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## Efficacy of Laser Therapy in Patient Self-Assessment for Cervical and Lumbar Spine Pain Syndromes – Original Study

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### Abstract

**Introduction:** Laser therapy, or *Light Amplification by Stimulated Emission of Radiation (LASER)*, is a relatively popular method used in rehabilitation for various patient conditions.

**Purpose:** To evaluate the effectiveness of laser therapy in treating pain syndromes of the cervical and lumbar spine.

**Material:** The study included 108 patients, consisting of 72 women (67%) and 36 men (33%) diagnosed with chronic pain syndromes in the cervical and lumbar spine regions. The average patient age was 64.4 years.

**Method:** A proprietary questionnaire survey

**Results:** According to 44.4% of respondents, the effects of laser therapy are moderate, while 28.7% reported significant improvement. The study showed that for 50% of patients, the pain relief was substantial, for 37% it was minimal, and for only 9.3% there was no noticeable improvement. Among the participants, 70.8% of women and 75% of men considered laser therapy to be an effective treatment. Notably, 100 respondents expressed a willingness to undergo laser therapy again in the future.

**Conclusions:** The data indicates that laser therapy is an effective treatment for spinal pain syndromes, often resulting in significant symptom relief. However, the concern is the short duration of pain relief after therapy, with symptoms commonly recurring within a few months to a year. The willingness of 100 respondents to undergo future laser therapy underscores the positive perception of this rehabilitation method among patients.

**Keywords:** laser therapy, LLLT, cervical spine pain syndrome, lumbar spine pain syndrome

### **Introduction and Purpose of the Study**

Laser therapy is a method of physiotherapy that plays a significant role in the rehabilitation of patients with various musculoskeletal disorders. By utilizing concentrated light energy, low-level lasers can stimulate tissue regeneration, reduce pain, and alleviate inflammation [1],[2],[3],[4]. Modern research confirms the effectiveness of this therapy in treating musculoskeletal injuries, chronic joint conditions, and neurological problems [5].

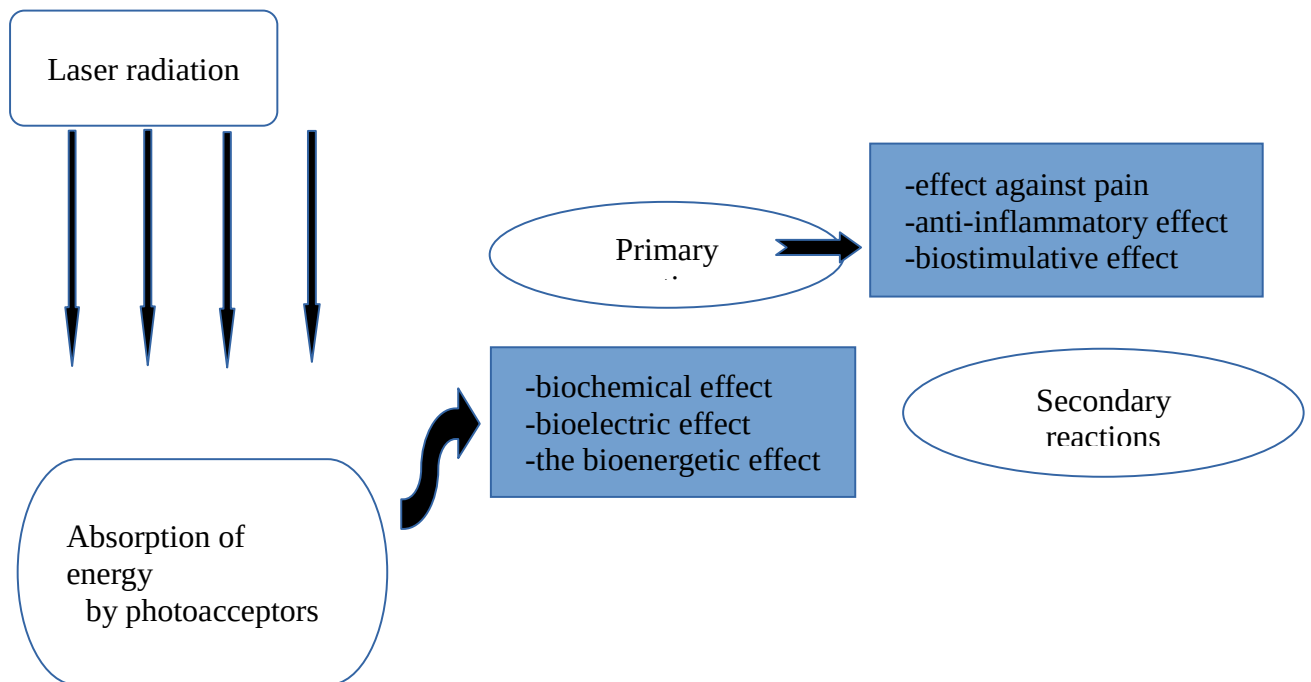
*LASER* stands for *Light Amplification by Stimulated Emission of Radiation* [6]. The first laser device was constructed in 1960 at the Hughes Research Laboratories in Malibu by Theodor Maiman [7]. Since then, numerous types of laser devices have been developed, finding applications in both diagnostics and therapeutic treatments. These devices, initially high-powered, were used to concentrate energy into a very narrow beam of radiation for tissue photocoagulation and photodestruction [1]. The lasers used in physiotherapy today are low-energy lasers (LLLT), known for their biostimulative properties [4].

Conservative, biostimulative laser therapy involves the direct application of the laser beam to tissue processes without causing damage [8],[9]. Laser radiation has beneficial biological effects. It stimulates intracellular photoreceptors, such as cytochrome c oxidase in mitochondria, leading to increased ATP production, accelerating cellular repair and regeneration. This mechanism also reduces oxidative stress and inflammation, which are key factors in chronic degenerative joint diseases [2],[10],[11].

In living cells, laser therapy stimulates collagen, protein, and RNA synthesis, induces changes in cell membrane potential, accelerates electrolyte exchange between cells and their environment, influences neurotransmitter release, enhances hemoglobin dissociation, and increases phagocytosis and prostaglandin synthesis, as well as the mitotic activity of cells [12],[13],[14]. In the peripheral nervous system, it affects nerve conduction and neural cell function [2],[11],[15].

In cases of soft tissue damage and inflammation, laser therapy improves peripheral blood circulation and microcirculation, enhances the functional state of arteries and capillaries, and promotes metabolic efficiency, lymphatic drainage from inflamed areas, wound and ulcer healing, increased vascularization, calcium content, bone density, and stimulation of bone formation [13],[14],[16]. The main effects of laser therapy in rehabilitation include pain relief, accelerated tissue regeneration, reduction of inflammation, and improved peripheral circulation [10],[16],[17].

Diagram of the effect of low-energy laser on tissues:



### Laser Therapy in Sports Medicine and Orthopedics

Laser therapy is widely applied in sports medicine and orthopedics for conditions such as shoulder pain syndrome, tennis elbow, Raynaud's disease, plantar fasciitis, Achilles tendon sheath inflammation, heel spurs, periarticular inflammation of the knee, degenerative changes of the spine, osteoarthritis of the knee joints, and in sprains and fractures [8],[16],[17],[18].

In **rheumatology**, laser therapy is used to treat psoriatic arthritis, fibromyalgia, rheumatoid arthritis, ankylosing spondylitis, and sacroiliac joint inflammation [3]. In **neurology**, laser therapy is applied for intercostal neuralgia, trigeminal neuralgia, carpal tunnel syndrome, and sciatica [13],[14],[19],[20],[21].

### Contraindications for Laser Therapy

Contraindications for laser therapy include pregnancy, active cancer, bacterial, viral, and fungal infections, blood clotting disorders, the use of anticoagulant medications, the presence of electronic implants such as pacemakers, heart rhythm disorders, uncontrolled diabetes, epilepsy, vitiligo, psoriasis, skin lesions, alcohol consumption within 24 hours before treatment, and light hypersensitivity. In physical therapy, laser exposure is prohibited in the areas of the eye sockets, eyeballs, endocrine glands, and skin damaged by UV, X-ray, or ionizing radiation [13],[14],[22]. This study aims to analyze the mechanisms of laser therapy, its clinical applications, contraindications, and discuss the results of research on the efficacy of this therapy as evaluated by patients suffering from cervical and lumbar spine pain syndromes.

## Material and Methods

The study was conducted in Nałęczów and Lublin on a group of 108 patients who underwent laser therapy for cervical and lumbar spine pain syndromes. The group consisted of 72 women and 36 men. Of the participants, 33 were under 61 years old (31% of the total), 47 were between 61 and 70 years old (43% of the total), and 28 were over 70 years old (26% of the total). The average age of the respondents was 64.4 years. A total of 46.3% of the patients lived in cities with over 100,000 inhabitants, while 25.9% lived in rural areas. Almost half of the participants (48.1%) reported having a higher education.

A diagnostic survey was used as the research method, with a custom questionnaire consisting of 20 closed and semi-open questions serving as the research tool. The survey began with an explanation of the study's purpose, assurance of anonymity, and instructions for completing the questionnaire. The first 10 questions gathered demographic information about the participants, while the remaining questions focused on the study's primary objectives.

The results were analyzed both quantitatively and qualitatively. Statistical analysis included hypothesis testing using both parametric and non-parametric methods such as analysis of variance (ANOVA), the median test, the Kruskal-Wallis rank test, and Pearson's Chi<sup>2</sup> test. Statistical significance was determined at a p-value of <0.05. The analysis was conducted using the "STATISTICA 12.0" software [22].

## Results

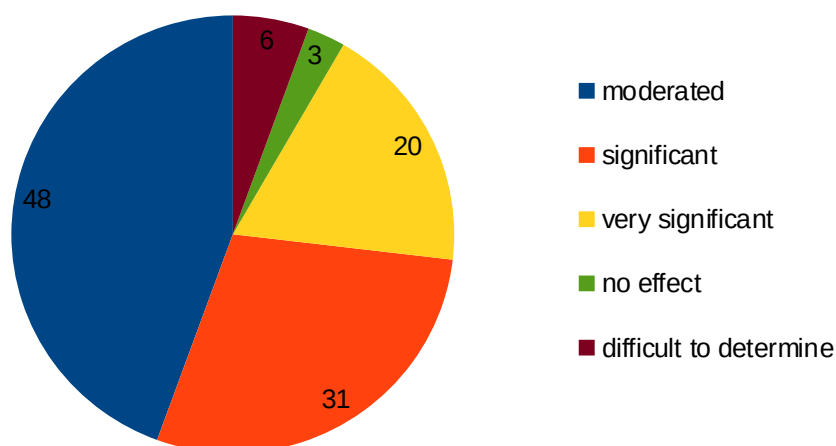
More than 70% of respondents, including 70.8% of women and 75% of men, believed that laser therapy is an effective form of rehabilitation. Less than 20% of the total respondents considered laser therapy to be only slightly effective or ineffective. The collected data is summarized in **Table 1**.

Table 1. Efficacy of laser therapy treatments in the self-assessment of the studied patients.

Sex	ineffective	marginally effective	effective	highly effective	total
Female (n=72)	1	13	51	7	72
	1,4 %	18,1 %	70,8 %	9,7 %	100 %
Male (n=36)	0	7	27	2	36
	0	19,4 %	75 %	5,6 %	100 %
Overall(n=108)	1	20	78	9	108
	0,9 %	18,5 %	72,2 %	8,3 %	100 %
Chi <sup>2</sup> Pearsona: 0,558, df=2, p= 0,757, (p>0,05)					

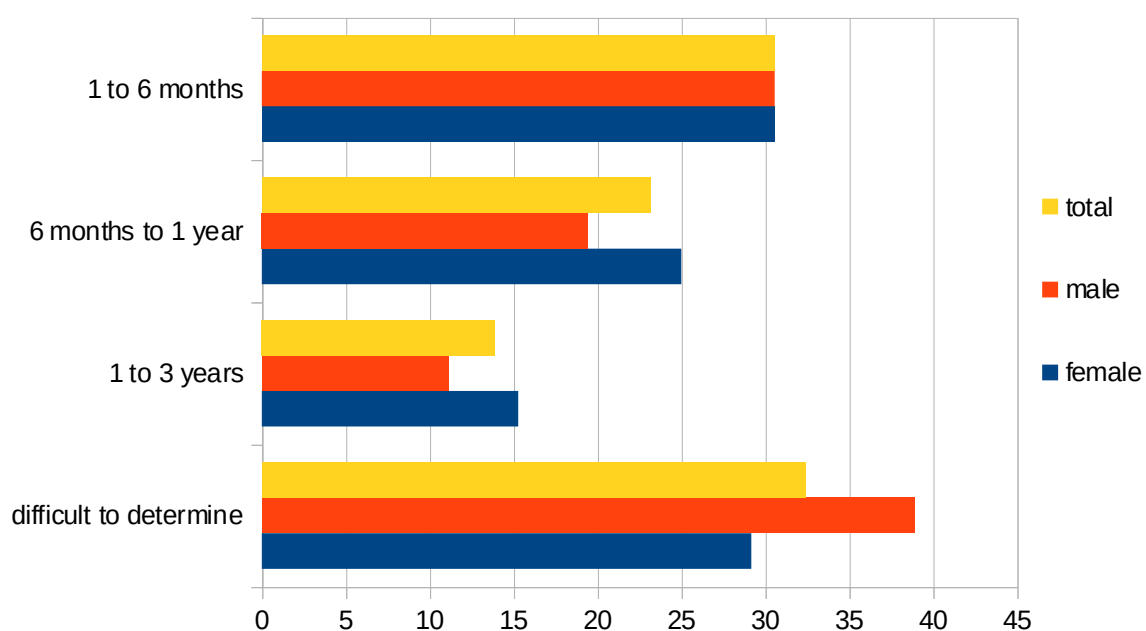
A significant portion of the respondents, 48 patients (44.4% of the study group), stated that laser therapy treatments had moderate effectiveness, while 31 people (28.7%) believed the effects of this form of rehabilitation were substantial. Only three individuals reported no effect from the treatments. The collected data is presented in diag. 1.

Diag. 1. Degree of effectiveness of laser therapy treatments in patients' self-assessment (n=108)



Both women and men experienced a recurrence of pain symptoms primarily between 1 and 6 months after the treatments (approximately 30% of women and 30% of men). In a smaller percentage of cases, pain recurred between 6 months and 1 year after laser therapy (25% of women and 19.4% of men). For a smaller group of patients, pain recurred less frequently, occurring between 1 to 3 years after the treatments (15.3% of women and 11.1% of men). These findings are summarized in diag. 2.

Diag. 2. Percentage distribution of periods followed by recurrence of pain after laser therapy in the patient group (n=108). Chi<sup>2</sup> Pearsona: 1,32, df=3, p=0,724, (p>0.05)



After laser therapy, 50% of patients experienced significant pain relief, 37% reported minor improvements, and only 9.3% saw no noticeable improvement. An impressive 100 respondents expressed a willingness to undergo laser therapy treatments again in the future.

## **Discussion**

Laser therapy has gained considerable attention in the scientific literature for its use in rehabilitation. The effectiveness of this therapy in treating musculoskeletal injuries, inflammation, and chronic pain is widely studied, though some discrepancies in research findings remain. Recent studies provide valuable insights into its applications, but there is still a need for more comprehensive studies with long-term results.

Many authors emphasize the positive impact of laser therapy on soft tissue healing and inflammation reduction. For example, a study by Huang et al. (2023) demonstrated that low-level laser therapy (LLLT) significantly accelerates muscle tissue regeneration and reduces pain in patients with chronic back pain. Similarly, Santos et al. (2022) observed significant improvement in patients with carpal tunnel syndrome after several laser therapy sessions. These results highlight the considerable effectiveness of this therapy in reducing pain and improving motor function.

However, the duration of therapeutic effects remains a topic of discussion. Although many studies report benefits immediately after therapy, long-term observations assessing the sustainability of these effects are still lacking. For instance, a study by Ribeiro et al. (2022) showed improvement in knee joint function in patients with arthritis after 8 weeks of therapy, but a follow-up study 6 months later revealed no significant differences compared to the control group. This suggests that laser therapy may provide short-term relief, but its long-term benefits require further investigation.

In terms of safety, laser therapy is considered a safe method with low risk of complications. Recent studies indicate that side effects from laser therapy are rare. In a study by Kwon et al. (2021), no serious adverse effects were observed in patients following treatments, confirming the high safety of this physiotherapy method [19].

In conclusion, available scientific evidence supports the efficacy of laser therapy in rehabilitation, particularly in reducing inflammation, alleviating pain, and promoting tissue regeneration. However, the lack of long-term studies highlights the need for further research to fully evaluate the effectiveness of this method.

## **Conclusions**

This study demonstrated that laser therapy is an effective form of rehabilitation for spinal pain syndromes, with significant pain relief achieved in most cases. However, the duration of pain relief after laser therapy is relatively short, with symptoms typically recurring within a few months to a year. Notably, 100 respondents expressed a willingness to undergo future laser therapy, underscoring the positive perception of this treatment among patients.

The data suggests that laser therapy is an effective treatment for chronic cervical and lumbar spine pain syndromes. However, the lack of sufficient long-term studies calls for further research to better understand its lasting effects.

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### **Conflict of interest**

The author reports no conflicts of interest

Damian Ruta: Conceptualization, Writing- rough preparation, Methodology, Investigation Resources, Formal analysis, Visualisation, Writing- review and editing

### **References:**

1. Łazowski J.: Podstawy fizykoterapii. Wyd. 2, AWF Wrocław 2002.
2. Mika T.: Fizykoterapia. Wydawnictwo Lekarskie PZWL Warszawa 1999, 133-151.
3. Subhashchandra R., Nihad K P., Riyas Basheer K B. A Comparative Study on the Efficacy of Low Level Laser Therapy (LLLT) of Wavelength 905 NM and 808 NM in Management of Chronic Low Back Pain 2021. doi:10.37506/ijpot.v15i4.16516
4. Saleh, M.S., Shahien, M., Mortada, H. *et al.* High-intensity versus low-level laser in musculoskeletal disorders. *Lasers Med Sci* 39, 179 (2024). doi.org/10.1007/s10103-024-04111-1
5. Stausholm MB, Naterstad IF, Joensen J, et al. Efficacy of low-level laser therapy on pain and disability in knee osteoarthritis: systematic review and meta-analysis of randomised placebo-controlled trials *BMJ Open* 2019;9:e031142. doi: 10.1136/bmjopen-2019-031142
6. Laser (Light Amplification by Stimulated Emission of Radiation) therapy (LT). In: Rovenský, J., Payer, J. (eds) *Dictionary of Rheumatology*. Springer, Vienna 2009. doi.org/10.1007/978-3-211-79280-3\_646
7. Sixty years of lasers. *Nat Rev Phys* 2, 221 (2020). <https://doi.org/10.1038/s42254-020-0181-9>
8. Mikołajewska E.: Fizykoterapia dla praktyków. Wydawnictwo Lekarskie PZWL Warszawa 2011.
9. Sieroń A.: Lasery w medycynie. *Ogólnopolski przegląd Medyczny* 2005; 11; 42-43.
10. Kushibiki T, Ishihara M. Biological Function of Low Reactive Level Laser Therapy (LLLT). *Photomedicine - Advances in Clinical Practice*. InTech; 2017. dx.doi.org/10.5772/65747

11. Kwolek A.: Rehabilitacja medyczna T 1, wyd. 1. Wrocław 2003.
12. Robertson V., Ward A., Low J., Reed A.: Fizykoterapia. Aspekty kliniczne i biofizyczne., s. 495-522 Wrocław 2009.
13. Straburzyńska-Lupa A., Straburzyński G.: Fizykoterapia z elementami klinicznymi. T 1, Wydawnictwo Lekarskie PZWL Warszawa 2008; 325-337.
14. Straburzyński G., Straburzyńska-Lupa A.: Medycyna fizykalna. Wydawnictwo Lekarskie PZWL Warszawa 1997; 276-288.
15. Kurkus B., Kuliński W.: Laseroterapia w medycynie fizykalnej. *Balneologia Polska* 3-4/2005, s. 76-83.
16. Baskov, A.; Borshchenko, I.A.; Baskov, V.; Shekhter, A.; Sobol, E. Laser Reconstruction of Spinal Discs Experiments and Clinic. *Appl. Sci.* 2022, 12, 675. doi.org/10.3390/app12020675
17. Kasprzak W., Mańkowska A.: Fizykoterapia, medycyna uzdrowiskowa i SPA. Wydawnictwo Lekarskie PZWL Warszawa 2008; 70-97.
18. Awotidebe, A.W., Inglis-Jassiem, G. & Young, T. Low-level laser therapy and exercise for patients with shoulder disorders in physiotherapy practice (a systematic review protocol). *Syst Rev* 4, 60 (2015). doi.org/10.1186/s13643-015-0050-2
19. Yeh SW, Hong CH, Shih MC, Tam KW, Huang YH, Kuan YC. Low-Level Laser Therapy for Fibromyalgia: A Systematic Review and Meta-Analysis. *Pain Physician.* 2019;22(3):241-254.
20. D. Gigo-Benato, T.L. Russo, E.H. Tanaka, L. Assis, T.F. Salvini, N.A. Parizotto: Effects of 660 and 780 nm low-level laser therapy on neuromuscular recovery after crush injury in rat sciatic nerve. *Lasers Surg Med*, 42: 673–682, 2010.
21. C.C. Shen, Y.C. Yang, T.B. Huang, S.C. Chan, B.S. Liu: Neural regeneration in a novel nerve conduit across a large gap of the transected sciatic nerve in rats with low-level laser phototherapy. *J Biomed Mater Res A*, 101: 2763–2777, 2013.
22. Ruta D. Skuteczność zabiegów laseroterapii w ocenie własnej pacjentów w zespołach bólowych odcinka szyjnego i lędźwiowego kręgosłupa. Praca licencjacka. Wydział Pielęgniarstwa i Nauk o Zdrowiu Uniwersytetu Medycznego w Lublinie 2014.