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# 1. Comparison of the risk of pain in the lumbar spine in people performing office work and physical work

*Porównanie ryzyka wystąpienia dolegliwości bólowych odcinka lędźwiowego kręgosłupa u osób wykonujących pracę biurową i fizyczną*

## Abstract

**Introduction:** Pain in the area of the lumbar spine has become a serious problem not only in medicine, but also in society. Lack of knowledge and errors resulting from improper load during professional work lead to the formation of microtraumas, and thus permanent changes in the structure of the spine. The aim of the study was to assess the incidence of pain in the lumbar spine in people performing office work and physical work. **Material and methods:** The study included 70 people of both sexes in the age groups below 18, 18–25, 26–31, and over 40. The respondents were divided into two groups: manual workers – 39 people and office workers – 31 people. The study used a self-authored questionnaire, a standardized Oswestry questionnaire and the VAS pain scale. **Results:** Pain in the lumbar spine is more common in people who work physically at work. Treatment, after the diagnosis was made, was started by 20 subjects (87.0%). They were all physically working respondents and 62.5% of people working in a sitting position ( $p=0.011$ ). The impact of pain on functioning in everyday life was assessed in ten aspects using the Oswestry questionnaire. No differences were found between the influence of pain on the size of the limitations of the two groups ( $p>0.05$ ). The greatest limitations of the respondents were found in terms of the intensity of the pain experienced and changes in its intensity, as well as in the performance of lifting and sitting activities.

**Conclusions:** Regardless of the nature of the work performed, most professionally active people experience pain in the lumbar spine, but it occurs more often in people who work physically. For people who perform manual work, the frequency of pain is defined as "sporadic", while among office workers, pain occurs more often – several times a month.

**Keywords:** treatment, pain, office work, physical work, spinal pain syndromes, prophylaxis

## Streszczenie

**Wstęp:** Ból w okolicy odcinka lędźwiowego kręgosłupa stał się poważnym problemem nie tylko w medycynie, ale także w społeczeństwie. Brak wiedzy i błędy wynikające z niewłaściwego obciążenia podczas pracy zawodowej prowadzą do powstawania mikrourazów, a tym samym trwałych zmian w budowie kręgosłupa. Celem pracy była ocena częstości występowania dolegliwości bólowych odcinka lędźwiowego kręgosłupa u osób wykonujących pracę biurową i fizyczną. **Materiał i metody:** Badaniem objęto 70 osób obojga płci w grupach wiekowych poniżej 18 lat, 18–25 lat, 26–31 lat oraz powyżej 40 lat. Respondentów podzielono na dwie grupy: pracowników fizycznych – 39 osób i pracowników biurowych – 31 osób. W badaniu wykorzystano kwestionariusz autorski, standaryzowany kwestionariusz Oswestry oraz skalę bólu VAS. **Wyniki:** Ból w odcinku lędźwiowym kręgosłupa występuje częściej u osób pracujących fizycznie. Leczenie, po postawieniu diagnozy, rozpoczęło 20 osób (87 proc.). Wszyscy byli osobami pracującymi fizycznie oraz 62,5 proc. osób pracujących w pozycji siedzącej ( $p=0,011$ ). Wpływ bólu na funkcjonowanie w życiu codziennym oceniano w dziesięciu aspektach za pomocą kwestionariusza Oswestry. Nie stwierdzono różnic między wpływem bólu na wielkość ograniczeń obu grup ( $p>0,05$ ). Największe ograniczenia badanych stwierdzono w zakresie napięcia odczuwanego bólu i zmian jego napięcia oraz wykonywania czynności podnoszenia i siedzenia. **Wnioski:** Bez względu na charakter wykonywanej pracy większość osób aktywnych zawodowo odczuwa ból w odcinku lędźwiowym kręgosłupa, ale częściej występuje on u pracujących fizycznie. Dla osób wykonujących pracę fizyczną częstotliwość bólu określa się jako „sporadyczne”, natomiast wśród pracowników biurowych ból występuje częściej – kilka razy w miesiącu.

**Słowa kluczowe:** leczenie, ból, praca biurowa, praca fizyczna, zespoły bólowe kręgosłupa, profilaktyka

## Introduction

Pain in the lumbar spine is a serious problem, not only a medical one, but also social [1]. Currently, an increasing number of people complain of nagging pain in the lower back. Epidemiological data show that approximately 80% of the working-age population suffer from spine dysfunction [2].

The number of factors contributing to the occurrence of pain ailments is large. The most common causes include disc degeneration, hernia of the nucleus pulposus, and degenerative changes in the joints of the spine. Lack of knowledge and errors resulting from improper lifting during work lead to the formation of microtraumas, and thus permanent changes in

the structure of the spine [3, 4]. Limited physical activity also has a great influence on the frequent occurrence of back pain. This has consequences in the form of overweight, reduced muscle strength, weakening of the ligamentous apparatus and adverse changes in figure. [2, 5].

The average person spends much more time sitting than standing or walking. Prolonged sitting and additional hypokinesia increase the risk of lower back pain [4]. Incorrectly adopted sitting position results in the rotation of the pelvis backwards, and thus flattening of the lumbar lordosis. During sitting, the lumbar spine experiences much greater compensatory forces than in the standing or lying positions. Nevertheless, the sitting position is a natural position, does not require a large energy expenditure and is conducive to the work performed by modern society. However, it is important to remember to properly adjust the seating position for each employee [6].

Performing various activities in a standing position increases energy expenditure many times over. To reduce the energy cost, an incorrect position is often taken, which increases the values of the forces that act on the lumbar spine. It is therefore important to adopt the correct standing position as it reduces the load on the intervertebral discs. A standing position increases the freedom of motion and movement. People working in a standing position should maintain a neutral position of the spine, which means minimising the movements of flexion, extension and twists of the torso [6].

The available literature contains many studies describing the impact of work performed on the frequency and nature of the occurrence of pain in the lumbar spine. These studies compare specific professions (e.g. medical professions [7, 8]) and not the type of work.

Problems related to back pain are now a very common health issue. It concerns not only people who perform heavy physical work, but also people leading a sedentary lifestyle [9]. Pain syndromes of the lumbar spine are a common ailment in people who perform manual work [10] predominantly in a standing position [11], as well as work in a leaning position in combination with rotation [12]. Similar results of research among 600 men employed in the construction industry were obtained by M. Malińska and J. Bugajska [13]. Currently, the sitting position is ubiquitous. It accompanies us at work, but also during rest. It is difficult to find confirmation in the literature that lower back pain and office work are closely related. However, there are studies which show that sitting for more than seven hours a day significantly increases the risk of back pain syndromes [14].

Pain in the cervical and lumbar spine area lead not only to functional disability, but also reduce the quality of life and productivity of employees [15].

Given the above considerations, the aim of the study was to assess the occurrence of pain in the lumbar spine in people who perform office work and manual work.

## **Materials and methods**

### **Study participants**

126 people diagnosed with pain in the lumbar spine were initially qualified for the study. These people attended outpatient physiotherapy treatments as directed by a doctor in the period from February to July 2019. The method of randomizing 100 people from all patients was used. Then, the criteria for excluding from participation in the study were taken into account, which were: age below 18 years of age, no office or physical work, no consent of the patient to participate in the study. After making the above selection, it turned out that 5 people were under 18 years of age, 12 people were unemployed, 9 people did not agree to participate in the study, 4 people did not show up for the agreed survey meeting.

Finally, the study included 70 people, who were divided into two groups: the first, 39 people (55.7%), who perform manual work, and the second, 31 people (44.3%), who do office work. There were 39 women (55.7%) and 31 men (44.3%) among the respondents. Among those doing manual work, there were more men – 53.9%, and among those doing office work, more women – 67.7%. This difference was close to the threshold of statistical significance ( $p=0.071$ ).

The subjects were between 18 and 50 years of age. In the 18–25 age group there were 13 people – 18.6%, in the 26–31 and 32–40 age groups there were 15 people each – 21.4%, and there were 27 people – 38.6% over 40 years old. Age did not significantly differentiate the subjects in the two groups ( $p=0.104$ ).

Among the subjects there were 37 people with normal body weight (52.9%), three with low body weight (4.3%), 20 who were overweight (28.6%) and 10 who were obese (14.3%). There were no statistically significant differences between the BMI of the subjects in the two groups ( $p=0.715$ ).

In terms of education, the group was as follows: 39 (55.7%) had higher education, 27 (38.6%) had secondary education and 4 (5.7%) had vocational education. Those working in office work had on average a higher level of education compared to the manual workers, the difference was close to the threshold of significance, but statistically insignificant ( $p=0.071$ ).

## Research tools

A self-authored questionnaire and a standardised Oswestry questionnaire were used to conduct the research. The questionnaire contained clearly defined sociodemographic questions regarding age, place of residence and education.

The Oswestry Disability Index (ODI) questionnaire allowed the assessment of disability caused by pain in the thoracolumbar spine. When completing the questionnaire, the respondent answers questions about 10 situations: intensity of pain, lifting, the ability to care for oneself, ability to walk, the ability to sit, sexual function, ability to stand, social life, sleep quality, and ability to travel. The answers to the questions allow classification of how much the patient's functioning is limited during the performance of particular activities. The responses are classified from 0 to 5. The researchers presented the overall result in a percentage scale of 0–100%, which determines the respondent's degree of disability. The results of the Oswestry questionnaire can also be presented on a 0–50 point scale.

## Statistical analysis

The statistical analysis of the collected material was performed in the Statistica 13.1 package by StatSoft. In order to ensure the reliability of the research and the representativeness of the sample, the minimum size of the sample was determined. During the analyzed period, the procedures were used by a total of 126 people with the onset of pain in the lumbar spine. These people were considered the general population. A standard estimated fraction size of 50% was used, a significance level of 0.05 and a tolerance error of 10%. The minimum sample size was 55 people. In this study, the final study group was 70 people, which meets the above criteria. In the basic statistical description of the analysed material, mean values, median, minimum and maximum values, first and third quartiles, and standard deviation were determined. Only non-parametric tests were used to analyse the variables. The choice of this type of tests was conditioned by the failure to meet the basic assumptions of the parametric tests, i.e. the compliance of the distributions of the studied variables with a normal distribution, which were verified with the Shapiro-Wilk test or only with their ordinal character. The Mann-Whitney U test was used to assess the differences in the average level of a numerical feature in the two populations. The analysis of qualitative variables was performed using the Pearson chi-square test. The correlation of two variables not meeting the normality criterion was calculated using the Spearman's rank correlation coefficient. The level of statistical significance was  $p < 0.05$ .

## Ethics

The study was performed in accordance with the Helsinki Declaration and based on the approval of the Bioethics Committee (Resolution No. 8/01/2019).

Before starting the study, each subject signed to give informed consent to participate in it. The consent form contained a description of the study and the information that all collected data would be used only for scientific purposes and the person may resign from participation in the study at any time.

## Results

Pain in the lumbar spine was experienced by 64 respondents (91.4%), including 38 of those who worked manually (97.4%) and 26 of those who worked in a sitting position (83.9%). This difference was statistically significant ( $p=0.044$ ) (tab. 1).

**Table 1. The occurrence of pain in the lumbar spine**

The occurrence of pain in the lumbar spine	Physical work		Office work		All	
	N	%	N	%	N	%
Yes	38	97,4%	26	83,9%	64	91,4%
No	1	2,6%	5	16,1%	6	8,6%
All	39	100,0%	31	100,0%	70	100,0%
p	$\chi^2(1)=4,06$ $p=0,044$					

p - test probability index;  $\chi^2$  - Pearson's chi-kwadrat test

Among those who experienced pain in the spine, it had occurred in 18 people (28.1%) for less than 1 year, in 25 people (39.1%) for 1–5 years, in 14 people (21.9%) for 6–10 years, and in 7 people (10.9%) for more than 10 years. The difference between the duration of pain in the group of manual and office workers was statistically insignificant ( $p=0.267$ ).

Back pain every day or several times a week was reported by 10 people (15.6%). In 24 people (37.5%), pains in this area occurred several times a month, and in another 20 (31.3%), back pain occurred sporadically. There were no statistically significant differences between the frequency of experiencing pain in the subjects from the two groups ( $p=0.357$ ).

The overall average level of perceived pain reported by the respondents on the VAS scale was 4.84 points  $\pm$  1.9 points. In the case of people

performing manual work, the average assessment of pain intensity was 4.92 points.  $\pm$  2.03 points, and in the case of people working in offices the average was 4.73 points  $\pm$  1.73 points. This difference was statistically insignificant ( $p=0.745$ ).

The impact of pain on limitations in the daily functioning of the people studied was assessed in general at the average level of 19.31%  $\pm$  15.09%. The lowest was 0.0% and the highest was 66.0%. In the group of people working manually, the level of restriction in functioning was estimated at 21.74%, and in the group of people doing office work it was at the average level of 16.26%. This difference, although visible in the studied groups, turned out to be statistically insignificant ( $p=0.190$ ) (tab. 2).

**Table 2. Pain intensity on the VAS scale and the level of functional impairment on the ODI scale**

Basic descriptive statistics									p
	N	X	Me	Min	Max	Q1	Q3	SD	
VAS [0-10pkt.]									
Physical work	38	4,92	5,00	1,00	10,00	3,00	6,00	2,03	Z=0,33 p=0,745
Office work	26	4,73	5,00	2,00	8,00	3,00	6,00	1,73	
All	64	4,84	5,00	1,00	10,00	3,00	6,00	1,90	
ODI [0-100%]									
Physical work	39	21,74	18,00	0,00	66,00	10,00	34,00	16,63	Z=1,31 p=0,190
Office work	31	16,26	14,00	0,00	48,00	6,00	26,00	12,51	
All	70	19,31	16,00	0,00	66,00	8,00	28,00	15,09	

Max – maximum value; Min – minimum value; N – number of participants; p – test probability index; Q1 – lower quartile; Q3 – upper quartile; SD – standard deviation; X – average value; Me – median; Z – U Mann-Whitney test

Treatment, after a diagnosis had been made, was started by 20 subjects (87.0%). These were all of the manually working respondents and 62.5% of those working in a sitting position. This difference was statistically significant ( $p=0.011$ ) (tab. 3).

**Table 3. Treatment initiation**

Treatment initiation	Physical work		Office work		All	
	N	%	N	%	N	%
Yes	15	100,0%	5	62,5%	20	87,0%
No	0	0,0%	3	37,5%	3	13,0%
All	15	100,0%	8	100,0%	23	100,0%
p	$\chi^2(1)=6,47$ p=0,011					

p – test probability index;  $\chi^2$  – Pearson's chi-kwadrat test

Similar numbers of the respondents spent their free time passively – 32 people (45.7%) and actively – 38 people (54.3%). There were no differences between the ways of spending free time between the subjects in the two groups ( $p=0.377$ ).

The impact of pain on functioning in everyday life was assessed in ten aspects using the Oswestry questionnaire. No differences were found between the influence of pain on the size of the limitations between the subjects in the two groups ( $p>0.05$ ). The greatest limitations of the respondents were found in terms of the intensity of perceived pain and changes in its intensity, as well as in the performance of lifting and sitting activities (tab. 4).

**Table 4. Results of the Oswestry questionnaire**

Results of the Oswestry questionnaire	Physical work		Office work		Z	p
	X	SD	X	SD		
Pain intensity	2.31	1.40	1.68	1.22	1.85	0.064
Lifting	1.31	1.49	1.10	1.49	0.74	0.460
Seat	1.23	1.37	1.10	0.94	-0.01	0.995
Sleeping	0.82	1.14	0.45	0.68	1.21	0.226
Traveling	1.26	1.29	0.71	0.86	1.57	0.116
Care	0.64	0.90	0.35	0.61	0.98	0.326
Walking	0.23	0.71	0.39	0.67	-1.01	0.315
Standing	1.21	1.24	0.74	0.89	1.58	0.113
Social Life	0.62	0.96	0.45	0.81	0.65	0.516
Change in pain intensity	1.26	1.14	1.16	1.04	0.35	0.723

p – test probability index; Z – U Mann-Whitney test

Most of the respondents had no disability caused by back pain – 44 people (62.9%). In the case of 20 people (28.6%) it was a slight disability, and in the case of 6 people (8.6%) moderate. There were no differences between the results of the subjects in the two groups ( $p=0.355$ ) (tab. 5).

**Table 5. The level of disability of the respondents in everyday life due to pain**

The level of disability of the respondents in everyday life due to the pain of ODI	Physical work		Office work		All	
	N	%	N	%	N	%
Lack	23	59.0%	21	67.7%	44	62.9%
Little	11	28.2%	9	29.0%	20	28.6%
Moderate	5	12.8%	1	3.2%	6	8.6%
Serious	0	0.0%	0	0.0%	0	0.0%
Whole	0	0.0%	0	0.0%	0	0.0%
All	39	100.0%	31	100.0%	70	100.0%
p	$\chi^2(1)=2.07$ $p=0.355$					

p – test probability index;  $\chi^2$  – Pearson's chi-square test



In the group of people working manually, the presence of 7 positive correlations between the intensity of pain and the degree of limitations in everyday functioning was demonstrated. People experiencing greater pain also indicated greater pain intensity in the Oswestry questionnaire, they had a greater problem in terms of lifting, traveling, caring for oneself, social activity and changing intensity of pain. They also had a higher overall disability index.

In the group of people performing office work, the presence of 7 positive correlations between the intensity of pain and the degree of limitations in everyday functioning was also confirmed. People experiencing greater pain also indicated greater pain intensity in the Oswestry questionnaire, and had greater problems with lifting, sitting, sleeping, traveling, and changing intensity of pain. These people also showed a higher overall disability index (tab. 6).

**Table 6. Assessment of the relationship between the intensity of pain and its influence on the level of disability of the respondents**

Variables & VAS	Physical work		Office work	
	R	p	R	p
Pain intensity	<b>0.67</b>	<b>0.000</b>	<b>0.72</b>	<b>0.000</b>
Lifting	<b>0.42</b>	<b>0.007</b>	<b>0.58</b>	<b>0.001</b>
Seat	0.26	0.116	<b>0.67</b>	<b>0.000</b>
Sleeping	0.23	0.168	<b>0.56</b>	<b>0.001</b>
Traveling	<b>0.43</b>	<b>0.007</b>	<b>0.57</b>	<b>0.001</b>
Care	<b>0.41</b>	<b>0.010</b>	0.24	0.192
Walking	0.27	0.093	0.20	0.292
Standing	0.27	0.103	0.22	0.242
Social Life	<b>0.42</b>	<b>0.008</b>	0.26	0.151
Change in pain intensity	<b>0.44</b>	<b>0.006</b>	<b>0.60</b>	<b>&lt;0.001</b>
General level of disability	<b>0.50</b>	<b>0.001</b>	<b>0.73</b>	<b>&lt;0.001</b>

p – test probability index; R – value of the Spearman’s rank correlation test

## Discussion

Pain in the lumbar region largely results from lifestyle and the work performed [16, 17]. It is a cause of lowered quality of life, absenteeism from work, lowering self-esteem, and also leads to motor disability. Based on the results of research, it can be concluded that the nature of the work performed may affect the occurrence of pain in the lower spine. Our own research clearly shows that among people who perform physical work,

as many as 97.4% of respondents report lower back pain. In the case of people working in a sitting position, 83.9% of respondents complained of pain in the area of the lumbar spine. This is a slight difference, but the majority are manual workers.

Research shows that a higher disability index, of 95%, is observed in the occurrence of back pain in manual workers [18]. Similarly, research by Kim et al. indicates that manual workers are more prone to back pain than office workers. 71.7% of firefighters surveyed suffered from lower back pain, while among people working in a sitting position this percentage was 54.5% [19].

Serranheira F. et al. studied a group of people who perform sedentary work and work that requires physical effort. According to their research, the frequency of back pain episodes in manual workers was six in twelve months, and in people working in a sitting position from 3 to 6 episodes of pain in twelve months. These results are comparable to the data obtained in the authors' own research [20].

In the authors' own research, when asked about the intensity of pain, the respondents overall assessed its level as average. The people studied who spend their free time in an active way constitute 54.3% of the total, and 45.7% of the respondents rest passively. The above results are consistent with the research of Kozłowski P. et al, who studied a group of people of both sexes, performing sedentary work and work that requires physical effort. In the question concerning the intensity of pain on the VAS scale, the respondents most often assessed their pain symptoms as 6 points. Only 7.8% of respondents report engaging in physical activity several times a week, the remainder take part in sports sporadically or not at all [21].

Another issue that was analysed was the method of self-managing back pain. Among manual workers, 47.4% declared that taking a comfortable and pain-relieving position was an effective way to combat pain, 21.1% respond to pain using painkillers, 18.4% did not take any action to reduce discomfort, while the smallest percentage of respondents (13.2%) do exercises to relieve pain in the lumbar spine. In the case of people doing sedentary work, the highest percentage of respondents (50%) cope with pain by assuming a comfortable posture, while 19.2% report taking painkillers, the same percentage of people perform exercises, the smallest proportion of respondents (11.5%) do not take any action, hoping that the pain will go away on its own.

Wolska et al, showed that taking painkillers was the most common way of coping with pain – 34.4% of all nurses participating in their study, 23.1% of the respondents do exercise to fight pain, 16.5% consult a doctor

when experiencing pain complaints, and relaxation techniques are used by only 5.8% of women [22]. Our own results and the results of Wolska et al. are slightly different; however, in both cases a large percentage of respondents use medications for fighting back pain.

Cichońska M. et al. in their research describe the use of painkillers as one of the most common methods of coping with back pain. Among the surveyed people who perform manual work and work in a sitting position, as many as 52% of the total declare taking medications to relieve pain, 11% of respondents admit to constantly taking large doses of medications [23].

Recurrent back pain may be a limitation in everyday functioning and lead to a related disability. The influence of lower back pain on functioning in everyday life was assessed in ten aspects using the Oswestry questionnaire. The greatest limitations in both studied groups concerned the intensity of pain and changes in its intensity, as well as lifting and sitting. In general, the impact of back pain on limitations in everyday life was assessed as average (19.31%), among people working manually this percentage was 21.74%, and in the group of office workers 16.26%.

Cetin H. et al. also described a disability index using the Oswestry questionnaire. The study participants were divided into three groups depending on the type of work they performed. Group A consisted of people doing sedentary work, group B manual workers performing dynamic activities, and group C people working manually in a standing position. The obtained results show that people in group B are more exposed to disability and lowered quality of life than the employees in the other groups [24].

Shin D. included a group of people doing office work in his research. The aim of the research conducted by the author is to investigate the relationship between the intensity of pain and the degree of disability in everyday activities. Shin D. also used the Oswestry questionnaire, in the Korean version, with an additional question relating to sex life. Statistical analysis shows that the disability index among office workers is 14.8 points, which indicates moderate disability. The analysis of our own results shows that the vast majority of the people studied did not have disability caused by lumbar spine pain (62.9%), in the case of slight disability the percentage of the respondents was 28.6%, and moderate disability was found in 8.6% of the total [25].

Summing up, the presented results of our own research do not differ significantly from the research conducted by other authors and it can be concluded that the type of work performed affects the quality of life and the incidence of back pain.

## Conclusions

Regardless of the nature of the work performed, most professionally active people experience pain in the lumbar spine, but more often in the case of people who do heavy physical work. For people who perform manual work, the frequency of pain is defined as “sporadic”, while among office workers, pain occurs more often – several times a month. A slight disability was found in 28.6% of the respondents, and moderate in 8.6% of all respondents. There was no serious disability assessed with the Oswestry questionnaire.

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