. **
	c. Self-Report. *
	d. No description.
Statistical test	a. The statistical test used to analyze the data is clearly described and appropriate, and the measurement of the association is presented, including confidence intervals and the probability level (p value). *
	b. The statistical test is not appropriate, not described or incomplete.

### Newcastle-Ottawa Scale for Cohort Studies

Selection (maximum 4 stars)	
Representativeness of the exposed cohort	a. Truly representative of the average____(describe) in the community *
	b. Somewhat representative of the average____in the community *
	c. Selected group of users e.g. nurses, volunteers.
	d. No description of the derivation of the cohort
Selection of the non-exposed cohort	a. Drawn from the same community as the exposed cohort. *
	b. Drawn from a different source
	c. No description of the derivation of the non-exposed cohort
Ascertainment of Exposure	a. Secure record (e.g. surgical records) *
	b. Structured interview *
	c. Written self-report
	d. No description
Demonstration that outcome of interest was not present at start of study	a. Yes *
	b. No

Comparability: (Maximum 3 Stars)	
Comparability of cohorts on the basis of the design or analysis	a. Study controls for____(select the most important factor) *
	b. Study controls for any additional factor. * (This criteria could be modified to indicate specific control for a second important factor).

Outcome (Maximum 3 Stars)	
Assessment of outcome	a. Independent blind assessment *
	b. Record linkage *
	c. Self-report
	d. No description
Was follow-up long enough for outcomes to occur	a. Yes (select an adequate follow up period for outcome interest) *
	b. No
Adequacy	a. Complete follow-up all subjects accounted for *
	b. Subjects lost to follow up unlikely to introduce bias – small numbers lost - <10% per year, or description provided of those lost*
	c. Subject lost to follow up > 10% per year
	d. No statement

### III. Data extraction secondary outcome measures

Reference	Secondary exposure	Risk indicator OR (95% CI)		p-value
		Univariate	Multivariate	
Ramond-Roquin et al. France, 2015	Driving industrial <sup>o</sup> vehicles $\geq$ 4 hrs. daily	1.41 (1.06-1.86)	1.35 (1.00-1.81)	0.017 <sup>u</sup> 0.047 <sup>m</sup>
Juul-Kristensen et al. Denmark, 2004	Never standing up during computer work	1.04 (0.72-1.50)	1.16 (0.79-1.70)	0.83 <sup>u</sup> 0.46 <sup>m</sup>
Pengying et al. China, 2012	Hrs. of working with the computer daily $\geq$ 4	1.13 (0.91-1.91)	0.71 (0.44-1.14)	-
Spyropoulos et al. Greece, 2007	Adjustable back support	2.27 (1.34-3.86)	5.98 (1.01-35.49)	0.002