



# Efficiency of dry needling along with standard physical treatment in people with lumbar pain syndrome

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## ABSTRACT

**Introduction:** The complaints that occur in the area of the lumbar spine are summarized under the term lumbar pain syndrome. These include lumbar discopathy, lumbago, lumboischiagia, sciatica, and other complaints associated with the lumbar region of the spine. The purpose of this study is to evaluate sociodemographic characteristics, assess the degree of disability patients experience due to lumbar pain syndrome, evaluate how many patients catastrophize their pain, and assess the effectiveness of the dry needling technique along with other physical therapy modalities in people with lumbar pain syndrome.

**Methods:** The study was designed as a prospective study conducted from March 2022 to June 2022. 35 subjects of both sexes, aged 25-83, agreed to participate in the study. The subjects who enrolled were pre-dominantly suffering from chronic lumbar pain syndrome, and there were also a smaller number of subjects with acute lumbar pain syndrome.

**Results:** The majority of respondents suffer from lumbar pain syndrome, which falls into the chronic category in 29 or 82.9% of cases. The mean score after the application of therapy on the Oswestry Disability Index (ODI) scale was  $22.0 \pm 16.23\%$  and was statistically significantly lower. The average score after the application of the therapy on the visual analog scale (VAS) was  $3.06 \pm 2.31$  and is statistically significantly lower ( $p < 0.05$ ) compared to the period before the therapy.

**Conclusion:** Dry needling in combination with standard physical procedures led to statistically significant improvements. The mean score on the pain catastrophe scale, VAS, and ODI was significantly lower than in the pre-therapy period.

**Keywords:** lumbar pain syndrome; conservative treatment methods; dry needling

## INTRODUCTION

Lumbar pain syndrome has been a major cause of disability since 1990 and remains a significant global public health problem today. Global studies have defined lumbar pain syndrome as pain in the posterior region of the body from the lower edge of the 12<sup>th</sup> rib to the lower gluteal folds, with or without pain referable to one or both lower extremities. Low back pain (LBP) is a common problem worldwide. The prevalence of LBP in 2017 is estimated to be around 577 million people (7.5% of the total world population). From 1990 to 2017, the number of people living with LBP syndrome has increased across all age groups. Although the prevalence of LBP syndrome is increasing as people live longer, the largest number of people with LBP in the world is currently in the 50-54 age groups. Despite new evidence and research showing that biological, psychological,

and social factors influence LBP syndrome and disability, the global burden of LBP syndrome is increasing. In the treatment of LBP syndrome, surgical, interventional, pharmacological, physical, psychological, and educational measures are considered to help patients. It is also important that the patient is not alone in this entire process, but that the best available evidence, expert clinicians, and appropriate resources are involved (1).

The World Health Organization (WHO) defines quality care as care that is safe, effective, person-centered, timely, equitable, and integrated. The aim of this study is to prove or disprove whether standard physical treatment using the dry needling technique meets one of the key pillars of the WHO's definition, namely effectiveness (2).

LBP is the fifth most common reason for visits to the doctor, affecting almost 60-80% of people at some point in their lives. Studies have shown that up to 23% of adults worldwide suffer from chronic LBP. This population has also been found to have a 1-year recurrence rate of 24-80%. Lifetime prevalence estimates are 84% of the adult population. A systematic review found an annual rate of adolescents suffering from back pain ranging from 11.8% to

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33%. 11-12% of the population may be potentially disabled due to back pain (3).

Clinical tests are very often unreliable when it comes to accurately determining the cause of back pain. In the lumbar spine alone, there are a large number of structures that can become irritated, making it sometimes impossible to determine the cause of the pain by physical examination alone. One of the possible causes can be degenerative changes, modic changes in the vertebrae, a tear in the annulus fibrosus, a bulging disk, a protrusion, an extrusion, spondylosis, spondylolisthesis, and stenosis of the lumbar spine. It is important to note that degenerative changes also occur in asymptomatic people who have almost no pain (4,5).

The guidelines recommend that the treatment plan for lumbar pain syndrome be based on a biopsychosocial model. The guidelines also recommend avoiding the routine use of radiologic and a laboratory diagnostic procedures in the early stages of treatment, as this very rarely changes the outcome of treatment (6).

Diagnostic procedures are crucial when the development of serious pathology is suspected, but routine use is not necessary (7).

There are a variety of modalities and methods used in practice to treat lumbar pain syndrome, namely: electrotherapy (galvanization, diadynamic currents, interferential currents, TENS, therapeutic ultrasound, short-wave diathermy, laser, etc.), massage, mobilization, and manipulation. Furthermore, exercises adapted to the patient's needs and appropriate training play the most important roles (8).

In addition to the above-mentioned measures, physical therapy is also useful, and in some cases, surgical treatment is also required. Although there is no single method of treating lumbar pain syndrome, despite numerous methods and modalities, it is necessary to check that all possible forms of conservative treatment have been applied before deciding on a surgical approach.

## METHODS

The study included subjects who visited the private psychiatric clinic of Dr. Buljugić "Sporticus" in the period from March 2022 to June 2022 due to symptoms of lumbar pain syndrome. Thirty-five subjects of both sexes, aged 25-83 years, agreed to the examination. The subjects who responded were mostly suffering from chronic lumbar pain syndrome, and there were also a smaller number of subjects with acute lumbar pain syndrome.

The respondents in this study were people with a variety of professional profiles, including IT technicians, doctors, dentists, diplomats, pharmacists, lawyers, secretaries, traders, entrepreneurs, and pensioners.

The criteria for inclusion in the study were subjects of both sexes, of all professions, aged 18 years and older, who were treated at the private psychiatric clinic of Dr. Buljugić "Sporticus" and appeared due to various symptoms caused by back pain, as well as subjects who were diagnosed with lumbar pain syndrome with or without radicular symptoms.

The exclusion criteria for the study were subjects who did not adhere to the treatment protocol, subjects who were

in rehabilitation for <10 days or discontinued treatment, and subjects who did not consent to treatment with the dry needling technique.

The study was designed as a prospective before-and-after study in which the subjects' condition was analyzed at the first and last examination.

Approval for this study was gained from the ethical board of the University of Sarajevo, Faculty of Health Studies.

After the examination, the subjects began the rehabilitation process. The rehabilitation included 10 physical procedures. The following procedures were included in the rehabilitation protocol: galvanic current, interferential currents, diadynamic currents, TENS, magnets, lasers, ultrasounds, short-wave diathermy, infrared lamps, dry needling, and massage.

Galvanic current was applied to patients with leg pain due to radiculopathy for 10 min. The electrodes were placed longitudinally. The cathode was placed proximally on the lumbar part of the spine, on the buttocks, or on the proximal part of the thigh, while the anode was placed more distally, depending on how far the pain spread.

TENS was used in patients without leg pain. Six self-adhesive electrodes were used, and the treatment lasted 20 min, usually in combination with an infrared lamp. The TENS programs are set automatically. The most frequently used program is "pain modulation", which releases beta-endorphins.

Interferential currents were used as an introductory procedure for all patients. It usually lasted 10 min, and two leads with plate electrodes were used. Four electrodes were placed crosswise to create interference in the lumbosacral part of the spine.

Continuous ultrasound with a frequency of 1 MHz was used as therapeutic ultrasound. The ultrasound application lasted for 5 min on the painful area. The most commonly used intensity was 0.8 W/cm<sup>2</sup>. Ultrasound was applied every day during the therapeutic protocol.

The laser was used using the solid-state contact technique. The intensity used was 3.0 J/cm<sup>2</sup>. The laser was used three times during the therapeutic protocol.

The infrared lamp was used three times during the therapeutic protocol. The application in the lumbar region of the spine lasted 10 min.

Manual massage was applied at the end of each therapy and lasted an average of 20 min. The standard massage techniques were applied to the lumbar spine area. If the patient suffered from radicular syndrome or radiculopathy, the massage was extended to the entire lower extremity.

Dry needling was applied twice during the therapeutic protocol. Standard acupuncture needles with a length of 40 mm were used. The number of needles during therapy was 6, and the needles were applied specifically to painful areas. However, a large number of patients had diffuse pain that was difficult to localize. For such patients, a larger number of needles were required, while for patients with more precisely localized pain, a smaller number of needles were used. Before the needles were inserted, the patients' sensitivity to pain was assessed by palpation. The pain on palpation was the decisive criterion for needle insertion.

A disinfection protocol had to be followed before the needles were used. Once the needles were inserted, the next step was to manipulate the needle with the aim of eliciting a local twitch response. This response is not always present and may not occur.

Education includes an informative discussion about the patient's condition (possible cause, interpretation of the findings, possible duration) and informing the patient about the therapeutic protocol and what they can expect from the therapy.

The study was conducted on the basis of instruments at the first and last assessments:

1. Oswestry LBP Scale: A questionnaire used by patients to indicate during which activities the pain occurs and which areas of life are most disturbed by the pain (example: walking, sitting, sleeping, socializing, etc.). This scale is the property of the Spine Research Institute of San Diego but can be used freely for non-commercial purposes (9).
2. Pain Catastrophizing Scale: A short 10-question questionnaire that assesses the degree of pain catastrophizing in patients. The questionnaire is copyrighted. It is the property of Michael Sullivan but can be used free of charge for non-commercial academic work (10).
3. Visual analog scale (VAS): Numerical scales used by patients to subjectively rate their pain on a scale of 1-10. The scale is not protected by copyright.

## RESULTS

The total sample comprised 35 subjects who were treated with the dry needling technique together with standard physiotherapy procedures in the private practice of the physiatrist "Sporticus" (Dr. Buljugić) in the period from March 2022 to June 2022.

Of the total number of respondents included in the study, 20 (57.1%) respondents were male and 15 (42.9%) were female (Table 1).

The respondents' age structure determined the average age of the respondents, which was 47 (SD = 12.11), where the youngest respondent was 25 and the oldest 82 years old (Table 2).

The majority of respondents suffer from lumbar pain syndrome, which falls into the chronic category in 29 or 82.9% of cases (Table 3).

The mean score after the application of the therapy on the ODI scale was  $22.0 \pm 16.23\%$  and was statistically significantly lower ( $p < 0.05$ ) compared to the pre-therapy period, when it was  $52.0 \pm 17.87$  (Table 4).

The average score after the application of the therapy on the pain catastrophe scale (PCS) scale was  $9.11 \pm 10$ . And it is statistically significantly lower ( $p < 0.05$ ) compared to the time before the therapy, when it was  $25.66 \pm 12.04$  (Table 5).

The mean score on the visual analog pain scale (VAS) before therapy was  $8.17 \pm 1.38$  (range 6-10). The median score was 8, with an interquartile range of 7-9, indicating a high level of pain in most patients. The mean score after the application of therapy on the VAS scale was  $3.06 \pm 2.31$  and is statistically significantly lower ( $p < 0.05$ ) compared to the pre-therapy period, when it was  $8.17 \pm 1.38$  (Table 6).

**TABLE 1.** Overview of the gender structure of respondents

Sex	N	%
Male	20	57.1
Female	15	42.9
Total	35	100.0

**TABLE 2.** Overview of the age structure of the respondents

Age	
$\bar{X}$	47.74
SEM	2.61
Median	42.00
SD	15.44
Minimum	25.00
Maximum	82.00
Quartiles	
QI	36.00
QIII	62.00

SEM: Standard error of the mean, SD: Standard deviation

**TABLE 3.** Stage of lumbar pain syndrome

Stage	N	%
Acute	6	17.1
Chronic	29	82.9
Total	35	100.0

**TABLE 4.** Review of ODI scores before and after therapy

Variables of the ODI	Before – ODI	After – ODI
$\bar{X}$	52.00	22.00
SEM	3.02	2.74
Median	50.0	18.00
SD	17.87	16.23
Minimum	24	0.00
Maximum	100.0	54.00
Quartiles		
QI	38.00	10.00
QIII	64.00	30.00

ODI: Oswestry Disability Index, SEM: Standard error of the mean, SD: standard deviation

## DISCUSSION

The analysis of the gender structure revealed that 15 (42.9%) female and 20 (57.1%) male respondents took part in the study.

An overview of the age structure of the respondents in the sample showed us that the average age was  $47.74 \pm 14.44$  years, with the youngest respondent being 25 years old and the oldest being 82 years old. The average age was 42 years (interquartile range 36-62 years).

Koppenhaver et al. published a study entitled "The association between dry needling-induced twitch response and change in pain and muscle function in patients with LBP: A quasi-experimental study", in which they included 66 subjects with mechanical LBP syndrome, with 38 men and 28 women in the total sample with a mean age of  $41.3 \pm 9.2$  years, which shows us a correlative relationship with our research.

Analyzing the structure of the respondents, we conclude that of the total number of respondents, 26 respondents (74.3%) are employed, 3 respondents (8.6%)

**TABLE 5.** Review of the pain catastrophizing scale before and after therapy

Variables of the PCS	Before – PCS	After – PCS
$\bar{X}$	25.66	9.11
SEM	2.03	1.70
Median	26.00	6.00
SD	12.04	10.05
Minimum	2.00	0.00
Maximum	49.00	34.00
Quartiles		
QI	15.00	0.00
QIII	34.00	17.00

SEM: Standard error of the mean, SD: Standard deviation, PCS: Pain catastrophe scale

**TABLE 6.** Review of the visual analogue scale before and after therapy

Variables of the VAS	Before –VAS	After–VAS
$X_{II}$	8.17	3.06
SEM	0.23	0.39
Median	8.00	3.00
SD	1.38	2.31
Minimum	6.00	0.00
Maximum	10.00	8.00
Quartiles		
QI	7.00	1.00
QIII	9.00	5.00

SEM: Standard error of the mean, SD: Standard deviation, VAS: Visual analog scale

are unemployed, and 6 respondents are not employed (17.1%).

Of the total number of respondents, 6 (17.1%) reported acute pain, while 29 (82.9%) patients reported chronic pain. Of the total number of respondents, 21 or 60.0% of respondents had localization of symptoms only in the lumbar spine, while 40% of respondents had symptoms (pain) that spread to other regions.

The analysis of the Oswestry Disability Index (ODI), the Pain Catastrophizing Scale, and the VAS shows the degree of disability, the influence of pain on catastrophizing, and the extent of pain before and after rehabilitation.

Comparing before and after therapy, the Wilcoxon test showed that the Oswestry disability index was statistically significantly lower after rehabilitation ( $Z = -3.606$ ;  $p = 0.05$ ), and the scores for the level of pain catastrophizing showed a statistically significant decrease after therapy. The VAS before and after therapy also showed a statistically significant decrease ( $Z = -5.089$ ;  $p = 0.05$ ).

Ziaefar et al. (2018) investigated the effectiveness of the dry needling technique in the treatment of myofascial trigger points and analyzed VAS, pain pressure threshold (PPT), and functional results before and after treatment. The study involved 33 participants, and the time between treatment and outcome was 7 days. In isolation, the dry needling technique helped to reduce the pain itself, but PPT and functional outcome were without statistically significant changes. In relation to the VAS scale, our research and that of Ziaefar et al. are correlated, but in relation to the functional outcomes, we have no correlation. In our group, there were functional improvements in

the form of activities of daily living, while in the study by Ziaefar (2018), we did not find any statistically significant improvement. Consequently, this means that our research is partially correlated (11).

In our study, the mean duration of symptoms (in months) was  $16.7 \pm 28.57$  months, with the shortest recorded duration of symptoms being 15 days and the longest being 120 months (10 years).

The median duration was 5 months, with an interquartile range of 3-14 months.

Perez-Palomares et al. (2017) conducted a study on the efficacy of the dry needling technique for chronic LBP syndrome, involving 122 subjects and comparing two groups. The experiment included 75 female subjects and 47 male participants. One group received only dry needling as an isolated modality, while the other group received an intervention with PENS (percutaneous electrical nerve stimulation). VAS, PPT, and ODI scales were used as examination instruments. The time between the start of the study and the outcome was 3 weeks. No statistically significant difference was found between the group receiving PENS and dry needling on any scale. Our study is consistent with that of Perez-Palomarez et al. Although no significant difference was found between the groups in this study, there were patients in both groups who experienced a decrease in pain as a result of the procedure (12).

In our study, the mean pre-therapy visual analog pain scale (VAS) score was  $8.17 \pm 1.38$  (range 6-10). The mean pain score was 8, with an interquartile range of 7-9, indicating a high level of pain in most subjects.

The mean ODI before therapy was  $52.0 \pm 17.87\%$  (range 24-100.0%).

The median pain score was 50.0% with an interquartile range of 38-64%, indicating a high degree of disability as measured by the ODI questionnaire. The largest number of respondents had an ODI score in the severe disability category (15 or 42.9% of cases), followed by respondents with disability in the moderate disability category (10 or 28.6%), disability leading to disability (8 or 22.9%), and immobile or exaggerated symptoms (2 or 5.7%).

Theodoros et al. presented a study entitled “The effects of dry needling on pain relief and functional balance in patients with sub-chronic LBP”, in which they set out to investigate the immediate effect of dry needling on pain and functional balance in patients with LBP. 25 patients with sub-chronic LBP were included in the study and randomly divided into two groups: the intervention group and the control group. Needles were used in the intervention group participants, bilaterally at the level of the spinosus in the L2–L5 levels of the lumbar spine. A third row of needles was placed in the interspinous, except at the L5-S1 level. Pain tolerance was measured with an algometer. Pain tolerance increased significantly in the experimental group after the interventions from ( $M = 4.87$ ,  $SE 0.663$ ) to ( $M = 6.52$ ,  $SE 0.547$ ) ( $F[1, 23] = 7.8$ ,  $p < 0.05$ ). Research has shown that dry needling relieves pain and improves functional balance, but the effect on specific muscles needs further investigation. Our research is consistent with this research (13).

Casanueva et al. (2019) conducted a study on patients suffering from myofascial pain syndrome in the neck and

back. They compared three methods, namely orthopedic manual techniques, dry needling techniques, and ischemic compression techniques. 120 subjects participated in the study, and the instruments were VAS, PPT, PCS, and ROM-C spine (range of motion – cervical spine). The time period was 2 weeks. In terms of pain reduction and pain catastrophizing, none of these techniques proved to be superior to any other. In terms of pain tolerance of the tissue, measured with an algometer, the orthopedic manual techniques proved to be the superior technique, while in terms of functional results, dry needling and the orthopedic manual techniques showed better results than the ischemic compression techniques. The study by Casanueva et al. showed a correlation with our study, as the dry needling technique was effective in pain relief. It is also important to emphasize that the dry needling technique showed a good functional outcome in this study, which is consistent with our study (14).

In our study, the mean score after application of the therapy on the PCS scale was  $9.11 \pm 10.05$  ( $M = 6$ ;  $QI-QIII = 0-17$ ) and is statistically significantly lower ( $p < 0.05$ ) compared to the pre-therapy period, when it was  $25.66 \pm 12.04$  ( $M = 26$ ;  $QI-QIII = 15-34$ ).

The mean score after application of the therapy on the VAS scale was  $3.06 \pm 2.31$  ( $M = 3$ ;  $QI-QIII = 1-5$ ) and is statistically significantly lower ( $p < 0.05$ ) compared to the pre-therapy period when it was  $8.17 \pm 1.38$  ( $M = 8$ ;  $QI-QIII = 7-9$ ).

The mean post-therapy ODI scale score was  $22.0 \pm 16.23$  ( $M = 18$ ;  $QI-QIII = 10-30$ ) and was statistically significantly lower ( $p < 0.05$ ) compared to the pre-therapy period when it was  $52.0 \pm 17.87$  ( $M = 50$ ;  $QI-QIII = 38-64$ ).

Mahmoudzadeh et al. presented a study in which they investigated the effects of the dry needling technique and standard physical modalities compared to physical modalities alone. 58 subjects participated in the study. The research instruments were ODI and VAS. The number of treatments was five over a time of between 3 and 8 weeks. The research results showed a statistically significant improvement for both scales in subjects who received standard physical therapy modalities with dry needling. This study showed a statistically significant improvement in the disability score and VAS scale, which is consistent with our study (15).

According to the results of our study, we found that there was a statistically significant difference in the disability categories in the sense that after treatment, 20 or 57.1% of the respondents had minimal disability, while there were no more respondents in the disability and immobile or exaggerated categories.

Itoh et al. (2011) presented a study with 26 subjects in which they compared two groups of patients with lumbar syndrome. One group (13 subjects) received dry needling treatments, while the other group (13 subjects) received treatments with wooden toothpicks, which were not disclosed to the patients due to the implications of the research itself. The number of treatments was six over a period of 21 days. The results of the research showed a statistically significant improvement in the people who received real dry needling treatments. In this study, dry needling showed significant results compared to the

placebo group. This study shows a correlation with our study (16).

Our research showed that pain intensity was significantly reduced after the application of the dry needling technique, with 11 respondents stating that the pain intensity was moderate and even 5 patients stating that they had no pain, finding a statistically significant difference compared to before the dry needling physical treatment was performed.

Before the study began, 12 patients (34.3%) reported that self-care was painful for them, while 5 patients (14.3%) needed help with most aspects of daily care. After performing physical therapy with the dry needling technique, 18 patients (51.4%) stated that they were able to care for themselves independently, while as many as 7 patients (20.0%) stated that they were able to care for themselves normally without experiencing additional pain, where we found a statistically significant greater ability to provide personal care compared to before ( $p < 0.05$ ).

Before the start of the study, nine patients had difficulty walking where they had to use a cane or crutches, while nine subjects had difficulty walking where pain prevented them from walking more than 400 m. After therapy, 14 subjects (40.0%) stated that the pain prevented them from walking more than 1.5 km, while 11 subjects (31.4%) stated that the pain did not prevent them from walking any distance. A statistically significant increase in walking ability was observed compared to before ( $p < 0.05$ ).

Statistically analyzing the data, we concluded that before therapy, only 3 respondents (8.6%) had a normal social life and did not cause additional pain, while 19 respondents (54.3%) reported that social life was normal after therapy and did not cause additional pain, noting a statistically significant lower disruption of social life due to pain compared to before ( $p < 0.05$ ).

Gattie et al. presented a scientific research paper titled “The Effectiveness of Trigger Point Dry Needling for Musculoskeletal Conditions by Physical Therapists: A Systematic Review and Meta-analysis” in the *Journal of Orthopedic and Sports Physical Therapy (JOSPT)* (2017) examining the effectiveness of the dry needling technique for musculoskeletal problems. The aim of the systematic review is to determine the effectiveness of this technique, which is used by a large number of physiotherapists worldwide. They initially examined 218 papers, of which only 13 were included in the systematic review. They concluded that there is low to moderate quality evidence that the dry needling technique is better than a placebo intervention, but that there is no statistically significant difference compared to other interventions. JOSPT also warned of a high risk of bias in these studies. This meta-analysis is consistent with our research (17).

Regarding the localization of symptoms, we found that pain localization was statistically significantly different, in the sense that pain was now limited to the lumbar part of the spine in most cases (26 or 74.3%) and that 7 or 20.0% of respondents had no pain during treatment.

Kaljić et al. analyzed 21 scientific research papers, namely prospective, longitudinal, and specific case studies, in their paper, which was a systematic review of the literature entitled “The role of a dry needling technique in pain

reduction” (2018). Based on the review of the literature, it was concluded that the dry needling technique, in isolation or as an adjunct to other interventions, is recommended in the treatment of musculoskeletal problems. Our study shows a correlative relationship with this research (18).

## CONCLUSION

Despite new evidence and research showing that biological, psychological, and social factors influence LBP syndrome and disability, the global burden of LBP syndrome is increasing. In the treatment of LBP syndrome, surgical, interventional, pharmacologic, physical, psychological, and educational interventions are being considered to help patients. It is also important that the patient is not alone in this entire process, but that the best available evidence, expert clinicians, and appropriate resources are involved.

In our work, we have concluded that the technique of dry needling in combination with standard physical procedures leads to a statistically significant improvement in terms of pain reduction, work disability, and pain catastrophizing and can thus be used as a method of pain control in patients with lumbar pain syndrome.

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## DECLARATION OF INTERESTS

Authors declare no conflict of interests.

## REFERENCES

- Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, et al. The global burden of low back pain: Estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis* 2014;73(6):968-74.  
<https://doi.org/10.1136/annrheumdis-2013-204428>
- World Health Organization (WHO). WHO Global Strategy on Integrated People-centred Health Services 2016-2026: Placing People and Communities at the Centre of Health Services. Geneva: WHO; 2015.
- Muftić M. Reumatologija - Fizikalna Terapija u Reumatološkoj Rehabilitaciji. Sarajevo: Univerzitet u Sarajevu; 2020.
- Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S, et al. What low back pain is and why we need to pay attention. *Lancet* 2018;391(10137):2356-67.  
[https://doi.org/10.1016/S0140-6736\(18\)30480-X](https://doi.org/10.1016/S0140-6736(18)30480-X)
- Buchbinder R, van Tulder M, Öberg B, Costa LM, Woolf A, Schoene M, et al. Low back pain: A call for action. *Lancet* 2018;391(10137):2384-8.  
[https://doi.org/10.1016/S0140-6736\(18\)30488-4](https://doi.org/10.1016/S0140-6736(18)30488-4)
- García-Ramos CL, Valenzuela-González J, Baeza-Álvarez VB, Rosales-Olivarez LM, Alpizar-Aguirre A, Reyes-Sánchez A. Lumbar degenerative spondylolisthesis II: Treatment and controversies. *Espondilolistesis degenerativa lumbar II: Tratamiento y controversias. Acta Ortop Mex* 2020;34(6):433-40.
- Millán Ortuondo E, Cabrera Zubizarreta A, Muñiz Saitua J, Sola Sarabia C, Zubia Arratibel J. Indicaciones de la resonancia magnética en la lumbalgia de adultos. Indications for magnetic resonance imaging for low back pain in adults. *Rev Calid Asist* 2014;29(1):51-7.  
<https://doi.org/10.1016/j.calid.2013.10.004>
- William E. *Therapeutic Modalities: For Sports Medicine and Athletic Training*. Boston: McGraw-Hill; 2003.
- Fairbank JC, Pynsent PB. The Oswestry disability index. *Spine (Phila Pa 1976)* 2000;25(22):2940-52; discussion 2952.  
<https://doi.org/10.1097/00007632-200011150-00017>
- Sullivan MJ, Bishop SR, Pivik J. The pain catastrophizing scale: Development and validation. *Psychol Assess* 1995;7(4):524-32.  
<https://doi.org/10.1037/1040-3590.7.4.524>
- Ziaefar M, Arab AM, Mosallanezhad Z, Nourbakhsh MR. Dry needling versus trigger point compression of the upper trapezius: A randomized clinical trial with two-week and three-month follow-up. *J Man Manip Ther* 2019;27(3):152-61.  
<https://doi.org/10.1080/10669817.2018.1530421>
- Pérez-Palomares S, Oliván-Blázquez B, Magallón-Botaya R, De-la-Torre-Beldarrain ML, Gaspar-Calvo E, Romo-Calvo L, et al. Percutaneous electrical nerve stimulation versus dry needling: Effectiveness in the treatment of chronic low back pain. *J Musculoskelet Pain* 2010;18(1):23-30.  
<https://doi.org/10.3109/10582450903496047>
- Loizidis T, Nikodelis T, Bakas E, Kollias I. The effects of dry needling on pain relief and functional balance in patients with sub-chronic low back pain. *J Back Musculoskelet Rehabil* 2020;33(6):953-9.  
<https://doi.org/10.3233/BMR-181265>
- Charles D, Hudgins T, MacNaughton J, Newman E, Tan J, Wigger M. A systematic review of manual therapy techniques, dry cupping and dry needling in the reduction of myofascial pain and myofascial trigger points. *J Bodyw Mov Ther* 2019;23(3):539-46.  
<https://doi.org/10.1016/j.jbmt.2019.04.001>
- Mahmoudzadeh A, Rezaeian ZS, Karimi A, Dommerholt J. The effect of dry needling on the radiating pain in subjects with discogenic low-back pain: A randomized control trial. *J Res Med Sci* 2016;21:86.  
<https://doi.org/10.4103/1735-1995.192502>
- Itoh K, Minakawa Y, Kitakoji H. Effect of acupuncture depth on muscle pain. *Chin Med* 2011;6(1):24.  
<https://doi.org/10.1186/1749-8546-6-24>
- Gattie E, Cleland JA, Snodgrass S. The effectiveness of trigger point dry needling for musculoskeletal conditions by physical therapists: A systematic review and meta-analysis. *J Orthop Sports Phys Ther* 2017;47(3):133-49.  
<https://doi.org/10.2519/jospt.2017.7096>
- Kaljić E, Trtak N, Avdić D, Bojčić S, Katana B, Pecar M. The role of a dry needling technique in pain reduction. *J Health Sci* 2018;8(3):128-39.  
<https://doi.org/10.17532/jhsci.2018.610>