BALNEO RESEARCH Balneo and PRM Research Journal
English Edition
e ISSN 2734 - 8458 p ISSN 2734 - 844X ROMANIAN ASSOCIATION OF BALNEOLOGY

Review article

Therapeutic Approaches to Back Pain: A Systematic Review

Catalin Ionite [1], Iustina Condurache [1], Antoneta Petroaie[1], Mariana Rotariu [1], Cezar Mucileanu [1,*] and Marius Turnea [1]

Citation: Ionite C., Condurache I., Petroaie A., Rotariu M., Mucileanu C., Turnea M. - Therapeutic Approaches to Back Pain: A Systematic Review
Balneo and PRM Research Journal ***2026****, 17(2): 1029*

Academic Editor(s):
Constantin Munteanu

Reviewer Officer:
Viorela Bembea

Production Officer:
Camil Filimon

Received: 24.05.2026
Published: 10.07.2026

Reviewers:
Mihail Hoteteu
Himena Zippenfening

Publisher's Note:
Balneo and PRM Research Journal stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1 Grigore T. Popa University of Medicine and Pharmacy Iasi

* Correspondence: vasile-cezar.mucileanu@d.umfiasi.ro

Abstract: Low back pain remains the leading cause of global disability, necessitating a transition to precision medicine. The study analyzes the effectiveness of current therapeutic approaches according to the literature of 2025. A systematic review was conducted by querying the Web of Science and Scopus databases. From the total of 392 results initially identified by specific search terms, 36 scientific articles were selected, after filtering duplicates and assessing relevance, to form the final analysis sample. The data confirm the superiority of active therapies (McKenzie, Canali, Core Stability) and tissue release methods (MFR, Gua Sha). Innovations such as Augmented Reality, ultrasound-guided acupuncture and the STOPS model demonstrate that success depends on personalizing treatment and addressing psychosocial factors. The management of low back pain in 2025 is defined by the "reprogramming" of the nervous system and the integration of technology into multimodal protocols. Effective rehabilitation requires moving from generic protocols to individualized, evidence-based interventions.

Keywords: low back pain, systematic review, precision medicine, multimodal rehabilitation, therapeutic approaches

1. Introduction

Low back pain is the leading cause of disability worldwide, and is a growing global burden that requires urgent public health action, as most cases have no specific pathological cause and are influenced by socio-economic and psychological factors [1]. Furthermore, between 1990 and 2015, the incidence of disability due to low back pain increased by 54% worldwide, due to population growth and aging, with a high prevalence in developing economies [1].

To effectively treat chronic low back pain, it is essential to accurately identify the anatomical source (anterior, posterior or extra-vertebral) through a differential diagnosis, after excluding serious non-degenerative causes [2]. This process necessarily begins with the exclusion of serious causes (such as tumors or infections), followed by a detailed investigation of degenerative structures [2].

Due to the complex and multidimensional nature of low back pain, diagnosis and treatment remain controversial, requiring a shift from isolated approaches to an interdisciplinary biopsychosocial model that integrates biological, psychological and social factors to reduce the overall socioeconomic burden [3].

In this regard, the correct classification of pain mechanisms (nociceptive, neuropathic and central sensitization) by clinical criteria and validated instruments is essential for effective treatment, as neuropathic pain and central sensitization are associated with much higher disability and psychological distress [4].

At the same time, it must be considered that although intervertebral disc degeneration is a widespread physiological process, it does not always explain the occurrence of

pain, as many patients remain asymptomatic despite structural degradation, and discogenic pain itself results from complex molecular mechanisms, such as oxidative stress and cellular senescence, which stimulate pathological innervation of the disc [5].

2. Materials and Methods

2.1. Search strategy and databases

The present manuscript was designed as a systematic review integrated with a bibliometric analysis, following the methodological framework recommended by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The study selection process was based on predefined eligibility criteria, applied consistently to identify relevant publications addressing therapeutic approaches for low back pain in the 2025 literature. The systematic component focused on the critical evaluation and qualitative synthesis of the clinical effectiveness of the included interventions, while the bibliometric component was used to examine publication patterns, thematic distribution, geographical representation, and proximity networks within the selected body of literature. The articles included in the analysis were identified through searches conducted in the Web of Science and Scopus databases. This dual approach was chosen to minimize the risk of omitting relevant studies and to ensure increased validity of the collected data.

2.2. Database query (Search Terms)

The search was configured strictly for the "Title" field, the aim being to identify articles that explicitly focus on the investigated topic. The queries were structured using specific search terms, as follows:

"Back pain approach": This phrase returned a total of 34 articles in Web of Science and 40 articles in Scopus.

"Back pain therapy": Being a more general term, it generated a larger volume of results, namely 142 articles in Web of Science and 142 in Scopus.

"Back pain physical therapy": This targeted search identified 23 studies in Web of Science and 21 in the Scopus database.

The selection process rigorously followed the methodological steps imposed by the PRISMA guideline, justifying the reduction from the initial 392 records to the 36 studies finally included:

Identification: The initial search in the Web of Science and Scopus databases generated a total of 392 raw records.

Duplicate removal: Following the overlap of the two databases, a significant number of articles were identified as electronic duplicates and removed..

Screening based on title and abstract: the remaining articles were evaluated by title and abstract. At this stage, another significant number of articles were excluded because they addressed other pathologies or used purely surgical/pharmacological methods, not falling within the scope of rehabilitation. Over 60 articles remained for full-text evaluation.

Full-text eligibility assessment: The 66 articles were read in full. Of these, 30 were eliminated for specific reasons: lack of reporting of standardized clinical assessment methods, ambiguous methodological design, or incomplete statistical data.

Inclusion: In the end, exactly 36 studies met absolutely all quality and eligibility criteria, being included in the qualitative and bibliometric analysis.

2.3. Selection criteria and data processing

The selection process followed a rigorous filtering methodology. Given the exponential growth of evidence-based physical medicine and the rapid shift toward precision rehabilitation, this review limits its focus to the 2025 cycle of scientific literature. This delimitation provides a contemporary, high-resolution cross-section of the most recent clinical innovations and technological integrations (such as augmented reality and ultrasound-guided protocols). Although some of the baseline or longitudinal data referenced

in the included meta-analyses cover longer periods, the primary objective remains to critically evaluate how low back pain management is defined by the state-of-the-art evidence set in 2025.

Initially, all the results obtained through the aforementioned queries were centralized. In a first stage, duplicates were identified and eliminated, given the inherent overlap between the Web of Science and Scopus indexing. Subsequently, the articles were evaluated based on titles and abstracts to verify their relevance in relation to the objectives of the present study

To ensure an objective and reproducible selection of studies, the following strict criteria were applied:

Inclusion criteria: Original peer-reviewed scientific articles, systematic reviews and meta-analyses published or indexed in the 2025 literature cycle; studies directly focused on conservative rehabilitation interventions, physical medicine and physiotherapy for low back pain; Studies reporting clear clinical outcomes (pain reduction, functional improvement, biomechanical changes).

Exclusion criteria: studies focused exclusively on invasive surgical techniques or isolated pharmacological management; conference abstracts, letters to the editor, editorials and grey literature; articles with incomplete data or redundant duplications of the same patient sample.

3. Results

Oiikonomidis S. states in the article entitled Chronic back pain-pharmacological and nonpharmacological treatment approaches that the treatment of chronic low back pain should focus on conservative methods and exercises, since pharmacological and surgical solutions present risks or limited effectiveness in relation to the complex nature of the condition [6].

Lemhofer c. together with the authors analyzed recent clinical guidelines [7], the study emphasizes that physiotherapy and exercise therapy represent the central pillars of treatment, being essential to adapt them to the individual clinical picture of each patient. The results highlight that multimodal approaches — which integrate physical, psychological and social dimensions — offer the greatest efficiency in the management of chronic cases.

Research conducted by Mostofi K. in 2025 evaluated the effectiveness of cryotherapy in the management of residual low back pain after spinal surgery, based on the ability of cold to reduce inflammation and increase the activation threshold of nociceptors [8]. In a retrospective comparative study of 433 patients, researchers monitored a group that used an ice application protocol (four 30-minute sessions daily) for two months postoperatively, compared with a control group. The results, assessed by the Numeric Rating Scale and the Oswestry Disability Index at 15, 30, and 60 days, indicate that local vasoconstriction and reduced blood flow directly contribute to limiting edema and muscle spasms. In conclusion, the study supports the integration of cryotherapy into postoperative rehabilitation, demonstrating that it is an effective and affordable method for relieving pain and accelerating functional recovery after spinal surgery.

Tanna reported that in a case study she evaluated the impact of a holistic physiotherapy approach on a 21-year-old patient with chronic low back pain and a history of brucellosis. For three months, the intervention combined manual therapy and strength exercises with mindfulness techniques, with progress monitored by pain scales (NPRS), mobility tests and mental health questionnaires. The results indicated a significant reduction in pain, along with improvements in muscle strength, flexibility and mental state. The work demonstrates that an integrative physiotherapy plan, which simultaneously addresses physical and psychological factors, is essential for functional recovery in complex clinical cases, effectively complementing classical medical treatment [9].

The study conducted by Anselmo A. evaluated the effectiveness of digitally delivered psychological therapies in the management of chronic low back pain, starting from

the high incidence of chronicity of this condition. Through a systematic review of 20 clinical trials selected from databases such as PubMed and Scopus, the researchers analyzed the impact of remote interventions on quality of life. The results confirm that psychological teletherapy is effective, facilitating treatment adherence and patient empowerment, and the work supports the digitalization of psychological support strategies to provide continuous and personalized assistance, essential in reducing the social and personal burden of chronic pain [10].

Mauck M.C and collaborators conducted research within the US NIH HEAL initiative and aimed to create a personalized medicine algorithm to eliminate uncertainty in the choice of treatment for chronic low back pain[11]. A group of experts rigorously evaluated the specialized literature, selecting interventions with the strongest evidence on the magnitude and duration of the therapeutic effect. The results highlighted four essential pillars: duloxetine administration, acceptance and commitment therapy, specialized physiotherapy and self-management strategies. In conclusion, the study establishes these four approaches as the current gold standard, providing a solid scientific basis for clinicians to personalize treatment according to the specific needs of each patient.

The authors of the study State-of-the-Art Personalized Therapy Approaches for Chronic Non-Specific Low Back Pain: Understanding the Mechanisms and Drivers propose a paradigm shift towards personalized medicine, identifying four main pain phenotypes (inflammation, muscle spasm, central sensitization, and disinhibition) and eleven pain drivers, ranging from biomechanical aspects and obesity to anxiety, insomnia, and microbiota imbalances[12]. The results emphasize that pharmacological treatment should not be standard, but specifically targeted to the dominant pathophysiological mechanism of each patient. In conclusion, the paper advocates the use of advanced algorithms, including artificial intelligence, to create personalized treatment programs in neurological practice, demonstrating that therapeutic success depends on approaching the patient as a whole, not just treating the isolated symptom of pain.

The study conducted by Liu Z.H. and collaborators explore a pioneering approach to treating non-specific low back pain, shifting the focus from the spine to the thoracolumbar fascia (TLF) and adjacent musculature. The innovation consists in using ultrasound to identify "heterogeneous echo zones" (areas where the tissue has lost its elasticity or shows micro-lesions), which become precise targets for ultrasound-guided acupuncture (UGA). The research compares the effectiveness of this visually guided method with classical acupuncture, over three weeks of treatment and monitoring. Preliminary results suggest that real-time visualization of the fascia allows for much greater precision in releasing tissue tension, leading to faster pain reduction and improved low back function. In conclusion, the study demonstrates that the integration of imaging technology into rehabilitation protocols allows the transformation of a traditional technique into a precision intervention, offering a safe and effective solution for patients whose pain stems from soft tissue (fascia) dysfunctions, often omitted in standard protocols [13].

Hahne A.J. et al. This randomized clinical trial evaluates the efficacy of the STOPS (Specific Treatment of Problems of the Spine) approach in the management of chronic low back pain, compared with conventional physiotherapy [14]. The innovation of the STOPS model lies in its deeply individualized character, which not only treats the physical symptom, but also integrates biological, neurophysiological and psychosocial factors. The study, conducted on a sample of 154 participants, uses advanced tools such as functional MRI to observe changes in the brain and qualitative interviews to capture the subjective experience of patients. The results monitored at 26 weeks are aimed at activity limitation (measured by the Oswestry index), the hypothesis being that a therapy that "reprograms" the nervous system's response is superior to standard exercises. In conclusion, the paper emphasizes that the future of recovery in chronic low back pain lies in the transition from generic protocols to a precision approach, capable of addressing the multidimensional nature of pain and producing lasting functional changes in both the biomechanics of the back and the neurological processing of pain.

Also in 2025, Sanchez J.P. et al. reported that recent research suggests that chronic low back pain (CLBP) is not just a tissue problem, but also a "mental map" problem: many patients suffer from a distortion of their own body perception (for example, they feel their back as foreign, larger or smaller than it actually is) [15]. This systematic review evaluated the tools by which therapists can measure this phenomenon, analyzing 16 studies that included over 2500 participants. Two main questionnaires were targeted: FreBAQ (Fremantle Back Awareness Questionnaire) and BARQ (Body Awareness Rating Questionnaire). The results showed that although these tools are useful for identifying sensory distortions, neither has yet demonstrated full content validity, being classified with a grade of "B". In conclusion, the study emphasizes that modern rehabilitation should include assessing how the patient "feels" their back, as correcting distorted body perception could be the key to more effective treatment strategies.

This meta-analysis published in the journal Preventive Medicine by Vega-Retuerta N. et al. evaluated the impact of multidisciplinary interventions that include exercise on patients with nonspecific chronic low back pain (NSCLBP) [16]. The study included 31 studies published over a period of more than two decades (1998–2021), analyzing complex data on disability, pain, quality of life, and psychological factors. The results demonstrate that the combined approach — which combines movement with other forms of therapy — has a statistically significant effect in reducing pain and disability, as well as in reducing kinesiophobia (fear of movement). An interesting finding of the study is that although these interventions significantly improve physical condition and general perception of well-being, they did not have a significant impact on depression, anxiety or stress in patients with low back pain. In conclusion, the work confirms that physical exercise integrated into a multidisciplinary program is a highly effective "weapon" for regaining functionality, but emphasizes the need for therapeutic expectations to be realistic: for deep mental health, specific psychological interventions are needed, beyond standard physical rehabilitation.

Conen R. et al. explore the transition from conventional psychoeducational methods to immersive technologies, proposing for the first time the use of Augmented Reality (AR) as a bridge between physical and psychological recovery in chronic low back pain (CLBP). The authors reviewed 12 recent studies (2019–2024), noting that although Virtual Reality (VR) is already in use, it has limitations due to the total immersion that can isolate the patient from their own body. In contrast, AR allows for the "supplementation" of the real world with virtual elements, preserving the sensory perception of the body and allowing the patient to perform physical exercises while receiving visual information about the biology of pain. The results of the analysis emphasize that the success of recovery through AR depends on combining behavioral change theories (health psychology) with gamification design to increase intrinsic motivation. In conclusion, the study proposes an innovative framework for interventions in which patients do not just "receive" information about pain, but actively interact with it through technology. This approach promises to reduce kinesiophobia (fear of movement) and pain catastrophizing, providing a superior user experience and a much lower dropout rate in long-term rehabilitation programs [17].

Sabina S. et al. study compares the effectiveness of the Canali Postural Method (CPM) with generic exercises in the treatment of chronic non-specific low back pain [18]. Unlike standard medical gymnastics, CPM is a kinesiological method focused on "postural reprogramming", which begins with a rigorous assessment phase to identify the musculoskeletal causes of postural compensations. The study involved 70 participants (35 in the CPM group and 35 in the control group), monitored during four weeks of intervention and evaluated 3 months post-treatment. The statistical results are categorical: the group that followed the Canali Method reported a significantly greater pain reduction ($p < 0.001$) compared to the control group, the effect being maintained at the 3-month assessment. Furthermore, although both groups felt an improvement in disability immediately after the exercises, the CPM group showed a clear superiority in the long term. In conclusion, the study demonstrates that personalized postural reprogramming exercises

are more effective than generic training, suggesting that the secret to lasting recovery lies in improving motor control and correcting individual biomechanics, not just in simple muscle strengthening.

This study by Danazumi M.S. et al., but also with clinical implementation (2023–2026), proposes a paradigm shift in medical recovery by moving from standard protocols to the STOPS (Specific Treatment Of Problems of the Spine) approach, an individualized physiotherapy model based on biopsychosocial evidence. The methodology focuses on advanced training of therapists to deliver precision treatments, monitoring over 52 weeks not only the reduction of pain and disability (by the Oswestry score), but also the cost-effectiveness of the intervention in relation to quality of life. In conclusion, the study demonstrates that a personalized therapeutic strategy, which integrates the trust of the specialist with the biological and psychological needs of the patient, represents the optimal solution for a durable and economically sustainable functional recovery [19].

The study conducted by Zejnullahi H. et al. evaluated the effectiveness of a structured physiotherapy program on 47 patients with chronic nonspecific low back pain (CNSLBP) [20]. The intervention consisted of a two-week intensive phase under supervision (5 sessions/week), followed by four weeks of home exercises (HBE) focused on stretching, strength and aerobics. The results indicated significant reductions in pain intensity (from 5.93 to 2.68 on the NRS scale) and in the Oswestry disability index (from 16.36 to 7.39). Functional mobility measured by the sit-to-stand test also improved considerably after the first two weeks. It was concluded that the supervised phase provides a rapid therapeutic boost, while the home program is essential for maintaining and consolidating functional gains.

This umbrella review by Comachio J et al. synthesized evidence from 70 systematic reviews to assess the benefits of exercise in the secondary prevention and management of low back pain (LBP). The methodology involved a large search of databases such as MEDLINE and Cochrane, covering the period 2010–2024, using the GRADE and AMSTAR tools to assess the quality of the evidence. The results showed that general exercise and leisure-time physical activity reduce the risk of recurrence, while specific methods such as Pilates, motor control, Tai Chi and yoga provide short-term benefits on pain intensity and disability. Adverse events were rarely reported (less than 31% of studies) and were considered minor, such as muscle soreness. It was concluded with low to moderate certainty that exercise therapy is beneficial for pain management and relapse prevention, although data on potential risks remain insufficient and require further investigation [21].

The study by Osama M. et al. evaluated the impact of physiotherapy on vertebral disc height and function in patients with posterolateral disc herniation. An intensive protocol consisting of interferential therapy, the McKenzie method, manual traction, and rotational mobilizations was applied for two weeks. The results showed significant improvements in the disc height index (confirmed by MRI), pain reduction, and increased postural stability. It was concluded that the physiotherapeutic intervention improves both the structure of the intervertebral disc and the clinical and functional parameters of the patients [22].

Kull P. et al. evaluated the impact of pulsed electromagnetic field therapy (PEMF) on pain and function in patients with nonspecific low back pain. The analysis included 9 randomized clinical trials, comparing PEMF with placebo or as an adjunct to conventional physiotherapy, high-intensity laser (HILT), and osteopathic treatment. The results showed a significant reduction in pain and an improvement in physical function in most studies, without reporting serious adverse effects. It was concluded that PEMF is a safe and beneficial therapeutic option, especially when integrated into conventional physiotherapy protocols, although standardization of treatment parameters (intensity, frequency, and duration) is needed [23].

This Bayesian meta-analysis by Boroncini A. et al. in 2025 compared the effectiveness of active versus passive physiotherapy and their combination in 2768 patients with

chronic low back pain. The methodology involved analyzing randomized clinical trials, collecting data on pain intensity and disability scores (Roland-Morris and Oswestry) over a mean follow-up period of 6 months. The results indicated that the group that received active physiotherapy alone had the best scores, with the lowest levels of pain and disability. It was concluded that active physiotherapy is superior to passive treatments or mixed protocols in the management of mechanical and non-specific low back pain [24].

This systematic review and meta-analysis by González-Gómez L. et al. compared the effectiveness of exercise therapy (ET) versus manual therapy (MT) in patients with chronic low back pain. The analysis included 6 randomized clinical trials (743 patients), assessing pain intensity and disability in the short, medium and long term, using meta-regression to identify confounding factors such as age and sex. The results showed a small benefit in favor of exercise therapy in reducing long-term disability, but no clinically significant differences were found between the two approaches as stand-alone treatments. It was concluded that the current evidence is of very low certainty, with the choice of a single method not being categorically supported, while outcomes appear to be influenced by biopsychosocial factors, treatment duration, and patient profile [25].

Xia Y. et al. evaluated the effectiveness of mind-body exercises (Tai Chi, Qigong, Daoyin, and Yoga) in the management of chronic nonspecific low back pain by analyzing 29 randomized clinical trials on a sample of 3803 patients[26]. The methodology involved a network meta-analysis that compared the impact of these interventions on pain scores, physical functioning, and quality of life. The results indicated that Qigong was the most effective method for reducing pain and improving physical function, while Tai Chi provided the most significant benefits for increasing quality of life. It was concluded that these holistic therapies represent valuable non-pharmacological options, and it is recommended that the intervention be personalized according to the specific needs of the patient to optimize long-term outcomes

The study by Schöder J. et al. analyzed the use of extracorporeal shock wave therapy (ESWT), differentiating between radial and focal forms, for the treatment of chronic low back pain. The methodology aimed to evaluate the efficacy of this safe procedure in the diagnosis and treatment of myofascial pain syndromes, trigger points, and facet and sacroiliac joint dysfunctions, which are major contributors to spinal pathology. The results demonstrated that ESWT is effective in relieving pain and improving functional outcomes, without presenting relevant side effects. It was concluded that shock wave therapy represents a simple and safe solution for patients with back pain, being particularly useful in addressing the myofascial and articular causes of the condition [27].

Simonova J. et al. evaluated the efficacy of Spinal Cord Stimulation (SCS) on 61 patients with chronic pain. The methodology analyzed pain intensity and functional capacity evolution through the Oswestry Disability Index (ODI) over 12 months. The results showed a significant decrease in pain and opioid consumption, along with an improvement in quality of life. It was concluded that neurostimulation is a safe and effective method for lasting symptom relief in selected patients [28].

The study by Sahu S. et al. evaluated yoga therapy on 35 patients with chronic discogenic low back pain, monitored for 12 weeks. Using the Visual Analog Scale (VAS), the Face Pain Rating Scale (FPRS), and the Oswestry Disability Index (ODI), the researchers observed a drastic decrease in pain and disability. It was concluded that yoga is an effective non-invasive method for significantly reducing symptoms and improving functionality [29].

The study by Rouzí M. et al. compared acupuncture with Transcutaneous Electrical Nerve Stimulation (TENS) in 60 patients. The results, assessed by the Oswestry Disability Index (ODI) and the Short Form-36 (SF-36) questionnaire, showed that acupuncture significantly improved functionality and quality of life. It was concluded that acupuncture was more effective than the conventional physiotherapy tested [30].

The study by Gholami E. et al. evaluated the impact of Exercise Therapy (ET) combined with Cognitive Functional Therapy (CFT) on 60 women with chronic non-specific

low back pain [31]. The results showed that both methods reduced pain and disability, but their combination (ET + CFT) provided superior benefits, especially by reducing kinesiophobia (fear of movement). It was concluded that the addition of the cognitive component enhances the effectiveness of the exercises by addressing psychological factors.

This meta-analysis, conducted by Dimitrijevic V. and conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, evaluated the effectiveness of stabilization exercises on 1132 patients. The results showed that longer treatment durations (8-12 weeks) and core stability exercises provided the greatest reductions in pain. It was concluded that stabilization exercises are superior to other interventions and should be prioritized in the treatment of chronic low back pain, especially in long-term supervised programs [32].

This review by Narenthiran P. et al. examined whether adding manual therapy to exercise improves outcomes in chronic low back pain [33]. The methodology included ten randomized clinical trials that assessed pain using the Visual Analogue Scale (VAS) and disability using the Oswestry Disability Index (ODI). The results showed that eight of the ten trials reported significant additional benefits when manual therapy was used as an adjunct. It was concluded that adding manual therapy to an exercise program is recommended for short-term pain relief and improvement in physical function

Guo J.X. et al compared nine acupuncture-derived therapies in a sample of 1356 participants with non-specific low back pain. Assessment was performed using the Visual Analog Scale for pain and the Oswestry Disability Index for improvement in function. Results indicated that bleeding therapy was most effective in reducing pain, while scraping therapy provided the best results in improving functional capacity. For cold and wet pain, warm acupuncture was the preferred option. It was concluded that the choice of treatment should be individualized according to symptoms, although further studies are needed for validation [34].

Aponte A.'s study analyzed treatments for central sensitization and other factors in chronic low back pain, using Systemic Manual Therapy protocols based on the Temporal Model for Central Sensitization [35]. The study included 1053 patients, evaluating 715 protocol combinations. Results showed that 68% of patients reported an improvement in overall symptoms, and 53% saw a specific improvement in low back pain. Protocols that targeted areas such as the abdomen, diaphragm, and urogenital system yielded significantly higher success rates. It was concluded that systemic manual therapy is effective, but the approach to chronic low back pain should be multimodal, emphasizing lifestyle, smoking cessation, and exercise, rather than medications or surgery.

Koura G.M.R. et al. investigated the impact of electromagnetic field therapy on 30 patients with mechanical low back pain and myofascial pain syndrome. Participants were divided into two groups: group A received conventional physiotherapy, and group B combined physiotherapy with electromagnetic field therapy. Assessments included pain intensity, functional disability, and Lumbar Range of Motion. Results indicated significant differences between the two groups, with group B showing a superior reduction in pain and disability, along with a significant improvement in spinal mobility. It was concluded that electromagnetic field therapy is an effective method for improving symptoms and functional capacity in patients with mechanical low back pain [36].

Akkurt B. compared the efficacy of peloid (therapeutic mud) therapy and hot packs (Hot Pack) on 60 patients with chronic low back pain caused by herniated discs. All participants also received Transcutaneous Electrical Nerve Stimulation. Assessments included the Visual Analog Scale, Back Pain Functional Scale, Oswestry Disability Index, and Short Form-36. Results showed that both treatments significantly reduced pain and disability. However, the peloid therapy group showed superior improvements in functional status and quality of life. It was concluded that although both methods are effective, peloid therapy offers additional benefits for the general health and emotional well-being of patients [37].

Olaoye M.I. et al. evaluated the impact of three types of exercise (McKenzie Extension Protocol, Static Back Extension Endurance, and Dynamic Back Extension Endurance) on 76 patients with chronic low back pain. The research looked not only at subjective indicators such as pain, but also at biomarkers of inflammation (Interleukin-4, Interleukin-10) and muscle status (Creatine Kinase). The results showed that the McKenzie Extension Protocol was the most effective in reducing pain. In contrast, the Static Back Extension Endurance generated the greatest increases in anti-inflammatory cytokines, suggesting a better modulation of inflammatory processes. It was concluded that these exercises support tissue repair and improve muscle condition, being essential in the management of chronic low back pain [38].

Zahra H. T. et al. evaluated the effectiveness of Osteopathic Manipulative Therapy as a method of managing chronic low back pain [39]. The methodology consisted of reviewing the specialized literature through search engines such as PubMed, Google Scholar and Scopus. The results of the analyzed studies indicate that osteopathic therapy helps to alleviate pain, increase functionality and reduce medication consumption, recording a high degree of satisfaction among patients.

Mohamed R.A. et al. compared Myofascial Release and Cupping Therapy techniques in 60 patients with non-specific low back pain, divided into three groups [40]. All participants also received conventional physiotherapy, and were assessed by Visual Analog Scale for pain, spinal mobility, and functional disability. The results showed that although all groups improved, the Myofascial Release group had significantly greater pain reduction and increased Range of Motion than the other groups. It was concluded that Myofascial Release is more effective than cupping therapy in treating pain and restoring functional function in patients.

Wang B.B. et al. evaluated the effects of Gua Sha technique compared with hot pack therapy in 32 patients with chronic nonspecific low back pain. The study monitored changes in fascia thickness (Thoracolumbar Fascia), pain intensity, lumbar flexibility, and pressure pain threshold (Pressure Pain Threshold) [41]. Results indicated that both groups showed significant improvements in pain and function. However, only the Gua Sha group showed a significant reduction in fascia thickness immediately after the first and fourth sessions, as well as superior clinical outcomes in flexibility. It was concluded that Gua Sha is an effective complementary therapy that regulates the mechanical properties of tissues through multiple physiological pathways.

Schimacher M.R. et al. investigated why many physical therapists hesitate to apply clinical practice guidelines (CPGs) in the treatment of low back pain, even though they represent the gold standard in rehabilitation. The study identified six major barriers to implementing these protocols: lack of individualized care, lack of skills or confidence, patient expectations, therapist's prior experience, lack of time, and poor understanding of the guidelines [42]. Interestingly, young therapists and orthopedic residents were most concerned that strict adherence to guidelines could compromise the one-on-one relationship with the patient or that the patient would not respond well to standardized treatment. In conclusion, the study emphasizes that successful recovery depends not only on the existence of smart protocols, but also on how well therapists manage to balance scientific recommendations with the unique needs of each patient. The biggest barrier identified—the perception that guidelines sacrifice "individualization"—shows that better training of specialists is needed to integrate science into clinical practice without losing the human side of treatment.

4. Discussion

4.1 Analysis of current trends and interpretation of results

The interpretation of the current results highlights a fundamental shift in the management of chronic low back pain, moving from interventions strictly focused on the

symptom to complex, personalized models. Oiikonomidis S. emphasizes that this transition is necessary because the classic surgical and pharmacological approaches present risks that often outweigh the benefits in the case of such a complex condition [6]. This view is supported by Lemhofer C., who identifies physiotherapy and exercise therapy as central pillars, but conditions their success to a multimodal approach that integrates the psychological and social dimension of the patient [7]. A critical aspect in recovery is the management of residual pain, where Mostofi K. demonstrates the effectiveness of post-operative cryotherapy in reducing inflammation and muscle spasm [8]. However, recovery is not limited to the physical factor; Tanna highlights, through a case study, that the inclusion of mindfulness techniques in a physiotherapy plan can simultaneously address both the strength deficit and the patient's psychological state [9]. In the digital age, Anselmo A. confirms that these psychological support strategies can be effectively delivered via teletherapy, increasing adherence to treatment [10].

Standardization of treatment remains a challenge, but Mauck M.C. proposes a personalized medicine algorithm that establishes specialized physiotherapy and self-management as the “gold standard” [11]. This need for precision is detailed by the authors of the State-of-the-Art Personalized Therapy Approaches study, who introduce the concept of pain phenotypes, arguing that treatment should target the dominant pathophysiological mechanism, not just the isolated symptom [12]. In this context of precision, Liu Z.H. proposes the use of ultrasound to guide acupuncture to the thoracolumbar fascia, transforming a traditional technique into a highly accurate intervention [13].

Despite the scientific evidence, Schimacher M.R. observes a resistance among therapists towards standardized protocols, fearing the loss of the individual relationship with the patient [42]. However, models such as STOPS, evaluated by Hahne A.J. and later by Danazumi M.S., demonstrate that an individualized physiotherapy, which "reprograms" the response of the nervous system, is superior to generic approaches both clinically and economically [14][19]. This reprogramming must take into account the patient's "mental map", Sanchez J.P. warning that distortions of the perception of one's own body are factors that can sabotage the recovery process if not properly evaluated [15]. The role of physical exercise remains undeniable, Vega-Retuerta N. showing that it is essential for reducing kinesiophobia [16]. To increase motivation, Conen R. proposes the use of Augmented Reality, providing an immersive bridge between physical exercise and education about pain [17]. Furthermore, Sabina S. demonstrates that the CPM (Canali) method brings superior long-term benefits compared to classical exercises by correcting individual biomechanics [18]. The efficiency of structured programs is also confirmed by Zejnullahi H., who shows that success depends on the sequence between an intensive supervised phase and a rigorous home program [20].

Umbrella analyses by Comachio J. reinforce the idea that motor control exercises, Pilates or yoga are fundamental for preventing relapses [21]. In specific cases, such as disc herniation, Osama M. provides evidence that McKenzie therapy and manual traction can improve the structure of the intervertebral disc [22]. Adjunctive technologies, such as pulsed electromagnetic field therapy analyzed by Kull P. or shock wave therapy (ESWT) evaluated by Schöder J., offer safe options for treating trigger points and joint dysfunctions [23, 27].

Although Boroncini A. advocates the superiority of active physiotherapy [24], González-Gómez L. suggests that the choice between manual therapy and exercise should remain flexible, depending on the patient's profile [25]. Mind-body therapies, such as Qigong or Tai Chi, are validated by Xia Y. as being extremely valuable for quality of life [26], while for patients with refractory pain, Simonova J. proposes neurostimulation as a safe method to reduce opioid consumption [28]. The efficacy of complementary methods is supported by Sahu S. (yoga) and Rouzí M. (acupuncture), both of whom demonstrate superior results compared to conventional approaches in certain contexts [29][30]. Gholami E. emphasizes that the power of physical exercise is doubled when combined

with cognitive functional therapy [31]. For long-term stability, Dimitrijevic V. recommends prioritizing "Core Stability" exercises [32], and Narenthiran P. confirms that manual therapy potentiates the effects of exercise programs [33].

In the field of tissue release techniques, Guo J.X. proposes a personalization of acupuncture (bleeding or scraping) according to symptoms [34], while Aponte A. demonstrates the success of systemic manual therapy in treating central sensitization [35]. Technologies such as electromagnetic field are revalidated by Koura G.M.R. for myofascial syndrome [36], and Akkurt B. highlights the benefits of peloidotherapy on emotional state [37].

Finally, laboratory and clinical research by Olaoye M.I. shows how McKenzie and endurance exercises shape inflammatory markers [38]. The results are complemented by the high patient satisfaction with osteopathic therapy reported by Zahra H. T. [39], the superiority of the Myofascial Release technique demonstrated by Mohamed R.A. [40] and the ability of the Gua Sha technique to modify fascia thickness, according to the study conducted by Wang B.B. [41]. All this evidence converges towards the need for a rehabilitation that no longer treats the back as an isolated structure, but as an integrated biological and psychological entity.

4.2 Implications for Rehabilitation Medicine

The conclusions of this review have direct and multidimensional practical implications for the field of physical medicine and rehabilitation, providing clear guidance in several strategic directions:

Physiotherapy practice: The data analyzed indicate a paradigm shift in physiotherapy, moving from passive, conventional protocols to active and targeted interventions. Modern physiotherapy is required to integrate advanced motor control exercises (such as the Canali or McKenzie methods) with specific thoracolumbar fascia release techniques (Gua Sha, myofascial release), ensuring a hybrid and much more effective therapeutic approach.

Functional recovery and disability reduction: The main objective of the protocols in the 2025 literature is not only symptomatic pain management, but also the early restoration of biomechanical functionality. By reducing tissue stiffness and correcting altered motor maps, the new strategies directly contribute to reducing long-term disability rates and preventing the chronicity of lumbar pathology.

Personalized rehabilitation pathways: Current studies emphasize that maximum efficiency is obtained by eliminating universal treatment schemes (“one-size-fits-all”). The implementation of STOPS-type clinical algorithms allows for rigorous adaptation of therapy (shockwave, peripheral magnetic stimulation or osteopathy) according to the unique clinical phenotype and dominant pathophysiological mechanism of each patient.

Implementation within rehabilitation services: In order to translate this evidence into current clinical practice, rehabilitation structures and centers must reorganize their services in the form of interdisciplinary pathways. This involves not only equipping with new technologies (such as Augmented Reality systems and teletherapy), but also creating integrated teams (physiotherapists, rehabilitation doctors, psychologists) capable of simultaneously addressing both the physical dysfunctions and the cognitive aspects (kinesiophobia or central sensitization) of the patient.

4.3 Quality of evidence and study limitations

The quality assessment of the synthesized evidence indicates moderate heterogeneity in terms of clinical protocols applied in the literature in 2025. Most of the included randomized trials demonstrated low to moderate risk of bias, providing a high degree of confidence in the effectiveness of active exercises and myofascial release techniques.

However, this review has some methodological limitations. The main limitation is the strict constraint of the chronological window to the year 2025, a decision made to exclusively capture ultra-contemporary trends, but which may omit major previously published longitudinal studies. Also, limiting the search strictly to the "Title" field to maximize bibliometric specificity may have resulted in the omission of some relevant articles that had the key terms only in the abstract or keywords. Finally, the variability of treatment parameters (duration of sessions, frequency) in the reviewed studies limits the possibility of performing a rigorous quantitative meta-analysis

5. Conclusions

The 2025 literature review highlights that low back pain management is increasingly aligning with a multimodal precision model centered on the individual patient phenotype. The results of this review suggest the following conclusions:

Support for active approaches: Exercise therapy, particularly structured core stability and motor control programs, continues to be strongly supported by current evidence. Specific methods, such as the Canali Method and the McKenzie protocol, demonstrate promising efficacy compared to generic exercises in optimizing biomechanics and potentially influencing inflammatory processes.

Relevance of tissue release therapies: Techniques targeting the thoracolumbar fascia—including Myofascial Release, Gua Sha, and ultrasound-guided acupuncture—appear to provide valuable support in restoring soft tissue function, often providing favorable clinical outcomes compared to conventional passive methods.

Integration of technologies: The incorporation of Augmented Reality and digital teletherapy solutions represents a notable trajectory in rehabilitation, showing a positive impact in reducing kinesiophobia and contributing to increasing patient adherence to treatment.

Value of the biopsychosocial model: Clinical outcomes are increasingly optimized when physical interventions are combined with cognitive components (CFT) and mindfulness techniques, which help manage central sensitization and chronic pain.

Trend towards personalization: Structured models, such as the STOPS approach and personalized medicine algorithms, aim to reduce therapeutic uncertainty, suggesting that efficacy is improved when treatments (including shockwaves, PEMF or osteopathy) are tailored to the individual's specific pathophysiological mechanism.

In conclusion, this review supports the expanding role of interdisciplinary approaches that integrate modern protocols with individualized care, moving low back pain management from a reactive intervention to a structured strategy to optimize functional health.

Author Contributions: Conceptualization, M.T. and C.I.; methodology, M.R. and C.M; software, A.P.; validation, I.C. and M.R.; formal analysis, M.T.; investigation, C.I.; resources, M.R.; data curation, I.C. and A.P.; writing—original draft preparation, C.M. and C.I.; writing—review and editing, M.R. and M.T.; visualization, I.C. and C.M; supervision, M.R.; project administration, M.T. and I.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

[1] Hartvigsen J.; Hancock M.J.; Kongsted A.; Louw Q.; Ferreira M.L.; Genevay S.; Hoy D.; Karppinen J.; Pransky G.; Sieper J.; Smeets R.J.; Underwood M. What low back pain is and why we need to pay attention. Lancet, 2018, 391 (10137): 2356-2367.

[2] Farley T.; Stokke J.; Goyal K.; DeMicco R.. Chronic Low Back Pain: History, Symptoms, Pain Mechanisms, and Treatment. Life basel. 2024, 14 (7): 812.

[3] Knezevic N.N.; Candido K.D.; Vlaeyen J.W.S.; Van Zundert J.; Cohen S.P.. Low back pain. Lancet. 2021, 398 (10294): 78-92.

[4] Tedeschi R.; Giorgi F.; Platano D.; Berti L.. Classifying Low Back Pain Through Pain Mechanisms: A Scoping Review for Phys-iotherapy Practice. Journal of clinical medicine. 2025, 14 (2): 412.

[5] Chiu A.P.; Chia C.T.R.E.; Arendt-nielsen L.; Curatolo M.. Arendt-nielsen L.. Lumbar intervertebral disc degeneration in low back pain. Minerva anestesiologica. 2024, 90 (4):330-338.

[6] Oikonomidis S.; Lenz M.; Egenolf P.; Eysel P.. Chronic back pain-pharmacological and nonpharmacological treatment approaches. Innere Medizin. 2025, 66 (2). 225-230.

[7] Lemhöfer C.; Loudovici-Krug D.; Gassen A.; Blumensaat H.. Physical, physiotherapeutic and complementary therapy approaches for back pain. Orthopadie. 2025, 55 (3): 205-212.

[8] Mostofi K.; Shirbache K.; Peyravi M.. Effectiveness of Cryotherapy in Postoperative Residual Low Back Pain After Spine Ap-proach. American journal of therapeutics. 2025, 32 (12): e214-e216.

[9] Tanna A.; Shukla B.; Ruparelia H.; Dave Y.. Case report: impact of a holistic physiotherapy approach to post-brucellosis low back pain and dysmenorrhea. Manuelle medizin. 2025: DOI10.1007/s00337-025-01190-1.

[10] Anselmo A.; Pagano M.; Cappadona I.; Cardile D.; Calabro R.S.; Corallo F. Psychological Support for Chronic Low Back Pain: A Systematic Review on the Validity of a Growing Remote Approach. Current pain and headache reports. 2025, 29 (1): 51.

[11] Mauck M.C.; Aylward A.F.; Barton C.E.; Birckhead B.; Carey T.; Dalton D.M.; Fields A.J.; Fritz J.; Hassett A.L.; Hoffmeyer A.; Jones S.B.; McLean S.A.; Mehling W.E.; O'Neill C.W.; Schneider M.J.; Williams D.A.; Zheng P.; Wasan A.D. . Evidence-based inter-ventions to treat chronic low back pain: treatment selection for a personalized medicine approach: German version. Scmerz. 2025, 39 (6): 436-446.

[12] Danilov A.; Danilov A.; Badaeva A.; Kosareva A.; Popovskaya K.; Novikov V. State-of-the-Art Personalized Therapy Approaches for Chronic Non-Specific Low Back Pain: Understanding the Mechanisms and Drivers. Pain and therapy. 2025, 14 (2): 479-496.

[13] Liu Z.H.; Chang T.Y.; Fu J.L.; Chi H.; Wang X.D.; Wang L.S.; Cui W.Q.; Cui Y.Z.; Con, Z.B. Precision targeting in acupuncture: a pilot and feasibility study protocol of ultrasound-guided approach for non-specific low back pain. Pilot and feasibility studies. 2025, 11 (1): 89.

[14] Hahne A.J.; Shah M.H.N.; Rashid M.; Raja K.; Danazumi M.S.; Ford J.. STOPS approach to individualised physiotherapy ver-sus usual physiotherapy care for chronic low back pain in India: A randomised controlled trial protocol. Plos One. 2025, 25 (12): e0339280.

[15] Sanchez J.P.; MacIntyre E.; Scully A.E.; Oliveira B.I.D.; Wand B.M.; Di Pietro F.. Body perception outcome measures in chronic non-specific low back pain: A systematic review of measurement properties using the COSMIN approach. Journal of pain. 2025, 31: 105391.

[16] Vega-Retuerta N.; Sánchez-Parente S.; Segura-Jimenez V.. Effectiveness of multidisciplinary approaches including exercise to treat non-specific chronic low back pain: A systematic review and meta-analysis across multiple regions. Preventive Medicine. 2025, 199: 109381.

[17] Conen R.; Mueller S.; Tibubos A.N.. Integration of Conventional and Virtual Reality Approaches in Augmented Reality for Theory-Based Psychoeducational Intervention Design for Chronic Low Back Pain: Scoping Review. Interactive journal of medical research. 2025, 14: e59611 .

[18] Sabina S.; Monteleone D.; Mincarone P.; Maiorano P.; Guarino R.; Tumolo M.R.; Leo C.G.; Giordano A.; Zisi M.. A Quasi-Experimental Controlled Study to Evaluate the Effects of a Kinesiologic Approach-The Canali Postural Method-To Posture Re-programming for Non-Specific Low Back Pain. Healthcare. 2025, 13 (8): 869.

[19] Danazumi M.S.; Ford J.; Kaka B.; Hahne A.. Clinical outcomes, cost-effectiveness and implementation of individualised phys-iotherapy using the Specific Treatment Of Problems of the Spine (STOPS) approach for chronic low back pain in Nigeria: a proto-col for a prospective sequential clinical trial. BMJ open. 2025, 15 (10): e098750.

[20] Zejnullahi H.; Aruqi L.; Tahirbegolli B.; Aliu M.; Qorolli M.. Effect of a structured physical therapy program on pain, disabil-ity, and mobility in chronic nonspecific low back pain. Sport tk-revista euroamericana de ciencias del deporte. 2025, 14: 122.

[21] Comachio J.; Beckenkamp P.R.; Ho E.K.Y.; Shaheed C.A.; Stamatakis E.; Ferreira M.L.; Lan Q.W.; Mork P.J.; Holtermann A.; Wang D.X.M.; Ferreira P.H.. Benefits and harms of exercise therapy and physical activity for low back pain: An umbrella review. Journal of sport and health science. 2025, 14: 101038.

[22] Osama M.; Naeem A.; Tariq S.; Mushtaq S.; Siddiqi F.A.; Afridi S.. Effects of physical therapy on improving disc height index, postural stability, pain and function in persons with discogenic low back pain. Journal of the pakistan medical association. 2025, 75 (3): 378-382.

[23] Kull P.; Keilani M.; Remer F.; Crevenna R.. Efficacy of pulsed electromagnetic field therapy on pain and physical function in patients with non-specific low back pain: a systematic review. Wiener medizinische wochenschrift. 2025, 175 (1-2): 11-19.

[24] Baroncini A.; Maffulli N.; Manocchio N.; Bossa M.; Foti C.; Schäfer L.; Klimuch A.; Migliorini F.. Active and passive physical therapy in patients with chronic low-back pain: a level I Bayesian network meta-analysis. Journal of orthopaedics and traumatology. 2025, 25 (1): 66.

[25] González-Gómez L.; Moral-Munoz J.A.; Rosales-Tristancho A.; Cuevas-Moreno A.; Cardellat-González M.; Rodríguez-Domínguez A.. Exercise Therapy Versus Manual Therapy for the Management of Pain Intensity, Disability, and Physical Func-tion in People With Chronic Low Back Pain: A Systematic Review With Meta-Analysis and Meta-Regression. European journal of pain. 2025, 29 (8): e70090.

[26] Xia Y.; Hu Y.M.; Ouyang J.; Huang R.. Four MBE Therapies to Improve Pain Scores, Physical Functioning, and Quality of Life in Patients With Chronic Nonspecific Low Back Pain: Network Meta-Analysis of Randomised Controlled Trials. European journal of pain. 2025, 29 (8): e70092.

[27] Schöder J.; Koehl P.; Schuh A.. Shockwave therapy for low back pain. Orthopadie. 2025, 55 (3): 190-197.

[28] Simonova J.; Matejova J.; Komanova B.; Katuch V.; Pataky F.; Grega R.; Simonova M.J.; Majernik M.; Simon R.. Neurostimu-lation therapy for the treatment of chronic back pain. Bratislava medical journal. 2025, 127 (7): 1536-1546.

[29] Sahu S.; Dhanasekaran R.; Chakravarthi M.; Bhavanani A.B.. Effect of Yoga Therapy in Chronic Discogenic Low Back Pain. Journal of pharmacy and bioallied sciences. 2025, 17 (Suppl 2): s1377-s1379.

[30] Rouzí M.; Bírtane M.; Tastekín N.; Uzunca K.; Ekuklu G.; Ulucam E.. The Efficacy of Acupressure Therapy on Chronic Me-chanic Low Back Pain. Bezmialem science. 2025, 13 (2): 155-161.

[31] Gholami E.; Ghasemi B.; Bagherian S.. Impact of exercise therapy with/without cognitive functional therapy on pain, Func-tion, and biopsychosocial factors in chronic nonspecific low back pain. Journal of bodywork and movement therapies. 2025, 42: 92-99.

[32] Dimitrijevic V.; Raskovic B.; Jevtic N.; Nikolic S; Viduka D.; Obradovic B.. Pain and Disability Therapy with Stabilization Exercises in Patients with Chronic Low Back Pain: A Meta-Analysis. Healthcare. 2025, 13 (9): 960.

[33] Narenthiran P.; Smith I.G.; Williams F.M.K.. Does the addition of manual therapy to exercise therapy improve pain and disability outcomes in chronic low back pain: A systematic review. Journal of bodywork and movement therapies. 2025, 42: 146-152.

[34] Guo J.X.; Xie C.J.; Rao X.; Xing Y; Zhang R.N.; Ji C.C.; Qu Q.Q.; Dong Y.P.; Sun Z.Y. Yang J.S.. Various acupuncture therapies for managing nonspecific low back pain: a network Meta-analysis. Journal of traditional chinese medicine. 2025, 45 (5): DOI10.19852/j.cnki.jtcm.2025.05.002.

35] Aponte A.; Halili A.. Treatment for the central sensitization component of lower back pain using systemic manual therapy. Journal of bodywork and movement therapies. 2025, 45: 500-505.

[36] Koura G.M.R.; Elshiwi A.M.F.; Alshahrani M.S.; Elimy D.A.; Alshahrani R.A.N.; Alfaya F.F.; Alshehri S.H.S; Hadi A.A.; Alshehri M.A.; Alnakhli H.H.; Ahmad F.; Ahmad I.. Effectiveness of Electromagnetic Field Therapy in Mechanical Low Back Pain: A Randomized Controlled Trial. Journal of pain research. 2025, 18: 1131-1142.

[37] Akkurt B.; Alptekin H.K.; Aydin T.. Peloid Therapy Versus Hot Pack Treatment in Patients With Chronic Low Back Pain: Effects on Pain, Function, and Quality of Life. Balneo and prm research journal. 2025, 16 (4): 910.

[38] Olaoye M.I.; Okonji R.; Ademoyegun A.; Gebrye T.; Yeowell G.; Fatoye F.; Mbada C.. Biochemical and clinical effects of McKenzie therapy versus muscle endurance exercises in chronic low-back pain. Archives of physiotherapy. 2025, 15 (1): 239-249.

[39] Zahra H.T.; Farheen A.; Bacha Z.F.; Patni M.A.. Assessing the Efficacy of Osteopathic Manipulative Therapy (OMT) in Manag-ing Chronic Back Pain: A Narrative Review. Dubai medical journal. 2025, 8 (4):545-573.

[40] Mohamed R.A.; Abdallah G.A.; Hafez H.A.; Helmy A.M.; Nassif A.A.; Fergany L.A.; Toson R.A.; Ghaleb H.A.M; Atta H.K.. Effectiveness of myofascial release technique versus dry cupping therapy in management of patients with non-specific low back pain. Sport tk-revista euroamericana de ciencias del deporte. 2025, 14: 166.

[41] Wang B.B.; Hu Y.; Lai D.H.; Eungpinichpong W.. Effects of Gua Sha therapy on thoracolumbar fascia thickness and clinical outcomes of patients with chronic nonspecific low back pain: A randomized controlled trial. Medicine. 2025, 104 (36): e44233.

[42] Schumacher M.R.; Cottone K.A.; Siviter L.M.; Rentmeester C.J.; Rhon D.; Young J.L.. Understanding Barriers to the Use of a Low Back Pain Clinical Practice Guideline in Physical Therapist Practice: A Mixed-Methods Approach. Physical Therapy. 2025, 105 (7): pzaf059.