# The effectiveness of Pilates exercises on treating low back pain

# Efektywność ćwiczeń metodą Pilates w terapii dolegliwości bólowych kręgosłupa lędźwiowego

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**Article history:**
Otrzymano/Received: 27.12.2018
Przyjęto do druku/Accepted for publication: 09.02.2019
Opublikowano/Publication date: Luty 2019/February 2019

**Abstract**

**Introduction:** Back pain is now a common problem. The study aimed to examine the effectiveness of Pilates exercises on the subjective spinal pain discomfort. degree of quality-of-life impairment and the lower back mobility.

**Materials and methods:** It was conducted in a group of 30 participants with chronic low back pain in whom. before and after the twelve-week Pilates exercise interventions. the level of subjective pain tolerance (VAS scale). lumbar spine mobility and the degree of quality-of-life impairment were assessed.

**Results:** Involvement in the Pilates exercise programme helped to reduce subjective pain complaints. improved the spinal range of motion in all planes and enhanced the quality of life in all participants.

**Conclusions:** The Pilates method is an effective tool in treating chronic low back pain.

**Keywords:** Pilates method. low back pain. mobility of the spine. quality of life

## Introduction

The Pilates method was created by Joseph Pilates in the last century. Pilates focused on developing body awareness. which gave the opportunity to create exercises and programmes to prevent back injuries. The Pilates method involves stretching exercises. strengthening selected muscle groups. as well as mobilising exercises performed with full control of selected movement phases. which contribute to increasing the range of motion in the joints. There are many modifications to these exercises. ranging from the simplest for beginners to the more difficult for a more advanced group of people performing exercises. The Pilates training. according to the assumptions of the author of this method. is meant to contribute to lowering the level of stress. improving body posture. relieving the spine. eliminating muscular disharmony. strengthening muscles without their excessive load. overall improving the health of people performing exercises and making all muscles more flexible and stretched. The effectiveness of the exercise programme performed is increased due to the integration of movement. breath and mental control [1. 2].

The Pilates method has been developed especially for people struggling with back pain. because the exercises allow to strengthen muscles stabilising segments of the spine. as well as other postural muscles that affect the stabilisation of the correct position of the spine. The exercises that are performed regularly can be effective in reducing back pain. The effectiveness of these exercises consists in the simultaneous stretching of excessively tight back muscles and strengthening of deep muscles. which play an important role in segmental stabilisation [3].

Anyone can do Pilates exercises. Because no sudden movements and jumps are involved. this method is adequate for people with back pain. poor physical condition. overweight or joint diseases. The main benefits offered by Pilates include:

– muscle slimming and lengthening.
– rehabilitation of acquired injuries.
– injury prevention.
– relaxation of the whole body and improvement of its elasticity.
– increase in muscle strength. especially of the lower back. abdominal. buttock and hip muscles.
– improvement of spine stability.
– figure slimming and fat burning.
– improvement of control of back and limb muscles.
– correct breathing.
– increase of one's body awareness.
– loosening of the neck. shoulders and upper back
– improvement of balance and coordination.

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– achievement of elasticity of shoulder. spine and hip joints [4–6].

The study aimed to examine the effectiveness of Pilates exercises on the subjective spinal pain discomfort and the lower back mobility for people with chronic pain. Additionally. the degree of impairment of the participants' quality of life was assessed.

## Materials and methods

### Sample group

30 people in the 30–50 age range participated in the study. The average age of the respondents was 40.5 years. The qualifying criterion for the sample group was low back pain lasting at least 3 months. in the age between 30 and 50 years old. The exclusion criterion was acute and subacute.

The sample group consisted of 9 men (30% of the participants of the study) and 21 women (70% of the participants of the study).

### Methodology of the study

The surveys were carried out twice: before the beginning and one day after the end of the 3-month Pilates exercise period. All surveys were carried out by the same person. Pilates exercises were conducted by a certified Pilates instructor 3 times a week. for 60 minutes. for 3 months.

To determine the level of pain. the visual-analogue VAS scale was used. The participants of the study determined the intensity of back pain on a scale from 0 to 10. in which the following was adopted: "0" – no pain. "1" minimal pain level. "2–3" weak pain. a result in the range "3–6" determines moderate pain intensity. "6–9" severe pain. while "10" unbearable pain [7].

The functional activities of the persons surveyed were assessed using the modified *Low Back Pain Rating Scale – LBPRS*.

The assessment of treatment according to this scale includes the degree of impairment of quality of life determined on the basis of 15 types of activity. Respondents to the questions in the survey could answer "yes" – 2 points. "sometimes" – 1 point. "no" – 0 points. The degree of functional impairment of quality of life is in the range of 0 to 30 points. where "0" means the norm. while "30" significant impairment of the functional state [8].

The mobility of the lumbar spine was estimated in accordance with Zembaty's methodology [8]. Measurements were made in all areas using a centimetre tape. the result was given with an accuracy of 0.5 cm. In addition. after each movement. the surveyed person was asked about any pain sensations during the examination of the movement.

Respondents were also asked to subjectively assess the effectiveness of Pilates exercises. For this purpose. the school scale was used. in which "5" meant very good. "4" good. "3" satisfactory. and "2" insufficient.

The results were processed using the Statistica v10 software. The results of the *LBPRS* questionnaire were analysed using the chi-square test of independence. Changes in the intensity of pain felt were determined using a Student's t-test for dependent samples. Spinal mobility was analysed via Wilcoxon test. In all the above-mentioned tests. the level of statistical significance was assumed to be $\alpha=0.05$.

## Results

The average body weight of the participants of the study was 74 kg. the lowest value was 51 kg. the highest 110 kg. The average body height of the participants of the study was 171 cm. the smallest 155 cm and the largest 181cm. The BMI was calculated on the basis of the body weight and height of the participants of the study. It was found that the average BMI of the respondents was 26.6 kg/m$^2$. the lowest BMI was 18.5 kg/m$^2$ and the largest was 35.4 kg/m$^2$.

Considering the level of pain sensations determined in the VAS scale. it was observed that before starting Pilates exercises. the respondents most often determined the intensity of back pain at level 6. which meant severe pain. Pain level of 6 was marked by 16 participants of the study. while pain intensity of 7 was marked by 4 participants of the study. Weak pain "2–3" was indicated by 2 respondents. and the result in the range of 3–6. i.e. moderate pain – 5 respondents. Three out of thirty respondents rated the intensity of pain at 9. which means that it was very strong.

After 3 months of Pilates training. these results have improved significantly. No participant of the study rated pain intensity at 9 and 10. Pain at level 1 on the VAS scale was declared by two respondents. at level 2 by three respondents. 2 respondents at level 3. the same amount at levels 4 and 5. Severe pain. at level 6 according to the VAS scale. was determined by 14 respondents. at level 7 three and at level 8 by two participants of the study (Table 1).

The statistical analysis of the results of the VAS scale showed a significant reduction of back pain among people participating in the exercise programme ($p = 0.00001$).

Based on the survey conducted with the LBPRS questionnaire. it was observed that before applying Pilates exercises. the subjects reported problems with practically all activities indicated in the questionnaire (Table 2). After 3 months of regular exercise. activity difficulties have decreased significantly. The biggest change was in terms of the feeling of back pain when carrying two full shopping bags (approx. 10 kg). Also the answer regarding whether pain limits the performance of daily activities differed significantly before and after Pilates exercises. and whether back pain could have an important impact on the future of the participants of the study (Table 2).

There were no statistically significant differences in the analysis of the questions in the questionnaire before the exercises and after 3 months of training. except for the question about the

**Table 1.**

The level of pain intensity expressed on the VAS scale

| VAS scale | Before training | After 3 months |
|---|---|---|
| **0** | 0 | 0 |
| **1** | 0 | 2 |
| **2** | 0 | 3 |
| **3** | 2 | 2 |
| **4** | 3 | 2 |
| **5** | 2 | 2 |
| **6** | 16 | 14 |
| **7** | 4 | 3 |
| **8** | 0 | 2 |
| **9** | 3 | 0 |
| **10** | 0 | 0 |
| **In total** | 30 | 30 |

**Table 2.**

Assessment of the functional state according to the modified Low Back Pain Rating Scale

| Question | Before exercises | | | After 3 months | | |
|---|---|---|---|---|---|---|
| | yes | sometim | no | yes | sometim | no |
| Do you have back pain during night sleep? | 12 | 14 | 4 | 9 | 13 | 8 |
| Do you have problems putting on your socks and shoes on your own? | 2 | 3 | 25 | 1 | 2 | 27 |
| Are there works you cannot do because of back pain? | 12 | 13 | 5 | 9 | 8 | 13 |
| Does back pain occur when performing easy home activities such as: cleaning a table. watering flowers? | 2 | 15 | 13 | 0 | 13 | 17 |
| Do you experience back pain when leaning over a bathtub and brushing your teeth? | 6 | 16 | 8 | 4 | 12 | 14 |
| Do you experience back pain when carrying two full shopping bags (approx. 10 kg)? | 7 | 12 | 11 | 4 | 8 | 18 |
| Do you have problems getting up from a deep armchair? | 5 | 19 | 6 | 3 | 16 | 17 |
| Does back pain limit your daily activities? | 15 | 7 | 8 | 10 | 4 | 16 |
| Does back pain prevent you from going upstairs without resting? | 5 | 9 | 16 | 3 | 6 | 21 |
| Does covering a distance of 400 m cause back pain? | 3 | 16 | 11 | 1 | 13 | 16 |
| Do you think that back pain can have an important impact on your future? | 17 | 10 | 3 | 5 | 14 | 11 |
| Do you experience back pain when riding a bicycle or a car? | 9 | 16 | 5 | 5 | 12 | 13 |
| Does back pain affect your emotional attitude towards your immediate family? | 13 | 8 | 9 | 5 | 13 | 12 |
| Have you had to cancel any social meeting due to back pain in the last two weeks? | 4 | 0 | 26 | 0 | 0 | 30 |
| Does your back pain make you rest during a 100 m run? | 4 | 12 | 14 | 2 | 10 | 18 |

impact of back pain on the future of the participant of the study ($p = 0.002$).

On the basis of the analysis of the results of the low back mobility. statistically significant improvement was found in all analysed variables in the group of people performing exercises ($p < 0.01$). Spinal mobility increased significantly in each area examined (Table 3. Figure 1).

The results of exercise participants regarding the evaluation of the effectiveness of Pilates therapy are presented in Table 3. After 3 months of regular exercise. responses differed significantly from those at the beginning of the study. People participating in the exercises rated the effectiveness of the Pilates method very well (18 participants of the study) or well (12 participants of the study). No respondent provided "satisfactory" (3) and "insufficient" (2) answers.

## Discussion

The survey conducted on a group of people implementing the Pilates exercise programme confirmed its beneficial effect on reducing pain and improving low back mobility.

Chronic back pain is an increasingly frequent phenomenon that directly and indirectly reduces the quality of life. In nearly 90% of patients. non-specific lower back pain spontaneously

**Table 3.**

Comparison of results of examination of ranges of movement within the examined group before and after exercises

| Variables | | M | SD | Me | Min | Max | Z | p |
|---|---|---|---|---|---|---|---|---|
| **flexion** | Before | 4.95 | 1.54 | 5 | 2 | 8 | -4.439 | 0.0001 |
| | After | 5.99 | 1.34 | 6 | 3 | 8.9 | | |
| **extension** | Before | 3.95 | 1.2 | 4 | 2 | 6.5 | -4.435 | 0.001 |
| | After | 4.76 | 0.87 | 5 | 3 | 7 | | |
| **right side flexion** | Before | 6.93 | 1.36 | 7 | 5 | 9 | -3.915 | 0.0001 |
| | After | 7.81 | 1.07 | 8 | 6 | 9 | | |
| **left side flexion** | Before | 7.02 | 1 | 7 | 5.5 | 9 | -3.060 | 0.002 |
| | After | 7.48 | 0.78 | 7 | 6 | 9 | | |
| **clockwise rotation** | Before | 3.69 | 0.86 | 4 | 2 | 4.5 | -4.360 | 0.0001 |
| | After | 4.64 | 0.58 | 4.5 | 4 | 6 | | |
| **counter-clockwise rotation** | Before | 4.2 | 0.6 | 4 | 3 | 5.5 | -4.541 | 0.0001 |
| | After | 4.9 | 0.71 | 5 | 4 | 6 | | |

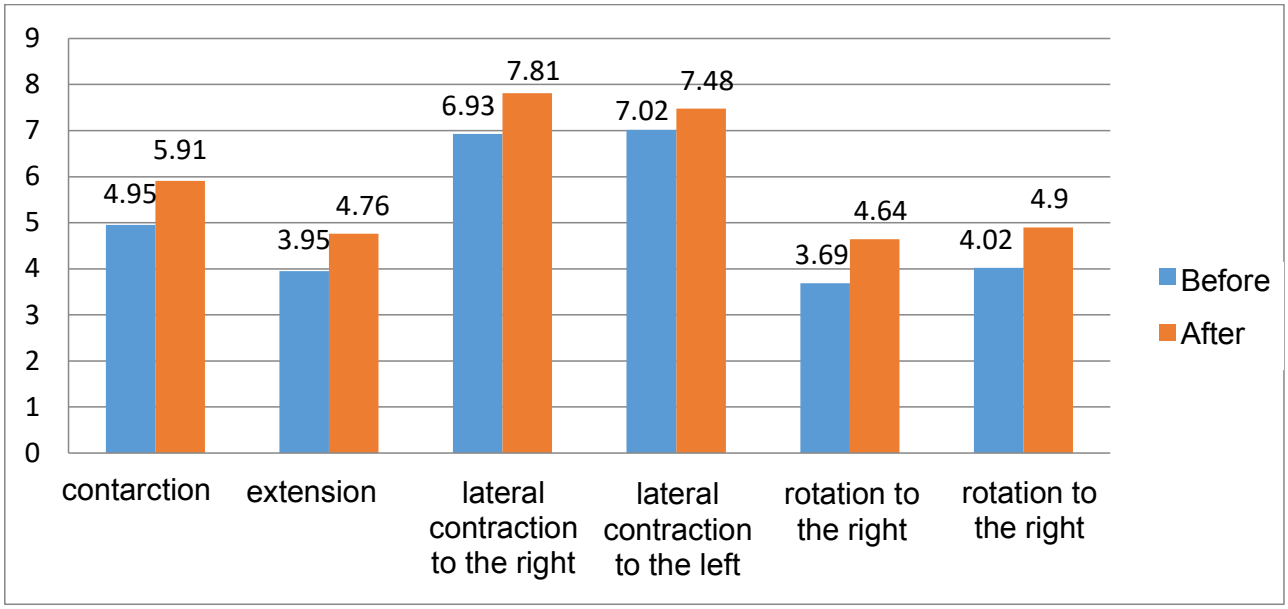


**Figure 1.** Comparison of results of examination of ranges of movements within the examined group before and after exercises

**Table 4.**

Subjective assessment of the effectiveness of Pilates exercises

| | very good | good | satisfactory | bad |
|---|---|---|---|---|
| **before exercises** | 2 | 15 | 8 | 5 |
| **after exercises** | 18 | 12 | 0 | 0 |

disappears after about 2 to 6 weeks. [10–12]. On the other hand. nearly 65% of patients who consulted with a family physician are asymptomatic 12 weeks after an episode of non-specific low back pain [13]. However. in about 30% of cases of the discussed pain. a shift into a chronic phase occurs. which. together with the recurrent nature of these ailments. presents a large scale of this problem [12]. That is why. in the era of commonly occurring pain and degenerative changes of the spine. finding an optimal training and improvement programme that will contribute to reducing accompanying ailments is a very important task. In the method of Joseph Pilates exercises. particular emphasis is placed on awareness of the correct body posture as well as on strengthening postural muscles. whose proper tension is important in the prevention and treatment of pain in the low back. It is also important to be able to perform exercises with controlling the neutral position of the pelvis [14]. The results of own study confirmed the effectiveness of the Pilates exercises in reducing the level of pain sensations and correlate with the results of studies conducted in a group of office workers [15]. Three-month Pilates training significantly contributed to both the decrease in the level of pain felt as well as the decrease in the level of disability and improvement of the quality of life of people participating in the exercises. Reducing pain is one of the most important assumptions of rehabilitation. because pain significantly reduces the quality of life of the patient and often leads to disability. Similarly. existing restrictions on the mobility of the spine also significantly reduce the quality of life of the patients [16]. In the own study. three-month Pilates training allowed to significantly increase the mobility of the spine in all examined areas. The results obtained correlate with Lipko-Kowalska's research. in which Pilates exercises significantly improved the flexibility of exercising women and additionally contributed to the improvement of muscle strength [17]. Despite the lack of static significance in the analysis of the results of most of the answers to the LBPRS questionnaire in own study. it can be seen that the three-month training has reduced the difficulty of performing most activities. The number of respondents declaring that there were no difficulties with performing certain activities increased significantly. The effectiveness of Pilates exercises in improving posture stability and muscle strengthening has also been confirmed in other studies [18]. The obtained benefits contributed to the improvement of the quality of functional movements of the upper limbs. due to achieving proper postural control and stabilisation of the spine. Also. the results of studies by Gladwell et al. carried out in a group of people with chronic back pain clearly indicate improvement in general health. pain level. functional activity. flexibility and proprioception of people participating in Pilates training compared to the non-exercising group [19].

The Pilates method. like Kinetic Control. allows for optimising movement as well as minimising and controlling improper muscle tension. Integration of many parts. such as: sensory feedback. neuromuscular control. motor coordination. allows for proper postural control and life without pain. On the other hand. Yomoto et al. in their conclusions emphasise that although there is evidence of the effectiveness of the Pilates method in reducing pain. its advantage over other types of exercises has not yet been proven [20].

It should be noted that Pilates training is a kind of movement with low participation costs. There is no need to spend large financial expenses on specialised training devices. whereas the activities themselves may be conducted both in rehabilitation clinics and in fitness clubs. It seems that this form of movement may play a very important role in the prevention and re-education of patients with chronic back pain.

## Conclusions

1. Exercises using the Pilates method reduced pain. improved spine mobility and the quality of life of the persons participating in the study.
2. Persons who were performing exercises highly rated the effectiveness of Pilates exercises.

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**Streszczenie**

**Wstęp:** Dolegliwości bólowe kręgosłupa stanowią obecnie problem powszechny. Celem badań było sprawdzenie wpływu ćwiczeń Pilates na poziom odczuwanych dolegliwości bólowych. stopień ograniczenia jakości życia i ruchomość kręgosłupa lędźwiowego.

**Materiał i metody:** Badania przeprowadzono w grupie 30 osób z przewlekłymi dolegliwościami bólowymi kręgosłupa. Przed i po trzymiesięcznym okresie ćwiczeń metodą Pilates oszacowano poziom bólu (skala VAS). ruchomość kręgosłupa lędźwiowego i stopień upośledzenia jakości życia.

**Wyniki:** Udział w ćwiczeniach Pilates przyczynił się do zmniejszenia poziomu bólu. poprawy zakresu ruchów we wszystkich płaszczyznach oraz poprawy jakości życia badanych.

**Wnioski:** Metoda Pilates jest skutecznym narzędziem w terapii przewlekłych dolegliwości bólowych kręgosłupa lędźwiowego.

**Słowa kluczowe:** ćwiczenia Pilates. ból kręgosłupa. ruchomość kręgosłupa. jakość życia