ISSN 2080-2021 • e-ISSN 2449-9021

Puls Uczelni 2016 (10) 2

Prace oryginalne | Original papers

DOI: 10.5604/20812021.1208705

ASSESSMENT OF THE EFFECTS OF MOBILISATION ON THE RANGE OF MOTION AND THE LEVEL OF PAIN IN PATIENTS WITH LUMBAR SPINE SYMPTOMS

OCENA WPŁYWU TECHNIK MOBILIZACJI NA ZAKRES RUCHU ORAZ DOLEGLIWOŚCI BÓLOWE U PACJENTÓW Z DOLEGLIWOŚCIAMI ODCINKA LĘDŹWIOWEGO

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | data interpretation, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature search, **G –** pozyskanie funduszy | funds collection

SUMMARY

Background: Low back pain is one of the most common musculoskeletal disorders with which patients come to a physiotherapist and it affects younger and younger people.

Aim of the study: The aim of this paper was to assess the effect of mobilisation techniques for low spine on the range of motion and pain level in patients complaining of strong pain in that area.

Material and methods: The study population consisted of 20 patients, aged between 28 and 67 years old ($x = 47.55 \pm 12.04$) with low back pain. Physical examination was performed to determine the movements which increased the pain. To assess the severity of pain, an analogue VAS scale was used. During treatment, "closing" techniques for the spinous processes were used. The treatment was carried out once and its duration was half an hour. After the therapy, the measurements were repeated.

Results: A significant reduction of pain was observed after the treatment in the following movements: extension ($p \leq 0.001$), lateral flexion to the left side ($p < 0.000$), lateral flexion – right side ($p < 0.000$), rotation to the left ($p \leq 0.014$), rotation to the right ($p \leq 0.016$). An analysis of the Student's t-test results showed statistically significant ($p < 0.001$) difference in the range of motion during extension before and after treatment, with greater range after treatment.

Conclusions: The techniques of manual mobilization of the lumbar spine are effective in decreasing pain and increasing the range of motion during lumbar spine extension.

KEYWORDS: manual therapy, VAS scale, low back pain

STRESZCZENIE

Wstęp: Ból odcinka lędźwiowego kręgosłupa jest jedną z najczęstszych dysfunkcji narządu ruchu, z jaką pacjenci zgłaszają się do fizjoterapeuty, i dotyczy coraz młodszych osób.

Cel pracy: Celem pracy była ocena wpływu technik mobilizacji dolnego odcinka kręgosłupa na jego zakres ruchu i poziom bólu u pacjentów z silnymi dolegliwościami wymienionej okolicy.

Materiał i metody: Do badań zakwalifikowano 20 pacjentów w wieku 28–67 lat (x = 47,55±12,04) z dolegliwościami bólowymi w dolnym odcinku kręgosłupa. W celu określenia ruchów nasilających dolegliwości bólowe wykonano badanie fizykalne, a do oceny nasilenia bólu posługiwano się skalą analogową VAS. W terapii wykorzystano technikę „zamykania" wyrostków kolczystych. Terapia przeprowadzona została jednorazowo, a czas jej trwania wyniósł pół godziny. Po terapii pomiary powtórzono.

Wyniki: Zaobserwowano istotne zmniejszenie bólu po terapii w ruchach: wyprostu (p ≤ 0,001), skłonu bocznego w lewo (p < 0,000), skłonu bocznego w prawo (p < 0,000), rotacji w lewo (p ≤ 0,014), rotacji w prawo (p ≤ 0,016). Analizując wyniki w teście T-Studenta, zaobserwowano istotne statystycznie zwiększenie zakresu ruchu wyprostu po zastosowanej terapii (p < 0.001).

Wnioski: Techniki manualnej mobilizacji odcinka lędźwiowego kręgosłupa przy ograniczeniu ruchu w kierunku wyprostu wpływają na zmniejszenie dolegliwości bólowych oraz zwiększają zakres jego ruchu.

SŁOWA KLUCZOWE: terapia manualna, skala VAS, ból odcinka lędźwiowego kręgosłupa

Background

Manual therapy is one of successful physiotherapeutic non-operative treatment methods for pain. It uses a number of procedures within the scope of reversible structural dysfunctions of the motor organ. Since the second half of the 20th Century, this method has been rapidly developing thanks to the expanding number of schools teaching this area of medicine. Manual therapy provides a wide range of therapeutic tools used in treatment, which include, inter alia, mobilization techniques and high velocity mobilisation techniques, known as manipulation [1–4].

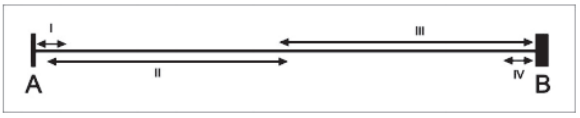


Figure 1. The characteristics of manual mobilisation in accordance with the German school, including four points: A – beginning of the movement, B – end of the movement [5]

Prior to performing treatment in the lumbar spine, the patient undergoes examination, inter alia on the spinous processes, the so-called opening and closing of the interspinous gaps, i.e. moving the spinous processes away from each other and moving them closer together during passive flexion and extension of the lumbar spine, respectively. Manual mobilisations of the spine are performed similarly. If the physical therapist wants to mobilise a certain segment, then during the opening movement they should block the spinous process, which is caudally higher in the given segment, with their finger and the opening movement should be initiated with the lower part of the body, by performing passive flexion of the lumbar spine. During the closing movement, the physical therapist should block the spinous process which is cranially higher in the given segment and the closing movement should be initiated with the lower part of the body, by performing passive extension of the lumbar spine. Own experience, corroborated by other authors, shows that in cases of limited range of motion, properly selected and performed mobilisations have positive effect on improving the range of motion in the lumbar spine.

The German school of physical therapy names four grades of mobilization:

I. Small amplitude movement at the beginning of the available range of motion in a joint.
II. Large amplitude movement in the middle of the available range of motion in a joint.
III. Large amplitude movement from the middle to the limit of the available range of motion in a joint.
IV. Small amplitude movement at the end of the available range of motion in a joint.

The grades of mobilisation are presented on Figure 1. Performing mobilisation techniques produces positive neurophysiological, mechanic and psychological effects [6–7].

Aim of the study

The aim of this paper was to assess the effect of mobilisation techniques for low spine on the range of motion and pain level in patients complaining of strong pain in that area. We assumed that the use of manual mobilisation techniques moving the spinous processes closer together in patients experiencing pain during extension of the spine, with simultaneous lack of such movements during flexion will decrease the pain level and improve to range of motion in that area.

Material and methods

The study population consisted of 20 patients, 10 men and 10 women, who came to Fizjo-Wysz Physical Therapy Centre complaining of pain the lumbar spine. The subjects were aged between 28 and 67 years old (x = 47.55±12.04). The inclusion criteria were: strong pain in the lumbar spine (10 on VAS) during extension, preventing the patient from extending the spine and no pain in flexion. The subjects did not take any medication, did not use any ointments or gels, and did not receive any therapy for

this affliction. The patients included in the study were in acute stages of the condition and experienced pain no later than 7 days after their first appointment with a physical therapist.

Each patient had their history taken and underwent examination assessing the mobility of the spine. The extension of the lumbar spine was measured from the xiphoid process to the pubic tubercle of the pubic bone using a measuring tape, in a standing position and in the maximum available range of extension of the lumbar spine. The difference between these two measurements constituted the range of extension mobility of the lumbar spine [8]. Moreover, we determined which motions increase and which decrease or even eliminate pain. During the examination, each patient was seen to be forced to take a position which reduced pain – flex, while an attempt to "straighten up" increased pain, which prevented the patient from fully extending. When the patient lied down on the side, we assessed the opening and closing movements, i.e. moving the spinous process away from each other during passive flexion and closer to each other during passive extension of the lumbar spine. The treatment was performed once, and the duration was 30 minutes. Moreover, each participant assessed the severity of pain on the 10 degree VAS.

After analysing the results of the examinations, we moved on to the therapeutic procedure, which constituted of performing mobilisation techniques closing the spinous processes. After the treatment, the mobility of the spine was re-examined and the severity of pain was re-assessed on VAS. The results were entered into an Excel spreadsheet and analysed using Statistica v8. Descriptive statistics were performed to provide characterisation of the study material (Table 1). Shapiro-Wilk's test was used to assess normal distribution. The results were different from normal. Student's t-test for dependent samples was used to perform statistical analysis, with statistical significance set at $p \leq 0.05$.

Table 1. Characteristics of the study group including age, BMI, height and weight of the subjects

Variable	Age [years]	Weight [kg]	Height [m]	BMI [kg/m²]
Min.	28	56	1.65	19.37
Max.	67	110	1.84	32.49
x	47.55	76	1.75	24.58
SD	12.04	13.11	0.05	3.61

Source: Own study.

Results

Table 2 contains the results of the assessment of the available range of extension in the lumbar spine.

Before treatment none of the participants were able to extend their spine due to strong pain. After the treatment, the range of motion for all participants changed between 3 and 7.5 cm, while only 9 out of 20 reached range of motion normal for their age range [8]. At the same time we observed that the pain experienced during extension significantly lessened.

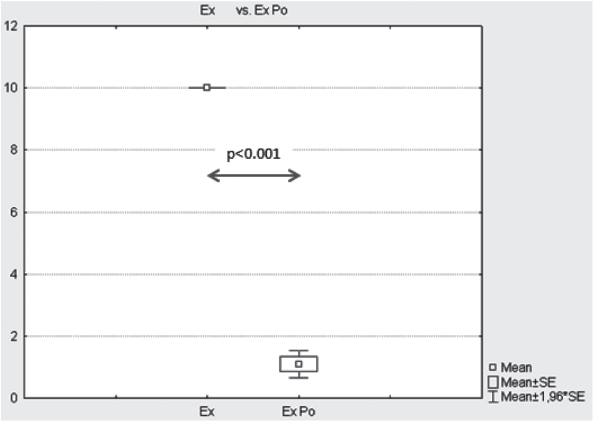
We compared the mean results of pain assessment on VAS before and right after administering mobilization techniques during extension, the data are presented on Figure 2.

Table 2. Assessment of the available range of extension in the lumbar spine

Variable	Before treatment			After treatment			*p*
	Initial position [cm]	End position [cm]	Result Difference [cm]	Initial position [cm]	End position [cm]	Result Difference [cm]	
Min.	28	0	0	28	32	3	$p < 0.004$
Max.	45	0	0	45	49	7,5	
x	35.73	0	0	35.73	40.73	5	
SD	5.69	0	0	5.69	5.39	1.32	

p – statistical significance.

Source: Own study.

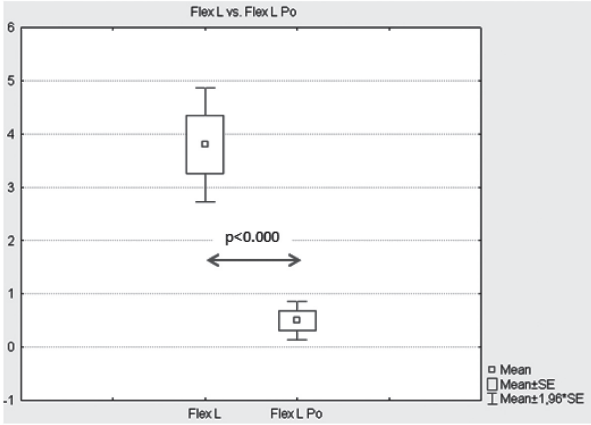


Explanation of acronyms:
Ex – extension range of the lumbar spine before treatment,
Ex Po – range of motion in trunk rotation to the right after treatment.
Source: Own study.

Figure 2. Mean distribution for the assessment of pain during extension before and after the treatment

An analysis of the results of Student's t-test on the assessment of the range of motion in extension before treatment showed statistically significant differences ($p < 0.001$). The mean for pain severity on VAS was 10 before treatment, and 1.1 after treatment.

We compared the mean results of pain assessment on VAS before and right after administering mobilization techniques during lateral flexion to the left side, the data are presented on Figure 3.

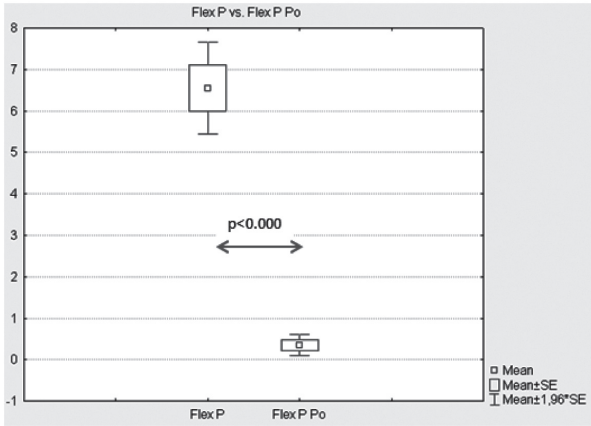


Explanation of acronyms:
Flex L – range of lateral flexion to the left side before treatment,
Flex L Po – range of lateral flexion to the left side after treatment.
Source: Own study.

Figure 3. Mean distribution for the assessment of pain during lateral flexion to the left side before and after the treatment

An analysis of the results of Student's t-test on the assessment of the range of motion in lateral flexion to the left side before and after treatment showed statistically significant differences ($p < 0.000$). The mean for pain severity on VAS decreased from 3.8 before treatment to 0.5 after treatment.

We compared the mean results of pain assessment on VAS before and right after administering mobilization techniques during lateral flexion to the right side, the data are presented on Figure 4.

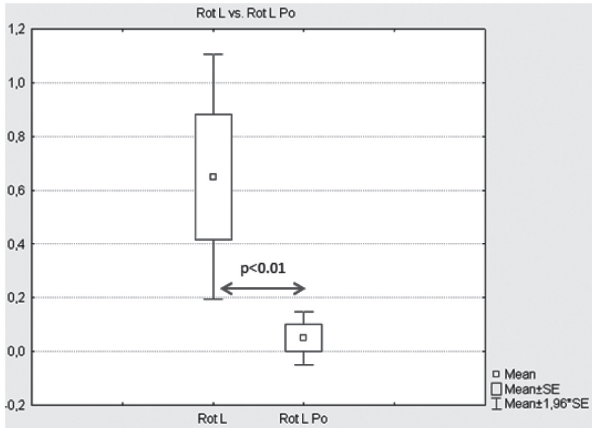


Explanation of acronyms:
Flex P – range of lateral flexion to the right side before treatment,
Flex P Po – range of lateral flexion to the right side after treatment.
Source: Own study.

Figure 4. Mean distribution for the assessment of pain on VAS during lateral flexion to the right side before and right after the treatment

An analysis of the results of Student's t-test on the assessment of the range of motion in lateral flexion to the right side before and after treatment showed statistically significant differences ($p < 0.000$). The mean for pain severity on VAS decreased from 6.55 before treatment to 0.35 after treatment.

We compared the mean results of pain assessment on VAS before and right after administering mobilization techniques during rotation to the left, the data are presented on Figure 5.



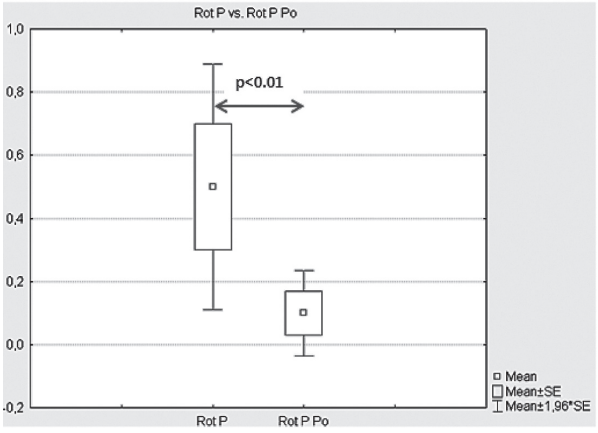
Explanation of acronyms:
Rot L – range of motion in trunk rotation to the left before treatment,
Rot L Po – range of motion in trunk rotation to the left after treatment.
Source: Own study.

Figure 5. Mean distribution for the assessment of pain during rotation to the left before and right after the treatment

An analysis of the results of Student's t-test on the assessment of the range of motion in rotation to the left before and after treatment showed statistically significant differences ($p < 0.01$). The mean for pain se-

verity on VAS decreased from 0.65 before treatment to 0.05 after treatment.

We compared the mean results of pain assessment on VAS before and right after administering mobilization techniques during rotation to the right, the data are presented on Figure 6.



Explanation of acronyms:
Rot P – range of motion in trunk rotation to the right before treatment,
Rot P Po – range of motion in trunk rotation to the right after treatment.

Source: Own study.

Figure 6. Mean distribution for the assessment of pain on VAS during rotation to the right before and right after the treatment

An analysis of the results of Student's t-test on the assessment of the range of motion in rotation to the right before and after treatment showed statistically significant differences (p = 0.01).

The participants did not experience any pain in the lumbar spine after the treatment.

Discussion

The present study shows results of the assessment of the efficiency of manual mobilization in patients experiencing low back pain.

Many available sources document the positive effect of full range of physical therapy on decreasing pain and improving the range of motion. In a study by Sapuła et al. conducted on a group of 37 patients suffering from low back pain prior to commencing physical therapy, which included kinesytherapeutic, physical therapy and mobilization treatments, the study population underwent a number of examinations, starting with assessing the range of motion and severity of pain and ending with assessing the radicular symptoms and experiencing pain. The administered treatment decreased pain and improved the range of motion [9].

Similar findings were presented by Depa et al.: full range of physical therapy, including physiotherapy treatments, such as magnetic field, diadynamic currents, cryotherapy, iontophoresis with lignocaine, massage and kinesiotherapy, significantly improved the range of motion and subjective assessment of experienced pain in patients with low back pain [10]. While there is irrefutable proof to the claim that full range of physical therapy in the case of patients with low back pain is effective, the results of studies on the effectiveness of manual mobilisations are ambiguous.

Willem et al. performed a meta-analysis of randomized studies, where the results of studies assessing the effectiveness of manual mobilisations of the spine in comparison with simulated therapy and using traditional treatment methods were analysed. The results showed that administering manual mobilisations is more effective than simulated therapy, however the authors did not determine significantly better effects in comparison with physical therapy, exercises, taking pain medication and back school exercises. Even though the authors documented clinically significant short-term decrease of low back pain, the results were not statistically significant [11]. Meta-analysis by Bronfort et al. showed that in the case of patients with severe back pain, there is moderate proof of more positive effect of administering manual manipulation in comparison with mobilizing the spine and limited proof of faster recovery of the patients who were administered manual manipulation in comparison with patients who received standard physiotherapeutic treatment [12]. Even though these studies do not show significant effectiveness of administering manual mobilisations in patients with severe back pain, own studies showed significant improvement of the range of motion and decrease in pain in the study group. Due to the discrepancy between the results, we recommend further studies and incorporating control groups in the future.

Conclusions

1. Using manual techniques closing spinous processes decreases or eliminates pain and improves mobility in the lumbar spine in patients suffering from severe pain and limited range of extension.

2. The results of the present study are promising, however further studies on a larger population and including other therapeutic procedures or including a control group to allow the comparison of the effects of administered therapy are required.

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Word count: 3059 • Tables: 2 • Figures: 6 • References: 12

The sources of funding
The review was funded by the authors.

The conflict of interests
The authors do not report any conflicts of interests.

Cite this article as: Wyszyński S, Stiler S, Piotrkowicz J, Federowicz P. Assessment of the effects of mobilisation on the range of motion and the level of pain in patients with lumbar spine symptoms.
PU-HSP 2016; 10, 2: 11–16.

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Received: 25.01.2016
Reviewed: 10.02.2016
Accepted: 09.05.2016