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ORIGINAL ARTICLE

COMPARATIVE ANALYSIS OF SELECTED COMBINED THERAPY TREATMENTS WITH STANDARD MANAGEMENT IN BACK PAIN DURING A SANATORIUM STAY

ANALIZA PORÓWNAWCZA WYBRANYCH ZABIEGÓW TERAPII SKOJARZONEJ Z POSTĘPOWANIEM STANDARDOWYM W BÓLACH KRĘGOSŁUPA PODCZAS POBYTU SANATORYJNEGO

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C – Data analysis and interpretation
D – Writing the article
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F – Final approval of the article

ABSTRACT

Introduction

Spinal pain can affect the spine as a whole or its individual segments. Lumbar and sacroiliac pain affects about 70% of the world's population, making it a have become a disease of civilization, leading to long-term limitations in human functioning or disability.

Aim

The purpose of the conducted research is the effectiveness of selected combined therapy procedures during sanatorium treatment in patients with pain in the lumbosacral-sacral spine, their impact on the patients' performance and quality of life.

Material and methods

The study was conducted at the Ministry of Interior and Administration rehabilitation medical facility in Kolobrzeg among sanatorium patients participating in 21-day stays in the period from July 2019 to September 2022. The study included 100 patients diagnosed with nonspecific lower back pain syndrome. Patients were randomly divided into two groups of 50. All calculations were performed using STATISTICA 8 to find out if the quality of sanatorium treatment differed according to the treatments selected. The results of the experimental group (combined therapy) were compared with the results of the control group, taking into account pain intensity and assessment of functional capacity. Changes in the level of dependent variables were monitored by two measurements, performed on the same subjects before and after treatment.

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Results
Based on the analysis of the obtained results, it can be concluded that all methods of sanatorium treatment lead to an improvement in the studied parameters, but the use of combined therapy allows to achieve a better therapeutic effect.

Conclusions
Combined therapy is an effective method of treating lumbosacral spine pain in a sanatorium stay. Combined therapy treatments have shown better therapeutic effects than standard sanatorium treatment offered by the National Health Fund. Combined therapy has the effect of increasing patients' functional status.

Keywords: combined therapy, spine dysfunction treatment, sanatorium, rehabilitation

STRESZCZENIE
Wstęp
Bóle kręgosłupa mogą dotyczyć jego całości bądź poszczególnych jego odcinków. Bóle odcinka lędźwiowo – krzyżowego dotyczą ok 70% światowej populacji, przez co stały się chorobą cywilizacyjną, prowadzącą do długotrwałych ograniczeń w funkcjonowaniu człowieka, czy jego niepełnosprawności.

Cel
Celem prowadzonych badań jest skuteczności wybranych zabiegów terapii skojarzonej podczas leczenia sanatoryjnego u pacjentów z bólem w odcinku lędźwiowo-krzyżowym kręgosłupa, ich wpływ na sprawność oraz jakość życia pacjentów.

Materiał i metody
Badania przeprowadzone zostały w Sanatorium MSWiA w Kołobrzegu wśród pacjentów sanatoryjnych uczestniczących w turnusach 21-dniowych, w okresie od lipca 2019 r. do września 2022r. Badaniami objęto 100 osób, u których rozpoznano niespecyficzny zespół bólowy dolnego odcinka kręgosłupa. Pacjenci losowo zostali podzieleni na dwie grupy 50-cio osobowe. Wszystkie obliczenia wykonano w programie STATISTICA 8 celem sprawdzenia, czy jakość leczenia sanatoryjnego różni się w zależności od dobieranych zabiegów. Porównywano wyniki grupy eksperymentalnej (terapia skojarzona) z wynikami grupy kontrolnej, uwzględniając nasilenie bólu oraz ocenę sprawności funkcjonalnej. Zmiany w poziomie zmiennych zależnych monitorowano w ramach dwóch pomiarów, wykonywanych u tych samych badanych przed podjęciem i po zakończeniu leczenia.

Wyniki
Na podstawie analizy otrzymanych wyników można stwierdzić, że wszystkie metody leczenia sanatoryjnego prowadzą do poprawy badanych parametrów, jednak zastosowanie terapii skojarzonej pozwala osiągnąć lepszy efekt terapeutyczny.

Wnioski
Terapia skojarzona jest skuteczną metodą leczenia dolegliwości bólowych w odcinku lędźwiowo-krzyżowym kręgosłupa w warunkach pobytu sanatoryjnego. Zabiegi terapii skojarzonej wykazały lepsze efekty terapeutyczne niż standardowe leczenie sanatoryjne oferowane przez NFZ. Terapia skojarzona ma wpływ na zwiększenie stanu funkcjonalnego pacjentów.

Słowa kluczowe: terapia skojarzona, leczenie schorzeń kręgosłupa, sanatorium, rehabilitacja

Introduction

Chronic low back pain (CLBP) is a widespread public health problem. Epidemiological data show that lower back pathology affects more than 570 million people worldwide (Wu *et al.,* 2020), of which approximately 85%–95% of patients have no specific pathoanatomical cause for their pain (Finucane *et al.,* 2020). The occurrence of CLBP carries a number of socioeconomic disadvantages that impinge on the condition of society as well as the country as a whole. CLBP-related disability, resulting sick leave, and loss of an employee create additional costs not only for the patient himself, but also for the employer and the treasury (Flitz and Firat, 2019).

The factors that can trigger the occurrence of CLBP are numerous, making it difficult to accurately determine the cause of its formation and effective and sustainable treatment management (Overas *et al.,* 2020). This has forced the World Health Organization (WHO) to publish the latest guidelines for the therapeutic and rehabilitative management of in spinal pain syndromes, in which spa treatment fits perfectly (Romanowski *et al.,* 2019).

Comprehensive physiotherapy management is aimed at reducing pain, restoring normal range of motion of the spine, and proper stabilization of the spine to prevent overloading of the skeletal and muscular systems (Plaskiewicz *et al.* 2015). A holistic therapeutic approach to the patient ensures improved functional capacity, which enables the satisfaction of basic and complex life needs, which are determinants of autonomy and autarky (Wiktor *et al.* 2010).

Combined therapy involves the simultaneous application of two or more therapeutic stimuli, which triggers a synergistic effect increasing the effectiveness of therapy with a reduced total treatment time, as well as improving the comfort of the procedure performed. The choice of the type and types of combined therapy treatments is selected individually to the patient, taking into account the patient's functional status, the type and severity of pathology, previous treatment and the expected effects and benefits of the methods used (Ponikowska, 2017). The goal of combining physical treatments in combined therapy is to achieve a distant, long-term, adaptive change in the body that will last for a longer period of time and lead to improved health (Allen, 2006).

AIM

The purpose of the conducted research was to evaluate the effectiveness of selected combined therapy treatments in patients with lumbosacral spine pain and their impact on the functional performance of the patients.

The study formulated the following research hypotheses (H):

H1. Combined therapy is an effective method of treating chronic lumbosacral spine pain in a sanatorium setting.

H2. The effectiveness of the therapeutic program depends on the type of spa therapy used.

H3. Combined therapy improves the functional capacity of patients.

Material and methods

The study was conducted at the Ministry of Interior and Administration rehabilitation medical facility in Kolobrzeg among sanatorium patients aged 50–70 years who had chronic lumbosacral spine pain of degenerative etiology and/or overload, participating in 21-day stays from July 2019 to September 2022. Eligibility for the study, was confirmed by physicians, referral to spa treatment and results of follow-up examinations (physical, subject and ancillary X-ray, MRI, CT). The study included 100 patients diagnosed with nonspecific lower back pain syndrome. Patients were randomly divided into two groups of 50.

Group I consisted of 30 women (age X = 62.80; SD = 5.62) and 20 men (age X = 62.58; SD = 5.12). Most of them were residents of rural areas (N = 31) who, also used pain medications (N = 35) and physiotherapy treatments (N = 28), and had been struggling with lower back pain for more than 16 years (X = 16.86; SD = 5.52). Group II included 32 women aged X = 63.38 (SD = 6.13) and 18 men aged X = 61, 83 (SD = 5.49). Among the women, the majority were residents of urban areas (N = 21), while among the men, the majority lived in rural areas (N = 11). Women struggled with the disease for an average of 16 years (X = 16.34), while men took 17 (X = 17.33). Pain medications were used by 39 patients (25 women, 14 men), and physiotherapy treatments were used by 30 patients (23 women, 7 men).

Group I (the study group) received treatments in the form of combined therapy type 2 including the principles of safety, performance methodology and selection of energy forms (Pasek *et al.*, 2017). The package included TENS + ultrasound combination therapy (11 treatments), mud iontophoresis (11 treatments), saline pool gymnastics (11 treatments), hydromassage with salt water (11 treatments), Aqua Thermo Jet (10 treatments). Group II (NFZ) received the following treatment package: shortwave diathermy DKF (8 treatments), group gymnastics (9 treatments), mud packs (10 treatments), brine baths (10 treatments), Nemec interference currents (8 treatments), classical massage of the spine (9 treatments).

A comprehensive evaluation of the subjects was performed twice: on the day of admission to the sanatorium stay and on the day of completion of the therapeutic stay (the period covers 21 days). The Numerial Rating Scale (NRS) recommended by the Polish Association for the Study of Pain and the modified Pain Rating Scale according to Domzhal were used to assess pain intensity. Patients' functional status was assessed using the Lower Back Pain Rating Scale (LBPRS scale), which allows us to consider the degree of functional impairment based on fifteen types of physical activity (Radziszewski, 2006, Polish Association for the Study of Pain, 2018).

All calculations were performed in STATISTICA 8 to find out, whether the quality of sanatorium treatment differed according to the treatments selected. The results of the group treated with combined therapy were compared with the results of the group treated according to NHF recommendations, taking into account the severity of pain and assessment of functional capacity.

In any research process, there are limitations that should be taken into account by researchers. In the present research, the most important limitation is the size of each group. An important aspect is the time span of the experiment conducted. The rather long time span of the study, covering different seasons, may have affected the physiological characteristics of the body, physical activity and lifestyle of the patients. All of the above factors could have affected the effect of the treatment, as well as the perceived effects of the therapy. The last limitation is the measurement methodology. Pain, as a subjective assessment of the patient, can take on different values. The same level of pain, some patients may describe as severe, others as moderate, and still others as very severe, which affects the the results and quality of therapy effects.

Results

Significant reductions in lumbosacral spine pain, as measured by the NRS scale, were noted between the first and second measurements ($p < 0.05$), but the combined therapy treatment group had significantly lower levels of pain than the standard treatment group ($p < 0.05$) (Figure 1.).

There was a significant reduction in perceived pain in the Domzhal scale in the lumbosacral spine between the first and second measurements ($p < 0.05$). The mean values of lumbosacral spine pain at the end of the study differed between groups I and II. There was a significantly lower level of pain

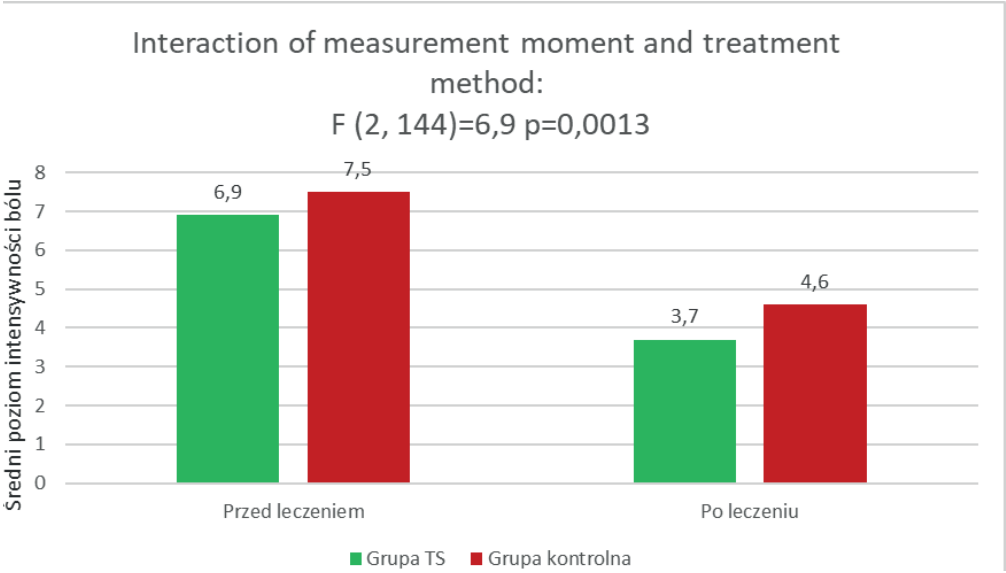

Figure 1. Pain intensity on the NRS scale

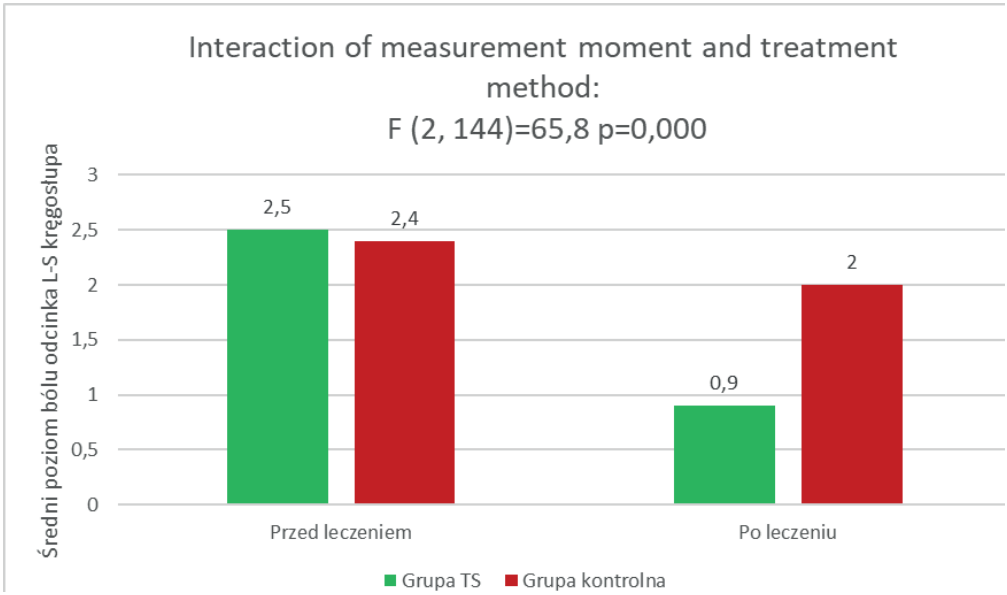

Figure 2. Pain intensity on the Domzal scale

in the study group than in the control group ($p<0.05$). (Figure 2).

In the functional assessment of patients in each group, there was a significant reduction in functional disability between the first and second examinations ($p < 0.05$). The mean functional impairment at the end of the study differed between the groups. A significantly lower level of functional impairment was observed in the combined therapy group than in the group with standard medical treatment ($p < 0.05$) (Figure 3.).

Discussion

Our own study confirmed the effectiveness and validity of combined therapy as part of

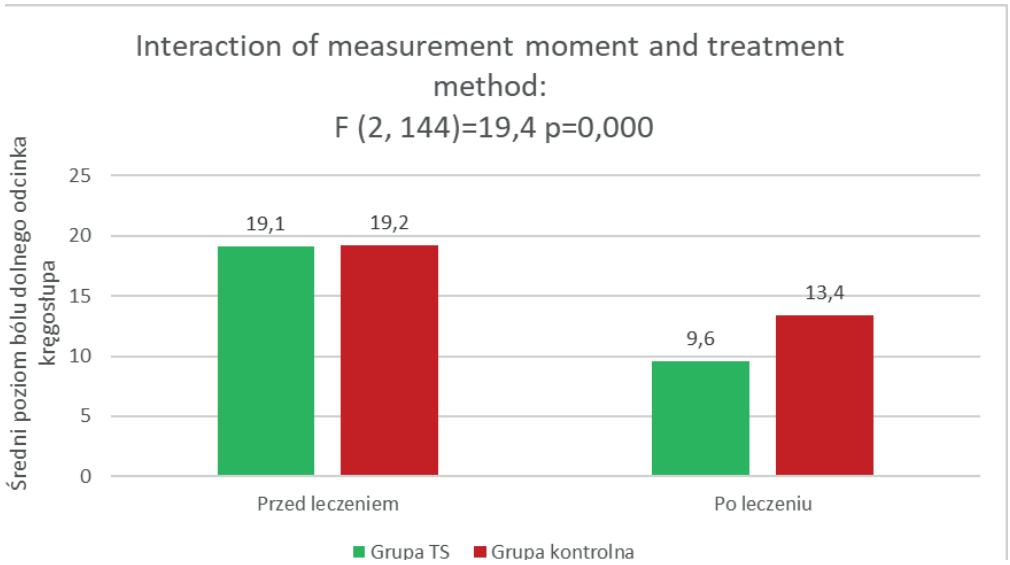

Figure 3. Assessment of the patient's functional status according to the LBPRS

the sanatorium treatment of lumbosacral spine pain. The results of the therapy assessing the intensity of pain and the functional capacity of the patients apologizes that the applied treatment was effective in each of the studied groups. The final therapeutic effect was significantly more favorable in the group with combined therapy, compared to the group with standard treatment.

Kolu *et al.* performed a comparative analysis of the effects of high-intensity laser therapy with combined therapy with TENS currents and ultrasound, on the analgesic outcome and functionality of patients with chronic lumbar radiculopathy. The 54 patients studied were divided into two groups. In group I, treatments included mud packs, combined therapy of TENS currents and ultrasound, and kinesiotherapy exercises. In group II, treatment included high-energy laser treatments, a mud pack and kinesiotherapy exercises. Patients were evaluated using the visual analog scale VAS and Oswestry Disability Index (ODI), before treatment, at the end of therapy, and four weeks after the end of treatment. The results of the study show better therapeutic effects immediately after the end of treatment, as well as one month later in the group with combined treatment of TENS currents with ultrasound, both in pain levels and in the ODI disability index (Kolu *et al.*, 2018). Our own research confirms the effectiveness of combination therapy and its superiority over the conventional use of physical therapy.

Similar findings were submitted by Dilekçi *et al.* They conducted a study on the effectiveness of combined balneology and physical therapy in patients with chronic nonspecific low back pain, in the treatment of pain, functional disability and their impact on patients' quality of life. They compared the results of 129 patients treated with hot mud packs, electrostimulation with TENS currents and ultrasound therapy, with a combined therapy group of 133 patients, which additionally benefited from balneological treatments in the form of a pool of thermomineralized water. The effects of the therapy were analyzed using the VAS visual analog scale, the Roland-Morris Disability Questionnaire and the Quebec Back Pain Disability Scale (QBPDS) at the beginning and end of the treatment. After the end of treatment, there was a significant decrease in all variables in favor of combined therapy. VAS and disability scale scores on the RMDQ questionnaire were at the $p < 0.01$ level of significance, while for

the QBPDS scale they were at the $p < 0.05$ level (Dilekçi *et al.*, 2020).

The effectiveness of combined therapy in the treatment of lumbosacral pain was documented in the work of Kim *et al.* They studied the therapeutic effect of two different combinations of combined therapy in the treatment of lower back pain. They divided the 40 patients they studied into two, 20-person groups. Group I received a heat massage, using the CGM MB – 1401 device, which simultaneously applied acupressure, moxie therapy, spinal rubbing and heat. Group II received a combined physiotherapy program that consisted of ultrasound therapy, TENS transcutaneous electrical nerve stimulation and a hot pack. The analgesic effect of the therapy was evaluated using: Numerical Pain Scale (NRS) and McGill pain questionnaire. Functional assessment of patients was performed with questionnaires: the Oswestry Disability Index (ODI) and the Roland-Morris Disability Questionnaire (RMDQ). The results of the therapy were evaluated before the clinical trial, after two weeks and after four weeks of therapy. The analgesic effect of therapy was noted at the second and fourth weeks of treatment in both groups. Functional disability scores also improved in both groups, after two and after four weeks compared to the results before the start of therapy. There was no significant difference after and during treatment between the groups (Kim *et al.*, 2023). Kim's research confirms the results obtained in this study as to the effectiveness of using combination therapy to treat lower back pain.

Ozkaraoglu *et al.* studied the effectiveness of high-frequency laser therapy (HILT) and transcutaneous TENS nerve electostimulation in combination with other treatments on pain intensity, functional disability and improvement in spinal range of motion. The patients, aged 18 to 60 years, were assigned to 2 groups. The first group received ultrasound therapy, TENS transcutaneous nerve electostimulation and a mud pack. The second group was treated with ultrasound, high-energy laser and a mud pack. The effects of therapy were measured using the VAS pain scale and the Oswestry questionnaire. Spinal mobility was measured using a goniometer. Deliberating the results of the study, there was a significant improvement in all parameters studied in both groups. The results measured by the VAS scale showed a significant difference in favor of the group treated with ultrasound therapy, TENS percutaneous nerve electostimulation and hot pack, while in the measurement of range of motion and functional disability there was no statistical difference between the study groups (Ozkaraoglu *et al.*, 2021). The conclusions put forward by Ozkaraoglu coincide with the results of our own study.

Evidence of the therapeutic efficacy of combined therapy is provided by a paper that aimed to compare the short-term efficacy of three electrotherapeutic methods in relieving root pain caused by lumbar intervertebral disc herniation by Efrat *et al.* (2022). Fourteen patients with root pain participated in one electrotherapy session, which included four 10-minute treatments: transcutaneous electrical nerve stimulation (TENS), interferential stimulation (IF), combined treatment with pulsed ultrasound and IF current (CTPI), and sham control. The degree of straight leg raising (SLR) was measured immediately before and after each treatment. After treatment, the most visible improvement was observed with CTPI treatment, followed by IF and finally TENS. Sham stimulation did not affect SLR results.

The effectiveness of using combined therapy to treat back pain was studied by Yilmaz *et al.* (2020). The purpose of their study was to compare the effects of high-intensity laser therapy (HILT) and a combination of transcutaneous nerve stimulation (TENS) and ultrasound (US) treatment on pain, range of motion (ROM) and functional activity in neck pain associated with cervical spine disc herniation (CDH). A total of 40 patients suffering from CDH participated in the study and were randomly divided into two groups. In Group 1 (20 patients), patients received 20

sessions of HILT plus exercise, while Group 2 (20 patients) received a combination of US, TENS and exercise. The results of the therapy were measured by the range of motion of the cervical spine, pain level measured by the Visual Analog Scale (VAS) and functional activity measured by the Neck Pain and Disability Scale (NPADS) before and after therapy. After treatment, all measured parameters improved significantly in both groups ($p < 0.05$), and there was no statistical significance between the two groups ($p > 0.05$). Both therapies showed analgesic efficacy and improved function in patients affected by CDH after four weeks of treatment. The results obtained by Yilmaz *et al.* are not consistent with the results of our own study. The reasons for this may be too small group sizes, a small treatment area or poorly selected therapeutic doses.

A study to compare the effects of high-intensity laser therapy (HILT) and a combination of ultrasound (US) and transcutaneous nerve stimulation (TENS) treatment on pain, range of motion (ROM) and functional activity in patients with cervical spondylosis (CS) was conducted by Venosa *et al.* (2018). A total of 84 patients affected by CS participated in the study. Patients were randomly divided into two groups: A (42 patients) who received 12 sessions of HILT plus exercise; B (42 patients) treated with a combination of US, TENS and exercise. The effects of therapy were measured by the range of motion of the cervical segment, the level of pain measured by the Visual Analog Scale (VAS) and functional activity measured by the Neck Disability Index (NDI) at the end of therapy. In both groups, cervical range of motion, VAS and functional scores showed significant changes, with better results in participants enrolled in Group A (HILT plus exercise). These results contradict, not only the results obtained by Yilmaz *et al.* but also our own.

The effectiveness of using combined therapy to treat knee osteoarthritis (KOA) was demonstrated by Usman *et al.* (2019). Their study aimed to compare the effects of combined ultrasound and infrared interferential current therapy on pain, functional activities and quality of life in people with KOA. They divided the subjects into two groups. Group I treated with CT and group II treated with infrared lamp light. Each group received 15-minute treatment three times a week for 12 weeks. The Visual Analog Scale (VAS), the Osteoarthritis Index (WOMAC) and a health status questionnaire form were used to assess pain to determine quality of life. At the end of the study, a significant ($p < 0.05$) reduction in pain and a significant ($p < 0.05$) improvement in functional activity and quality of life were observed in patients treated with combined therapy.

Alqualo-Costa *et al.* demonstrated the higher efficacy of using combined therapy to treat knee osteoarthritis than with monotherapy. They randomly assigned patients to four groups with the following therapies: interferential current, photobiomodulation, interferential current plus photobiomodulation, and a placebo-treated group. They measured pain intensity at rest and during movement as the main outcome. Patients were evaluated at the beginning of the study, after 12 sessions, and three and six months after treatment. Their results show that interferential current plus photobiomodulation reduced pain intensity at rest and during movement compared to placebo and interferential current at all time points (Alqualo-Costa *et al.* 2021).

Conclusions

The obtained results of our own study, as well as the results of other authors' studies detailed in the discussion, allow us to affirm that the use of combined therapy in the treatment of non-specific lumbosacral spine pain, affects better pain degression and functional improvement of patients suffering from spinal pain.

Combined therapy is an effective method of treating painful conditions in the lumbosacral spine in a sanatorium setting. Combined therapy treatments showed better therapeutic

effects than standard sanatorium treatment offered by the National Health Fund. Combined therapy has the effect of increasing the functional status of patients.

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