

RESEARCH ON THE MANAGEMENT OF LOW BACK PAIN THROUGH PHYSIOTHERAPY AND EXERCISE

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ABSTRACT

Low back pain can have many causes, including damage to the lumbar spine: lumbar disc herniation or radiculopathy. Because of it, a person's daily activities can be considerably affected, which is why the intervention of a medical specialist is necessary.

In the present study, 55 patients with low back pain were included, who underwent a combined treatment: physiotherapy procedures together with therapeutic physical exercise. The program was individualized according to the needs of the patients.

Both before the start of the treatment and after its completion, the following parameters were evaluated: pain (through VAS scale), flexibility of the lumbar spine (Schober test and finger-ground index) and quality of life (questionnaire QOL-BREF).

The final results showed significant improvements for each of the previously listed parameters, which proves the effectiveness of the treatment applied for 15 days.

INTRODUCTION

The spine is one of the most important components of the myo-artho-kinetic apparatus. From a mechanical point of view, it withstands intense demands, especially in everyday life that involves working at the office for many hours every day. (Kjaer, P., Kongsted, A., Ris, I., Abbott, A., Rasmussen, C. D., Roos, E. M., ... & Hartvigsen, J., 2021). Evaluation of the risk factors is very important in the study of this condition. (Chou, R., 2021). In some cases, low back pain determines patients

to adjust their movements in order to reduce pain on a daily basis. (van Dieën, J. H., Flor, H., & Hodges, P. W., 2017).

Low back pain can occur mainly in people who work in a sitting position for a long time, sometimes being transmitted through the sciatic nerve to the lower limb. (Qaseem, A., Wilt, T.J., McLean, R.M., & Forciea, M.A., 2017). This condition is a cause of major work loss nowadays. (Becker, B. A., & Childress, M. A., 2019). In recent years, this pain also occurs in young children and adolescents, this being very concerning for general health. (García-Moreno, J. M., Calvo-Muñoz, I., Gómez-Conesa, A., & López-López, J. A., 2022).

This study has a starting point a study conducted in 2020 on the same topic, and involved monitoring a group of patients who followed a program of physical therapy and exercise to treat low back pain. The duration of the study is 6 months, during which a number of 55 patients followed the treatment.

To carry out the study, an initial assessment was carried out to determine the initial parameters the patient presents for treatment, then physiotherapy procedures and physical exercises were applied for 15 days. Following the application of the treatment, the final evaluation of the patients was carried out, in order to ascertain the progress achieved.

MATERIALS AND METHODS

To perform the initial and final measurements, the following functional tests were used: the Schober test and the finger-ground index. Questionnaires were used: QOL to measure quality of life and VAS scale to assess pain. They were applied initially and finally, their results being analyzed and compared in order to evaluate the improvement of these indices following the physiotherapy procedures and physical exercises applied.

The Schober test was performed as follows: in orthostatism, the apophysis of the L5 vertebra was marked, and a distance of 10 centimeters superior to L5, on the median line, was also marked. The patient was asked to bend over without bending the knees or rotating the pelvis. The greater the distance between the two marks during bending, the better the flexibility of the spine is considered. Normal spine flexibility was considered if the distance between the marks was greater than or equal to 5 centimeters.

For the fingers-ground index, the values were recorded as follows: from the orthostatic position, the patient is asked to bend down, trying to touch the ground with the fingers, without bending the knees. It was measured the distance from the fingers to the ground using the tape measure. The greater the finger-to-ground distance, the less flexibility the lumbar spine has.

QOL-BREF includes questions to assess patient's quality of life, correlated with their mental and physical status. The QOL questionnaire was applied in the short version approved by the World Health Organization.

The Visual Analogue Scale (VAS) is used to assess pain, in this case low back pain. Patients were asked to rate the level of pain felt before starting the procedures and exercises, but also after finishing the treatment protocol.

Physiotherapy procedures used in the treatment were:

- TECAR therapy;
- 4-pole interferential current;
- TENS;
- Ultrasound;
- Laser.

TECAR therapy was applied for 20 minutes/session, using as intensity the level of tolerance of each patient. A metal element placed under the patient's abdomen was used, it being in the ventral decubitus position. The other element was used making light movements on the surface of the lumbar area, using a special conductor for this equipment. TECAR therapy is used for the analgesic effect and to increase the blood flow in the depth of the tissue by means of diathermy. (Di Filippo, F., Catananti, C., Sarchielli, P., Calabro, R.S., Palazzo, C., & Bagavoli, G., 2019).

Interferential current was applied to the lumbar area, using 4 electrodes, two crossed channels, to focus its effect on the center of the painful area. The application time was 20 minutes/session, using the patient's tolerance threshold as the intensity level. This current was applied for its decontracting, analgesic and vasodilating effect. (Fuentes, J.P., Armijo-Olivo, S., Funabashi, M., Miciak, M., Dick, B., Warren, S., Magee, D.J., 2018).

The TENS current is a low frequency one, which has as its main effect analgesia. (Johnson, M. I., Paley, C. A., Howe, T. E., & Sluka, K. A. (2015). Its application time was 20 minutes/session, using two poles placed on either side of the painful area.

Ultrasound was applied with an intensity of 1 W/cm², paravertebrally, at the level of the lumbar spine, using conductive gel, for 2 minutes/session. The main effect it was used for is cavitation. (Carbonell-Baeza, A., & Aparicio, V. A., 2011)

Laser therapy has been used to stimulate healing processes at the tissue level. (Notarnicola, A., Maccagnano, G., Tafuri, S., Pesce, V., Fiore, A., Moretti, L., & Moretti, B., 2014). It was applied for 6 minutes/session.

Physical exercises were performed with the aim of reducing pain and improving muscle tone in the back. (Chow, R.T., Johnson, M.I., Lopes-Martins, R.A., & Bjordal, J.M., 2009). The Williams program was used, along with active stretching exercises performed progressively in intensity and difficulty. Physical therapy uses physical exercise in a systematic way to restore the function of the arthrokinetic apparatus and improve the quality of life. (Marcu V., Dan Mirela, 2010, p. 27). They need to be progressive though, to achieve the maximum improvement possible. (Kiss I., 2007, p. 35) Physical exercise improves the stability and mobility

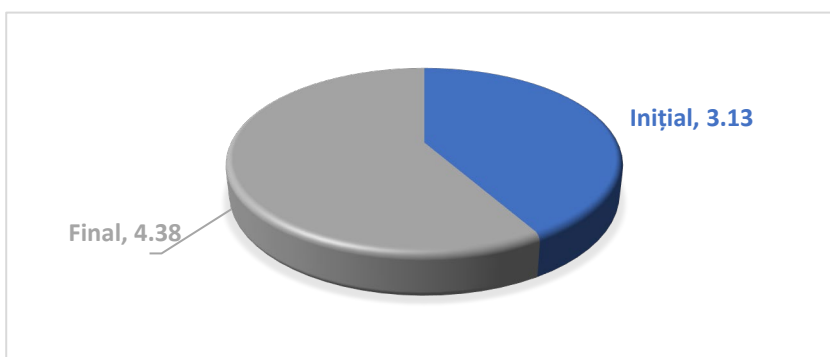
of the joint and improves the normal sequence of movements. (Cordun Mariana, 1999).

RESULTS

The results obtained from the initial and final measurements were quantified and compared in the tables and graphs below. Arithmetic mean, mode, standard deviation, median and t-test were used as statistical indices.

THE SCHOBER TEST

To compare the results, the arithmetic mean of the initial Schober test values was calculated, and the arithmetic mean of the Schober test values after the 15 days of treatment, being considered final values.



Graph 1. – Average values of the initial and final Schober test results (cm).

In the graph above, you can see the average value of the results of the Schober test initially carried out, being 3.13 centimeters distance between the two markings. For the final testing, the average value of the results is 4.38 centimeters distance between the marks. Thus, a significant improvement in the results obtained following the treatment is noted.

For the initial measurements mode value was 3, and for the final measurements the value was 4, which reinforces the conclusion obtained by comparing the arithmetic means above.

The initial median value was 3, and the final value was 4, the final value being higher. The standard deviation recorded 0.76 initial and 0.59 final.

Table 1. – Statistical indices calculated for the Schober test, initial and final.

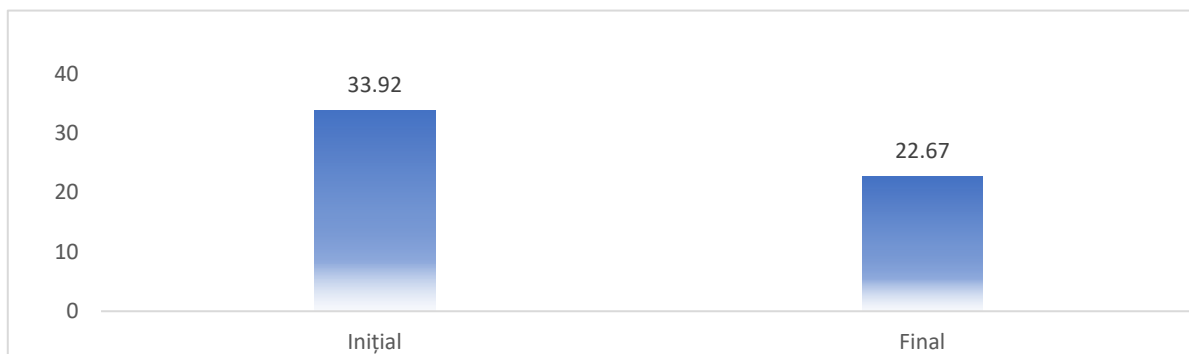
Statistical indexes	Initial values	Final values
Average	3.13	4.38
Mode	3	4
Median	3	4
Standard deviation	0.76	0.59
t-test	p<0.05	SIGNIFICANT

In the T-Student test, the p-value was less than 0.05, which means that the null hypothesis is not confirmed, and the difference between the initial and final results is statistically significant.

These results demonstrate that following the application of the treatment, the mobility and flexibility of the spine were significantly improved, the treatment being an effective one.

INDEX FINGERS-GROUND

At initial measurements, the finger-ground index values ranged from 46 centimeters to 21 centimeters. However, the final measurements ranged from 8 to 36 centimeters. The values of the arithmetic mean of the initial measurements compared with the final ones are according to the representation in graph 2:



Graph 2. – Average values of the initial and final measurements for the toe-soil index (cm).

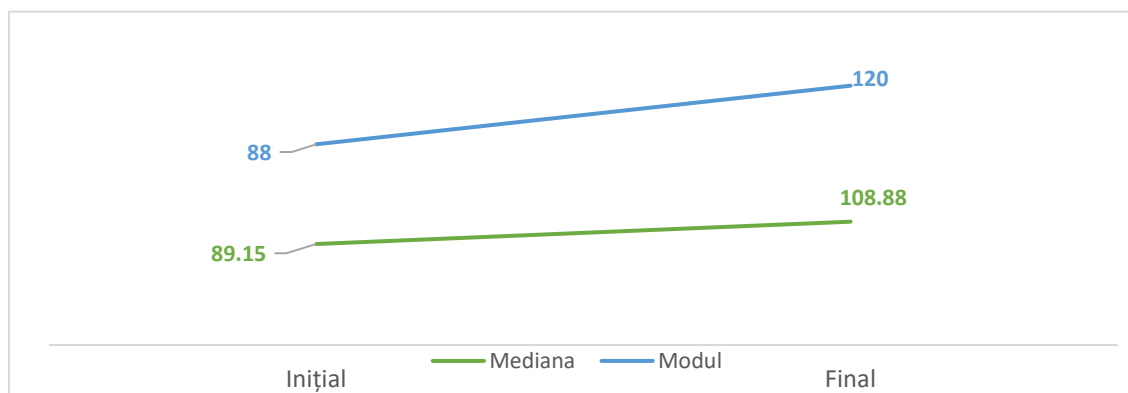
Observing the values represented in the graph above, we find that the difference between the two arithmetic means is 11.25 centimeters. This result indicates a significant improvement in the flexibility of the lumbar spine following the applied treatment.

Table 2. – Calculated statistical indices for toe-soil index, initial and final.

Statistical indexes	Initial values	Final values
Average	33.92	22.67
Mode	33	20
Median	33	22
Standard deviation	6.65	6.54
t-test	p<0.05	SIGNIFICANT

The module recorded values of 33 centimeters for the initial measurements, and 20 centimeters for the final measurements, which means that the most common value of the finger-ground index measurement decreased by 13 centimeters in the final measurements compared to the most common value at the initial measurements.

The median was 33 at baseline and 22 at final, and the standard deviation was 6.65 at baseline and 6.54 at final.



The T-Student test recorded a value of p lower than 0.05, which means that the obtained result is statistically significant.

The finger-ground index confirms the results obtained in the Schober test, recording significant improvements in the final values. Physiotherapy procedures and physical exercises have been shown to be effective.

QOL-BREF QUESTIONNAIRE

At the initial measurements, the QOL-BREF questionnaire scores had a mean value of 89.15, with a mode value of 88. The arithmetic mean for the final measurements was 108.88, and a mode value of 120.

Graph 3. – Arithmetic mean and mode values for the initial and final results of the QOL-BREF questionnaire.

Observing the values represented in graph 3, we can conclude that higher values of the final results were recorded, which means the improvement of the patients' quality of life following the application of physical exercises and physiotherapy procedures.

Table 3. - Calculated statistical indices for the QOL-BREF questionnaire, initial and final.

Statistical indexes	Initial values	Final values
Average	89.15	108.88
Mode	88	120
Median	88	110
Standard deviation	7.71	9.65
t-test	p<0.05	SIGNIFICANT

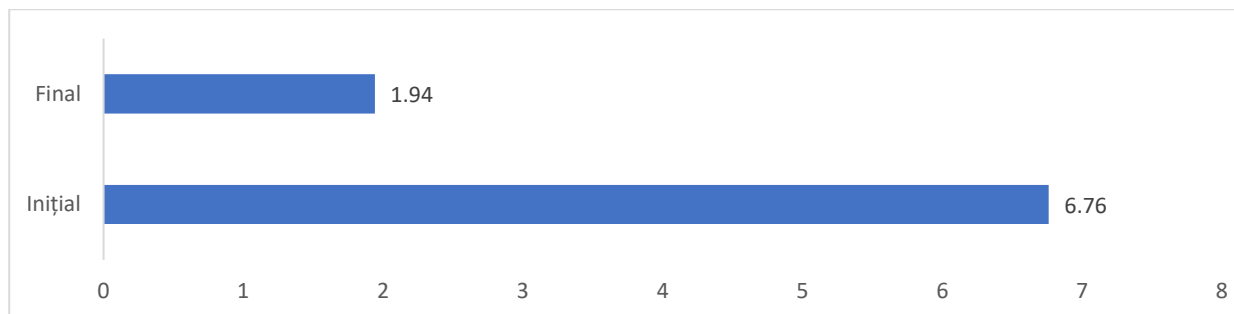
The median value is 88 at the initial measurement and 120 at the final measurement, with a significant difference. The standard deviation was initially 7.71 and final 9.65.

In the T-Student test, the p value is less than 0.05, which shows that the difference is statistically significant and the recovery program is effective on quality of life.

Following the application of the recovery treatment, the patient's quality of life is significantly improved, as can be seen from the results obtained at the final testing.

VAS SCALE

At the initial assessment, the mean recorded value of the VAS scale score was 6.76, which represents an increased pain level, while at the final assessment, the mean value of the VAS scale score was 1.94, which represents a threshold of low pain.



Graph 4. – Mean values of the initial and final testing for the VAS scale.

The mode value for the initial assessment was 7 and for the final assessment it was 2.

Table 4. – Statistical indices calculated for the VAS scale, initial and final.

Statistical indexes	Initial values	Final values
Average	6.67	1.94
Mode	7	2
Median	7	2
Standard deviation	1.98	0.63
t-test	p<0.05	SIGNIFICANT

The median value at the initial testing was 7 and at the final testing 2, while for the standard deviation the initial value was 1.98 and the final value was 0.63.

The T-Student test proves the effectiveness of the applied treatment, because the value of p is less than 0.05, statistically significant.

These results are representative of the significant improvement in pain experienced following application of the treatment protocol. The physical exercise and the electrotherapy procedures performed demonstrated an increased efficiency according to the final testing for the pain parameter.

DISCUSSIONS

Low back pain can be an impediment to the daily activities of patients with this condition. Factors favoring its appearance can be prolonged time spent in a sitting or standing position, lifting weights, carrying out intense physical exertion, which demands the lumbar spine, etc.

In order to analyze the possibility of improving the pain, the flexibility of the lumbar spine and the quality of life of the patients, initial and final measurements

were made, using the VAS scale for the assessment of pain, the Schober test and the finger-ground index for the assessment of the flexibility of the lumbar spine, and the questionnaire QOL-BREF for the assessment of patient's quality of life. For a good interpretation of the obtained results, statistical indexes were calculated to objectiveize these results: the arithmetic mean, the mode, the median, the standard deviation, and the T-Student test.

The data collected and interpreted for this study demonstrate an increased effectiveness of the treatment protocol for patients with low back pain, as compared to the results from the initial and final tests.

Each of them improved after applying the protocol, which was composed of the physiotherapy procedures described in the "material and methods" chapter, as well as physical exercises aimed at increasing muscle tone, spinal flexibility and pain relief.

CONCLUSIONS

The obtained results encourage the continuation of research regarding the approach of some combined treatment protocols as efficiently as possible for a quick recovery, but also of the development of some prophylactic exercise programs, to avoid the progress of a condition, or even to avoid the appearance of some pathological situations.

Treatment protocols in the field of physiotherapy can be successfully complemented by individualized exercise programs, which bring benefits such as shortened recovery time, obtaining better functionality of the affected segments, reducing costs for the recovery period, and increasing the quality of life of patients.

The results presented in this paper can be a starting point for the development of new research directions. These include the most effective electrotherapy procedures for low back pain, methods of preventing spinal injuries, the beneficial effects of exercise recovery, but also prevention strategies using therapeutic exercise.

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