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Title: Lifestyle Risk Factors Increase the Risk of Hospitalization for Sciatica: Findings of Four Prospective Cohort Studies

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**Clinical Research Study****Lifestyle risk factors increase the risk of hospitalization for sciatica: Findings of four prospective cohort studies**

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#### **Declaration of interest**

The authors declare that they have no conflicts of interest.

#### **Contributors**

RS analyzed the Young Finns Study and the Health 2000 Survey. MH analyzed the Mobile Clinic Survey and TL analyzed the Helsinki Health Study. RS performed meta-analyses and drafted the manuscript. UE and TL contributed to writing a small part of the manuscript. Other authors

suggested subsequent changes. All authors approved the final version to be submitted for publication.

### **Clinical Significance**

- Current smoking increases the risk of hospitalization for sciatica by 33%, whereas past smokers are no longer at increased risk.
- Obesity defined by body mass index increases the risk of hospitalization for sciatica by 36% and abdominal obesity defined by waist circumference increases the risk by 41%.
- Walking or cycling to work reduces the risk of hospitalization for sciatica by 33%.

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## Abstract

**BACKGROUND:** To assess the effects of lifestyle risk factors on the risk of hospitalization for sciatica and to determine whether overweight or obesity modifies the effect of leisure-time physical activity on hospitalization for sciatica.

**METHODS:** We included four Finnish prospective cohort studies (Health 2000 Survey, Mobile Clinic Survey, Helsinki Health Study and Young Finns Study) consisting of 34,589 participants and 1259 hospitalizations for sciatica during 12 to 30 years follow-up. Sciatica was based on hospital discharge register data. We conducted a random-effects individual participant data meta-analysis.

**RESULTS:** After adjustment for confounding factors, current smoking at baseline increased the risk of subsequent hospitalization for sciatica by 33% (CI 13-56%), whereas past smokers were no longer at increased risk. Obesity defined by body mass index increased the risk of hospitalization for sciatica by 36% (CI 7-74%) and abdominal obesity defined by waist circumference increased the risk by 41% (CI 3-93%). Walking or cycling to work reduced the risk of hospitalization for sciatica by 33% (CI 4-53%), and the effect was independent of body weight and other leisure activities, while other types of leisure activities did not have a statistically significant effect.

**CONCLUSIONS:** Smoking and obesity increase the risk of hospitalization for sciatica, whereas walking or cycling to work protects against hospitalization for sciatica. Walking and cycling can be recommended for the prevention of sciatica in the general population.

**KEYWORDS:** Exercise, hospitalization, obesity, sciatica, smoking

Sciatica involves pain that radiates from the lower back along the sciatic nerve to the back of the thigh and down the leg, and is accompanied by clinical findings suggestive of compression or irritation of the lumbosacral nerve root.<sup>1,2</sup> A herniated lumbar disc with nerve root compression is the most common cause of sciatica.<sup>1,2</sup> The prevalence of clinically verified sciatica in the general population ranges between 2% and 5%.<sup>3-5</sup> Sciatica is a more persistent and disabling condition than other low back syndromes.<sup>6</sup> The majority of sciatica cases are, however, treated conservatively and only a small proportion of the cases eventually need surgery.<sup>1,2,7</sup> In general, sciatica is a relatively uncommon cause for hospitalization.<sup>8-10</sup> Among metal industry workers, 4.4% of men and 5.9% of women had been hospitalized for cervical, thoracic or lumbar intervertebral disc disorder during a 27-year follow-up.<sup>8</sup> Moreover, among male construction workers 0.8% had been hospitalized for lumbar disc disease during a 16-year follow-up,<sup>10</sup> and among men working in private or public companies, 1.7% had been hospitalized for a herniated lumbar disc during a 33-year period.<sup>9</sup>

The etiology of sciatica is multifactorial.<sup>1</sup> Of lifestyle risk factors, overweight and obesity,<sup>11</sup> and smoking<sup>12</sup> increase the risk of sciatica, but the role of leisure-time physical activity in sciatica is uncertain.<sup>13</sup> A meta-analysis<sup>11</sup> showed that overweight increases the risk of clinically verified sciatica by 12% and hospitalization for sciatica by 16%. For obesity the excess risk is 31% for sciatica and 38% for hospitalization due to sciatica. Moreover, another meta-analysis<sup>12</sup> found that current smoking increases the risk of clinically verified sciatica by 35% and hospitalization or surgery due to sciatica by 45%. Smoking cessation reduces the excess risk, and past smokers are 9-10% more likely to have sciatica than never smokers.<sup>12</sup> Furthermore, a recent meta-analysis of a limited number of prospective cohort studies found that a high level of leisure-time physical activity protects against lumbar radicular pain by 16%. Leisure-time physical activity had, however, no protective effect on clinically verified sciatica.<sup>13</sup>

Most of the previous studies on the role of lifestyle risk factors in clinically verified sciatica used a cross-sectional design, or were case control studies conducted among selected populations. The previous systematic reviews<sup>11-13</sup> identified only a limited number of prospective cohort studies on this topic. There may be reverse causation between leisure-time physical activity and sciatica. Individuals with lumbar radicular pain may limit their leisure activities because of fear of pain.<sup>14</sup> Cross-sectional studies are more prone to reverse causation than prospective cohort studies. Moreover, there is a vicious circle between obesity and physical inactivity.<sup>15</sup> Physical inactivity contributes to weight gain and decreased level of physical activity can be a consequence of obesity.<sup>15</sup> A prospective cohort study found that physical inactivity increases the risk of lumbar radicular pain in abdominally obese individuals, but not in persons with normal waist circumference.<sup>16</sup> It is unknown whether overweight or obesity modifies the effect of leisure-time physical activity on sciatica. The aim of this study was to investigate the effects of lifestyle risk factors on hospitalization for sciatica by conducting an individual participant data meta-analysis of four prospective cohort studies. Furthermore, we determined whether overweight or obesity modifies the effect of leisure-time physical activity on hospitalization for sciatica.



## Methods

### *Population*

*Health 2000 Survey:* A representative sample of people aged 30 years or older living in Finland in 2000-2001 was recruited using a two stage cluster sampling design.<sup>17</sup> Of 8028 individuals, 6986 (87.6%) were interviewed, and 6354 (79.7%) participated in the health examination.<sup>17</sup> We excluded 124 cases who had been hospitalized for sciatica five years before the baseline survey between 1996 and 2000 based on register data and 126 cases of probable sciatica based on clinical examination at baseline. The final sample consisted of 6413 participants with data on at least leisure-time physical activity and were followed-up until December 31, 2013. All participants signed a written informed consent, and the Ethics Committee for Epidemiology and Public Health of the Hospital District of Helsinki and Uusimaa, Finland approved the study.

*Mobile Clinic Survey:* The study was carried out by the Social Insurance Institution's Mobile Clinic Unit between 1973 and 1976.<sup>18</sup> Participants aged 20 years or older living in Finland participated in the baseline examination (N=19,518, participation rate=83%). Individuals (n=97) whose first hospitalization for sciatica preceded five years before the baseline examination were excluded from the analysis. The final population comprised 19,343 participants with data on variables of interest and were followed-up until December 31, 2011. The participants were fully informed about the use of the collected data for research purposes, and voluntary participation was according to the principles of the World Medical Association Declaration of Helsinki.

*Helsinki Health Study:* The study was conducted among the employees of the City of Helsinki aged 40 to 60 years at baseline in 2000-2002 (N=8960, response rate=67%).<sup>19</sup> The register linkages were made for those with a written consent for combining their survey responses with the register data (74%).<sup>19 20</sup> The participants (n=25) who had been hospitalized for sciatica four years before the

baseline study were excluded from the analysis, leaving 6288 participants with data on variables of interest. The participants were followed-up until December 31, 2013. The ethics committees of the health authorities of the City of Helsinki, and the Department of Public Health, University of Helsinki approved the study.

*Young Finns Study:* The baseline study included children and adolescents aged 3, 6, 9, 12, 15, or 18 years (N=4320) living in five Finnish university cities in 1980 (N=3596, response rate=83%).<sup>21</sup> The follow-up studies were carried out in 1983, 1986, 2001, 2007 and 2011. The baseline population for the current study included 2620 participants (73% of those who participated at baseline) who took part in the 2001 follow-up study.<sup>21</sup> The age of the participants ranged between 24 and 39 at baseline in 2001. Twenty-one participants who had been hospitalized for sciatica four years before the baseline study in 2001 were excluded from the analysis. Finally, 2545 participants were included in the current study and were followed-up until December 31, 2014. The study protocol was approved by the local ethics committees and all participants gave a written informed consent.

### *Outcome*

The data on hospitalizations for sciatica were obtained for all cohorts from the Finnish Hospital Discharge Register covering all Finnish hospitals. The register is held by the National Institute for Health and Welfare. In all four studies, the following five ICD-10 codes on sciatica were included: 1) M511 lumbar and other intervertebral disc disorders with radiculopathy; 2) M512 other specified intervertebral disc displacement; 3) M543 sciatica; 4) M544 lumbago with sciatica; and 5) G551 nerve root and plexus compressions in intervertebral disc disorders. Additionally, in the Mobile Clinic Survey the data on sciatica before 1996 were based on the following ICD-8 codes (353.99, 725.10 and 725.19) and ICD-9 codes (7225A, 7227C and 7228C).

### *Independent variables*

Information on age, sex, education, occupation or exposure to physical workload factors, smoking, and leisure-time physical activity was gathered by the home interview in the Health 2000 Survey and by a self-administered questionnaire in other three studies. Weight and height were measured in three studies, and were self-reported in the Helsinki Health Study. Moreover, waist and hip circumferences were measured in the Health 2000 Survey and Young Finns Study. Physicians diagnosed chronic back disorders at baseline in the Health 2000 Survey,<sup>17</sup> and low back pain was self-reported in other three studies.

In the Health 2000 Survey information on the nature, frequency and duration of leisure-time physical activity (Supplementary Table S1), in the Mobile Clinic Survey data on nature and duration of leisure-time physical activity (Supplementary Table S2), in the Helsinki Health Study data on duration and intensity of physical activity (Supplementary Table S3), and in the Young Finns Study information on frequency, intensity and duration of physical activity during leisure-time (Supplementary Table S4) were collected at baseline. A metabolic equivalent of task (MET) index<sup>22</sup> was computed for the Young Finns Study and Helsinki Health Study. We used the tertile distribution of physical activity to classify the participants into low, moderate, or high level of leisure-time physical activity. Furthermore, information on commuting to work by walking or cycling was gathered in the Health 2000 Survey and Young Finns Study.

### *Statistical analysis*

We defined overweight as body mass index (BMI) value between 25.0 and 29.9 kg/m<sup>2</sup> and obesity as BMI value  $\geq 30$  kg/m<sup>2</sup>. We also defined overweight as waist circumference between 94 and 101.9 cm for men and between 80 and 87.9 cm for women, and abdominal obesity as waist circumference  $\geq 102$  cm for men and  $\geq 88.0$  cm for women.<sup>23</sup> We ran Cox proportional hazards regression models. The data on deaths during the follow-up periods were obtained from Statistics Finland. Participants who died during the follow-up periods were censored. For the Health 2000 Survey, we conducted a

survey data analysis using Stata's *svy* prefix command. In all studies we controlled the estimates for age, sex, education, occupation or exposure to workload factors, smoking, overweight and obesity, leisure-time physical activity, and low back pain at baseline. Age did not modify the association between lifestyle factors and hospitalization for sciatica. Furthermore, the Helsinki Health Study and the Young Finns Study did not have statistical power for sex-specific analysis. We therefore did not perform age- or sex-specific analyses in each individual study. We performed stratified analyses to determine whether overweight or obesity modifies the effect of leisure-time physical activity on hospitalization for sciatica. We tested for violation of proportional hazards assumption, and the analyses were conducted in the absence of violation. We used a two-stage random-effects individual participant data meta-analysis,<sup>24</sup> assessed the presence of heterogeneity across the studies by the  $I^2$  statistics.<sup>25</sup> We used Stata, version 13, and SAS, version 9.4 for the analyses.

## Results

The characteristics of the included studies are presented in Table 1. The sample size of the studies ranged between 2545 and 19,343, and the mean follow-up time ranged between 12 and 30 years. The cumulative incidence of hospitalization for sciatica varied from 0.9% to 4.7%. Altogether, 34,589 participants and 1259 events were included in the individual participant data meta-analyses.

The results of original studies are presented in the supplementary tables S5-S12. An individual participant data meta-analysis (Table 2) showed that overweight/obesity defined either by BMI or waist circumference increases the risk of hospitalization for sciatica after controlling for age, sex, education, occupation, smoking, leisure-time physical activity and low back pain at baseline. The included studies, however, showed inconsistent results on the association between obesity defined by BMI and sciatica. There were only three events in obese participants in the Helsinki Health Study. For this study we therefore report the results for overweight/obesity only. The Health 2000 Survey and Young Finns Study found a significant positive association, whereas in the Mobile Clinic Survey and Helsinki Health Study, no association was found. Limiting the follow-up period to <14 years in the Mobile Clinic Survey yielded a larger hazard ratio (HR) for obesity (1.22, 95% CI 0.88-1.71), and the pooled HR also reached statistical significance for obesity (HR=1.36, CI 1.07-1.74,  $I^2=0\%$ ).

Current smoking at baseline increased the risk of hospitalization for sciatica by 33% (CI 13-56%), whereas past smokers were no longer at increased risk. Commuting to work by walking or cycling reduced the risk of hospitalization for sciatica by 33% (CI 4-53%), while other types of leisure activities had no significant effect on hospitalization for sciatica (Table 2). The protective effect of commuting to work by walking or cycling on sciatica was independent of body weight and other

leisure-time physical activities, whereas other leisure-time physical activities had no significant effect on hospitalization for sciatica in either normal weight or overweight/obese persons (Table 3).

## Discussion

This individual participant data meta-analysis suggests that current smoking and obesity increase the risk of hospitalization due to sciatica by 33-41%, and commuting to work by walking or cycling protects against hospitalization for sciatica by about 33%. Other leisure-time physical activities had no significant effect on hospitalization for sciatica.

The findings of the current study are in line with our earlier meta-analyses.<sup>11-13</sup> The effect sizes are also similar to those of the meta-analyses. However, the previous studies were mostly cross-sectional or case control studies and only a limited number of cohort studies focused on clinically verified sciatica. Additionally, we found that walking or cycling to work, independent of body weight and other leisure activities, protects against hospitalization for sciatica. In our earlier meta-analyses<sup>13,26</sup> we found that moderate or high level of leisure-time physical activity protects against lumbar radicular pain<sup>13</sup> and chronic low back pain<sup>26</sup> by 11-16% only, supporting the current result that the protective effects of physical activity on most low back outcomes are only minor.

We found no association between overweight/obesity and hospitalization for sciatica in the Helsinki Health Study. The finding can be due to selection bias. It could also be a chance finding as the number of events was low. The rate of sciatica was, nonetheless, lower than expected in the study population. The cumulative rate of sciatica was 2.0% in all the 41,495 employees of the City of Helsinki aged 40 or older during a 13-year follow-up, while the rate was only 0.9% in the current study population. This suggests that the employees at lower risk of sciatica have been recruited into the study. However, our analysis showed that overweight or obese employees were more likely to

consent to register linkage. Furthermore, in this female-dominated study weight and height were self-reported. Women underreport their weight and overreport their height, resulting in an underestimation of BMI<sup>27</sup> and diluting the association between overweight/obesity and hospitalization for sciatica.

### *Mechanisms*

In our earlier reports<sup>11-13</sup> we discussed some possible underlying mechanisms through which lifestyle risk factors contribute to sciatica. Smoking reduces perfusion around the intervertebral discs,<sup>28 29</sup> increases production and release of inflammatory cytokines in intervertebral discs,<sup>30 31</sup> slows down healing process,<sup>32</sup> and causes intervertebral disc degeneration.<sup>31 33 34</sup> Obesity may be involved in the development of sciatica by increasing the secretion of leptin and inflammatory mediators from excess adipose tissue,<sup>35</sup> and interfering with the nutrition or healing of the intervertebral discs.<sup>36</sup>

Walking and cycling to work prevent against sciatica because they are regular low level physical activities that do not strain the lower back, while a moderate level of other leisure-time physical activities may include sports that strain the lower back,<sup>37</sup> particularly in individuals who occasionally practice them. Regular walking or cycling to work has also a favorable effect on body fat mass.<sup>38</sup>

### *Strengths and limitations*

This study had several strengths. First, three of the included studies were population-based, and one was focused on an employed population subsample. Second, the response rate to the baseline survey was high in the three studies, and they can therefore be considered representative samples of their target populations. Third, height and weight were measured in all but one study. Fourth, we used national administrative register data to similarly and objectively define sciatica in all four cohorts.

The outcome was based on comparable and international ICD codes, and were derived from the same register data holder. Fifth, using register data avoided loss to follow-up. This register covers almost all Finland and the accuracy of the codes is in general good.<sup>39</sup> Sixth, in all studies we were able to exclude the sciatica cases that had been hospitalized four years before the baseline surveys.

The study had also some limitations. First, none of the studies objectively measured physical activity at baseline. The included studies used somewhat different questions to assess the level of leisure-time physical activity. Moreover, commuting to work could not be distinguished from other leisure-time physical activities in two studies, and only one study collected data on the intensity of physical activity. Second, two studies had low statistical power and we were not able to conduct a reliable sex-specific analysis. Third, the coverage of the Finnish Hospital Discharge Register has been above 80%,<sup>39</sup> and improved to above 95% only in more recent years.<sup>39</sup> Fourth, the two largest studies assessed physical activity, and measured weight and height at one point in time only. We were therefore unable to consider changes in the risk factors during the relatively long follow-up period. Some participants may have increased or decreased their level of physical activity, and some overweight participants at baseline may have gained more weight and become obese, and alternatively some obese participants might have lost weight during the follow-up period.



## **Conclusions**

Smoking and obesity increase the risk of hospitalization for sciatica, while walking or cycling to work reduces the risk. Walking and cycling can be recommended for the prevention of sciatica in the general population. The public health implications of commuting to work by walking or cycling can be substantial.

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**Table 1** Characteristics of Individual participant data meta-analysis of four population-based prospective cohort studies on the effects of lifestyle risk factors on hospitalization for sciatica

Characteristic	Health 2000 Survey	Mobile Clinic Survey	Helsinki Health Study	Young Finns Study
Sample	6413	19343	6288	2545
Events	260	901	57	41
Mean follow-up time (years)	11.6	30.0	12.5	13.8
Age at baseline, range	30-99	20-92	40-60	24-39
Female, %	53	49	78	55
Overweight, %	41	35	34	31
Obesity, %	22	12	15	12
Ever smoking, %	49	47	47	42
Low level of leisure activity, %	28	26	34	26
High level of leisure activity, %	17	12	34	42
Hospitalization for sciatica, %	4.2	4.7	0.9	1.6

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**Table 2** Individual participant data meta-analysis of four prospective cohort studies on the effects of lifestyle risk factors on hospitalization for sciatica

Characteristic	N	Event	HR	95% CI	I <sup>2</sup> , %
<b>Body mass index</b>					
Normal	17135	619	1		
Overweight or obesity	17110	635	1.19	1.01-1.41	0
Overweight	10012	458	1.31	1.14-1.49	0
Obesity	4028	151	1.27	0.92-1.74	41
Obesity *	4028	122	1.36	1.07-1.74	0
<b>Waist circumference</b>					
Normal	3334	92	1		
Overweight or obesity	4801	193	1.34	1.01-1.77	0
Overweight	1987	73	1.16	0.84-1.62	0
Obesity	2814	120	1.41	1.03-1.93	0
<b>Smoking</b>					
Never	18435	585	1		
Ever	15746	658	1.20	1.08-1.34	0
Past	6340	234	1.11	0.94-1.31	0
Current	8333	403	1.33	1.13-1.56	10
<b>Leisure activity</b>					
Low	9682	320	1		
Moderate	18098	749	1.12	0.87-1.44	45
High	6669	189	0.96	0.76-1.21	20
<b>Walking or cycling to work</b>					
No	6649	240	1		
Yes	1651	47	0.67	0.47-0.96	0

\* Limiting the follow-up time to <14 years in the Mobile Clinic Survey

Adjustment for age, sex, education, occupation, leisure time physical activity, overweight/obesity, smoking and back pain at baseline

**Table 3** Individual participant data meta-analysis on the effect of leisure time physical activity on hospitalization for sciatica in normal weight and overweight/obese participants

Leisure time physical activity	Normal					Overweight or obese				
	N	Event	HR	95% CI	I <sup>2</sup> , %	N	Event	HR	95% CI	I <sup>2</sup> , %
<i>Overweight and obesity defined by body mass index</i>										
Leisure activity										
Low	4203	143	1			5346	176	1		
Moderate	9053	373	1.14	0.79-1.65	30	8938	372	1.05	0.87-1.26	0
High	3776	103	1.21	0.66-2.20	65	2756	84	0.88	0.67-1.14	0
<i>Walking or cycling to work</i>										
No	2609	76	1			3796	161	1		
Yes	816	22	0.81	0.49-1.34	0	757	23	0.60	0.38-0.96	0
<i>Overweight and obesity defined by waist circumference</i>										
Leisure activity										
Low	725	18	1			1432	53	1		
Moderate	1476	41	0.96	0.55-1.68	0	2445	111	1.05	0.52-2.10	40
High	1045	33	1.50	0.91-2.48	0	849	26	0.42	0.06-3.10	75
<i>Walking or cycling to work</i>										
No	2400	73	1			3782	157	1		
Yes	782	15	0.55	0.31-0.98	0	765	29	0.77	0.51-1.17	0

Adjustment for age, sex, education, occupation, smoking and back pain at baseline



## Appendix

**Table S1:** Questions on physical activity in the Health 2000 Survey

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Item

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How much do you exercise and strain yourself physically in your leisure time?

In my leisure time I read, watch TV and do other activities in which I do not move much and which do not strain me physically

In my leisure time I walk, cycle and move in other ways at least 4 hours per week

In my leisure time I exercise at least 3 hours per week

In my leisure time I practice regularly several times per week for competition

How often do you exercise in your leisure time so that you are at least slightly out of breath and sweating?

Daily

4-6 times a week

2-3 times a week

Once a week

2-3 times a month

Few times a year or even more rarely

How many minutes do you walk or cycle on your daily way to and from work?

I do not work or I work at home

I use a motor vehicle for the entire trip

Less than 15 minutes a day

From 15 to 29 minutes a day

From 30 to 59 minutes a day

From 1 to 2 hours a day

2 hours or longer a day

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**Table S2:** Question on physical activity in the Mobile Clinic Survey

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Item

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How often and how much do you exert yourself during leisure time in a usual week?

None or little

Walking, cycling, or related light activities  $\geq 4$  hours/week

Ball games, jogging, or related activities  $\geq 3$  hours/week

Regular vigorous exercise

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**Table S3:** Question on physical activity in the Helsinki Health Study

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Item

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The following question is about your leisure-time physical activity. If you think of the previous 12 months, how vigorous have your physical activities been and how often have you engaged in such activities?

Walking or equivalent

Brisk walking or equivalent

Light jogging or equivalent

Running or equivalent

Not at all

Altogether less than half an hour per week

Altogether ½-1 hour per week

Altogether 2-3 hours per week

Altogether 4 hours or more per week

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**Table S4:** Construction of the MET index in the Young Finns Study

Item	Score
How much breathlessness and sweating do you experience when you engage in physical activity and sport?	
Not at all	2
Moderate amount	4
A lot	8
How often do you engage in rigorous physical activity?	
Not at all	0
Once a month or more	0.25
Once a week	1.0
2–3 times a week	2.5
4–6 times a week	5.0
Every day	7.0
How long is duration of individual session of exercise or sports?	
Less than 20 minutes	0.17
20-40 minutes	0.50
40-60 minutes	0.83
More than 60 minutes	1.33
MET index, range	0–74.5
Commuting to work	
How do you travel to and from work in summer?	
Own car	
Public transport	
Walking	
Cycling	
How do you travel to and from work in winter?	
By own car	
By public transport	
Walking	
Cycling	

**Table S5:** Adjusted hazard ratios (HR) of hospitalization for sciatica by lifestyle risk factors in the Health 2000 Survey

Characteristic	N	Event	% of sciatica	Model 1		Model 2		Model 3	
				HR	95% CI	HR	95% CI	HR	95% CI
Frequency of leisure time physical activity leading to breathlessness or sweating (times per week)									
<1	1654	57	3.7	1		1			
1	1052	39	3.8	0.88	0.58-1.34	0.80	0.53-1.22		
2-3	1975	85	4.3	1.04	0.73-1.49	0.98	0.68-1.40		
≥4	1649	78	4.9	1.29	0.94-1.77	1.18	0.85-1.64		
Leisure activity									
Low	1889	60	3.4	1		1		1	
Moderate	3401	153	4.6	1.21	0.90-1.63	1.14	0.85-1.53	1.29	0.97-1.73
High	1070	47	4.3	1.07	0.73-1.56	1.02	0.70-1.48	1.21	0.84-1.76
Walking or cycling to work									
<15 minutes a day	4736	208	4.5	1		1		1	
15-29 minutes a day	581	18	3.1	0.58	0.36-0.94	0.59	0.36-0.96	0.58	0.35-0.97
≥30 minutes a day	558	25	4.4	0.86	0.56-1.31	0.83	0.54-1.27	0.83	0.54-1.28
Body mass index									
Normal	2410	91	3.9	1		1		1	
Overweight	2552	100	4.0	1.14	0.85-1.53	1.17	0.85-1.60	1.17	0.85-1.61
Obesity	1409	69	5.0	1.47	1.04-2.09	1.46	1.01-2.13	1.49	1.02-2.18
Waist circumference									
Normal	1943	75	3.9	1		1		1	
Overweight	1570	67	4.3	1.20	0.86-1.67	1.20	0.85-1.68	1.18	0.83-1.66
Obesity	2436	109	4.6	1.39	1.00-1.91	1.37	0.99-1.91	1.37	0.98-1.91
Smoking									
Never	3351	116	3.6	1		1		1	
Past	1328	52	3.9	1.19	0.85-1.66	1.12	0.78-1.59	1.05	0.73-1.49
Occasional	336	17	5.2	1.30	0.77-2.19	1.27	0.73-2.20	1.17	0.66-2.09
Current	1363	75	5.5	1.52	1.14-	1.58	1.17-2.12	1.58	1.16-

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Model 1: Adjustment for age and sex

Model 2: model 1 + level of educational, workload factors, and chronic back disorder at baseline

Model 3: model 2 + leisure activity, commuting to work, body mass index (or waist circumference) and smoking

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**Table S6:** Adjusted hazard ratios (HR) of hospitalization for sciatica by lifestyle risk factors in the Mobile Clinic Survey

Characteristic	N	Event	% of sciatica	Model 1		Model 2		Model 3	
				HR	95% CI	HR	95% CI	HR	95% CI
Leisure activity									
Low	5029	232	4.6	1.00		1.00		1.00	
Moderate	11900	561	4.7	0.98	0.84-1.14	0.95	0.81-1.11	0.96	0.82-1.12
High	2414	108	4.5	0.76	0.60-0.96	0.78	0.61-0.98	0.81	0.64-1.02
Body mass index									
Normal	10246	483	4.7	1.00		1.00		1.00	
Overweight	6754	342	5.1	1.35	1.17-1.57	1.31	1.13-1.52	1.32	1.14-1.53
Obesity	2343	76	3.2	1.06	0.82-1.36	1.05	0.81-1.35	1.05	0.82-1.35
Smoking									
Never	10319	423	4.1	1.00		1.00		1.00	
Past	3502	167	4.8	1.18	0.97-1.43	1.12	0.93-1.36	1.11	0.92-1.35
Current	5522	311	5.6	1.35	1.15-1.58	1.23	1.05-1.45	1.23	1.05-1.45

Model 1: Adjustment for age (continuous) and sex

Model 2: model 1 + education, occupation, and back pain at baseline

Model 3: model 2 + leisure time physical activity, body mass index and smoking

**Table S7:** Adjusted hazard ratios (HR) of hospitalization for sciatica by lifestyle risk factors in the Helsinki Health Study

Characteristic	N	Event	% of sciatica	Model 1		Model 2		Model 3	
				HR	95% CI	HR	95% CI	HR	95% CI
Leisure activity									
Low	2117	15	0.7	1		1		1	
Moderate	2006	24	1.2	1.67	0.88-3.19	1.69	0.88-3.23	1.68	0.87-3.21
High	2165	18	0.8	1.16	0.58-2.30	1.19	0.60-2.37	1.18	0.59-2.38
Body mass index									
Normal	3202	31	1.0	1		1		1	
Overweight/obesity	3086	26	0.8	0.88	0.52-1.50	0.83	0.49-1.42	0.85	0.49-1.46
Smoking									
Never	3330	25	0.8	1		1		1	
Past	1510	15	1.0	1.33	0.70-2.54	1.29	0.68-2.47	1.30	0.68-2.48
Current	1448	17	1.2	1.59	0.85-2.95	1.51	0.80-2.83	1.52	0.80-2.87

Model 1: Adjustment for age and sex

Model 2: model 1 + education, occupation, and back pain at baseline

Model 3: model 2 + leisure time physical activity, body mass index and smoking

**Table S8:** Adjusted hazard ratios (HR) of hospitalization for sciatica by lifestyle risk factors in the Young Finns Study

Characteristic	N	Event	% of sciatica	Model 1		Model 2		Model 3	
				HR	95% CI	HR	95% CI	HR	95% CI
Frequency of leisure time physical activity leading to breathlessness or sweating (times per week)									
<1	656	13	2.0	1		1			
1	726	10	1.4	0.70	0.31-1.60	0.87	0.37-2.02		
2-3	834	12	1.4	0.74	0.33-1.61	0.89	0.40-2.00		
≥4	329	6	1.8	0.96	0.36-2.54	0.98	0.34-2.81		
Leisure activity (MET)									
Low	647	13	2.0	1		1		1	
Moderate	791	11	1.4	0.70	0.31-1.56	0.84	0.37-1.92	0.80	0.30-2.15
High	1020	16	1.6	0.79	0.38-1.65	0.92	0.43-1.99	0.92	0.37-2.30
Walking or cycling to work in both summer and winter									
No	1913	32	1.7	1		1		1	
Yes	512	4	0.8	0.51	0.18-1.46	0.59	0.20-1.68	0.35	0.08-1.50
Body mass index									
Normal	1277	14	1.1	1		1		1	
Overweight	706	16	2.3	2.03	0.97-4.21	1.67	0.78-3.54	1.92	0.85-4.34
Obesity	276	6	2.2	1.94	0.74-5.08	1.66	0.63-4.34	2.03	0.75-5.55
Waist circumference									
Normal	1391	17	1.2	1		1		1	
Overweight	417	6	1.4	1.15	0.45-2.93	0.87	0.32-2.38	1.02	0.36-2.86
Obesity	378	11	2.9	2.41	1.11-5.21	1.86	0.83-4.13	1.77	0.72-4.37
Daily smoking									
Never	1435	21	1.5	1		1		1	
Ever	1073	21	2.0	1.36	0.74-2.49	1.05	0.55-2.01	1.09	0.49-2.44

Model 1: Adjustment for age and sex



Model 2: Model 1 + educational status, and low back pain at baseline

Model 3: Model 2 + leisure activity, walking or cycling to work, waist circumference (or body mass index) and smoking

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**Table S9:** Adjusted hazard ratios (HR) of hospitalization for sciatica for the levels of leisure time physical activity according to body mass index and waist circumference in the Health 2000 Survey

Leisure time physical activity	Normal					Overweight or obese				
	N	Event	% of sciatica	HR	95% CI	N	Event	% of sciatica	HR	95% CI
Overweight and obesity defined by body mass index										
Leisure activity										
Low	613	13	2.3	1		1241	47	4.0	1	
Moderate	1314	56	4.3	1.70	0.90-3.22	2084	96	4.7	1.09	0.76-1.56
High	467	22	4.6	2.04	1.08-3.83	602	25	4.0	0.87	0.54-1.41
Walking or cycling to work										
<15 minutes a day	1690	66	4.0	1		3039	142	4.8	1	
≥15 minutes a day	538	21	3.8	0.84	0.50-1.41	599	22	3.7	0.63	0.39-1.02
Overweight and obesity defined by waist circumference										
Leisure activity										
Low	416	15	3.7	1		1206	44	3.9	1	
Moderate	1074	38	3.6	0.98	0.54-1.77	2186	107	5.0	1.28	0.90-1.82
High	445	22	4.9	1.41	0.82-2.43	581	24	4.0	0.96	0.56-1.64
Walking or cycling to work										
<15 minutes a day	1397	60	4.4	1		3170	143	4.6	1	
≥15 minutes a day	491	14	2.8	0.57	0.31-1.04	627	28	4.5	0.80	0.52-1.22
Adjustment for age, sex, level of educational, workload factors, smoking and chronic back disorder at baseline										

**Table S10:** Adjusted hazard ratios (HR) of hospitalization for sciatica for the levels of leisure time physical activity according to body mass index in the Mobile Clinic Survey

Leisure time physical activity	Normal BMI					Overweight or obese				
	N	Event	% of sciatica	HR	95% CI	N	Event	% of sciatica	HR	95% CI
Low	2449	120	4.9	1.00		2580	112	4.3	1.00	
Moderate	6303	301	4.8	0.93	0.75-1.15	5597	260	4.6	1.02	0.81-1.27
High	1494	62	4.1	0.75	0.55-1.03	920	46	5.0	0.89	0.62-1.26

Adjustment for age (continuous), sex, education, occupation, smoking and back pain at baseline

**Table S11:** Adjusted hazard ratios (HR) of hospitalization for sciatica for the levels of leisure time physical activity according to body mass index in the Helsinki Health Study

Leisure time physical activity	Normal BMI					Overweight or obese				
	N	Event	% of sciatica	HR	95% CI	N	Event	% of sciatica	HR	95% CI
Low	856	7	0.8	1		1261	8	0.6	1	
Moderate	1052	13	1.2	1.64	0.65-4.12	954	11	1.2	1.73	0.69-4.32
High	1294	11	0.9	1.16	0.44-3.01	871	7	0.8	1.20	0.43-3.32

Adjustment for age (continuous), sex, education, occupation, smoking and back pain at baseline

**Table S12:** Adjusted hazard ratios (HR) of hospitalization for sciatica for the levels of leisure time physical activity according to body mass index and waist circumference in the Young Finns Study

Leisure time physical activity	Normal						Overweight or obese							
	N	Event	% of sciatica	Model 1 HR	Model 1 95% CI	Model 2 HR	Model 2 95% CI	N	Event	% of sciatica	Model 1 HR	Model 1 95% CI	Model 2 HR	Model 2 95% CI
Overweight and obesity defined by body mass index														
Leisure activity														
Low	285	3	1.0	1		1		264	9	3.4	1		1	
Moderate	384	3	0.8	0.76	0.15-3.76	0.78	0.15-3.92	303	5	1.7	0.49	0.16-1.47	0.67	0.22-2.09
High	521	8	1.5	1.43	0.38-5.42	1.62	0.42-6.24	363	6	1.7	0.49	0.17-1.38	0.53	0.17-1.62
Walking or cycling to work in both summer and winter														
No	919	10	1.1	1		1		757	19	2.5	1		1	
Yes	278	1	0.4	0.36	0.04-2.82	0.44	0.05-3.48	158	1	0.6	0.26	0.03-1.94	0.27	0.04-2.07
Overweight and obesity defined by waist circumference														
Leisure activity														
Low	309	3	1.0	1		1		226	9	4.0	1		1	
Moderate	402	3	0.8	0.79	0.16-3.93	0.85	0.17-4.28	259	4	1.5	0.39	0.12-1.28	0.56	0.17-1.91
High	600	11	1.8	1.93	0.54-6.94	2.14	0.59-7.81	268	2	0.8	0.19	0.04-0.88	0.12	0.02-1.01
Walking or cycling to work in both summer and winter														
No	1003	13	1.3	1		1		612	14	2.3	1		1	
Yes	291	1	0.3	0.30	0.04-	0.36	0.05-	138	1	0.7	0.33	0.04-	0.33	0.04-2.56

2.34

2.78

2.54

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Model 1: Adjustment for age and sex

Model 2: Adjustment for age, sex, educational status, and low back pain at baseline

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