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Comparative Outcomes Of Neuroscience-Based Education In Chronic Low Back-Pain

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Abstract-

Chronic low back pain (CLBP) can be described as pain for more than three months and is a major cause of reduced quality of life and disability worldwide, particularly in the working population. Conventional management strategies have been directed toward biomechanical and tissue-related factors. Nonetheless, the multidimensional aspects of chronic pain demand more comprehensive interventions. Pain Neuroscience Education (PNE) focuses on enhancing individual's knowledge of the neurophysiology of pain by explaining how neural processes, together with cognitive, emotional, and behavioural influences, affect pain perception and related outcomes.

Objective-

The aim of this review was to assess the effectiveness of PNE in the management of people with chronic low back pain. Relevant randomized controlled trials were thoroughly searched in electronic databases such as Pub-Med, Google-Scholar and Research-Gate.

Methodology-

Ten studies adhered to the inclusion criteria and were included in the review. The findings suggest that adding PNE to rehabilitation programs significantly improved pain intensity, functional disability and overall physical performance in people with CLBP. Evidence suggests that PNE improves the efficacy of standard rehabilitation strategies by fostering a better understanding of pain and self-management.

Conclusion-

To sum up, Pain Neuroscience Education is an effective adjunct to rehabilitation programs for low back pain. Its incorporation into rehabilitative care can improve patient outcomes, reduce disability and improve long-term pain management.

CONFLICT OF INTEREST- None

KEYWORDS: Pain Neuroscience Education (PNE), Traditional Patient Education (TPE), Chronic Low Back Pain (CLBP), Kinesiophobia, Catastrophizing, Chronic Non-Specific Low Back Pain (CNSLBP).

INTRODUCTION

The Low back-pain is most common problem nowadays which directly affects the muscles and bones. It is the reason why people cannot work, and it affects a lot of people, up to 80 percent of people, at some point in their lives. This is a problem for society because it happens to people who are working. Around 62 crore population suffered with the low bak-pain in the year 2020 as per reports. It is expected that more people will have low back pain as the population gets older. Low back pain causes a lot of pain, making it hard for people to do things. It reduces the quality of life. Because low back pain can be caused by various things, it is very important to find out what is causing it.[2]

Chronic back pain is when the pain lasts for more than three months. It is associated with feeling uncomfortable, being tired, and having a lot of stress, anxiety, depression and trouble sleeping. Multiple factors contribute to its development, such as sedentary lifestyles, unfavorable work environments, reduced physical activity, and muscular imbalance leading to weakness and reduced flexibility of the lumbar stabilizing muscles. Spinal instability is considered a leading cause ofchronic low back pain, resulting in pain, restricted lumbar mobility, reduced endurance, and functional limitations. Typical symptoms include recurrent dull, sharp, or aching pain in the lower lumbar region. Chronic pain increases pain sensitivity and reduces physical activity, leading to muscle inhibition, atrophy, and weakness, which further aggravate pain and contribute to disability.[10]

The most common treatments for CLBP include proper medication, intrusive techniques, extensive physical therapy and surgery in some cases. Over the past two decades, interest in the application of manual therapy (MT) for the management of chronic low back pain (CLBP) has increased considerably. Alongside MT, patient education may be delivered through either Pain Neuroscience Education (PNE) or traditional patient education (TPE), which is commonly based on biomechanical principles. Most traditional teaching methods stick to the basics—anatomy, how the body moves, treatment steps, and what results you can expect. Healthcare professionals still lean on the biomedical model when they talk to patients about pain. But Pain Neuroscience Education (PNE) is starting to take the spotlight as a more modern way to explain what patients are feeling. This approach focuses on enhancing patients' understanding of the neurophysiological mechanisms of pain and offers a promising strategy for individuals experiencing chronic low back pain.[9]

Persistent pain often continues beyond tissue healing, leading to unnecessary tests and treatments that increase financial burden, stress, and fear for patients. Understanding pain through a biopsychosocial perspective is essential for addressing the pain cycle. Pain Neuroscience Education (PNE) provides a foundational understanding of how pain works and helps clinicians guide patients using evidence-based approaches. Incorporating PNE into treatment plans can improve patient understanding, compliance, functional outcomes, and quality of life, particularly when combined with movement and psychology-based interventions.[4]PNE is a treatment approach that may help reduce sensitivity of the central nervous system, especially when combined with therapeutic exercises. It aims to improve patients' understanding of pain and change their pain-related beliefs, which can encourage positive behavioural changes and better treatment outcomes.[3]

Recent studies indicate thatPNE, particularly when delivered alongsidethe conventional treatment, may lead to improved outcomes. Reported benefits include reductions in pain-severity, Kinesiophobia, functional disorders and pain-catastrophizing. A systematic review published in 2024 demonstrated that integrating PNE into treatment programs resulted inimprovement in and disability andpain compared with physiotherapy alone.[5] Furthermore, findings from a 2025 umbrella review suggested that PNE is beneficial in managing chronic non-speciific low back pain, with the greatest effects observed when it is combined with exercise-based or biopsychosocial interventions.[6] Recent systematic reviews published between 2024 and 2025 have examined how factors such as session duration and methods of delivery influence outcomes, including pain catastrophizing and kinesiophobia. The findings highlight the importance of intervention dosage and program design in

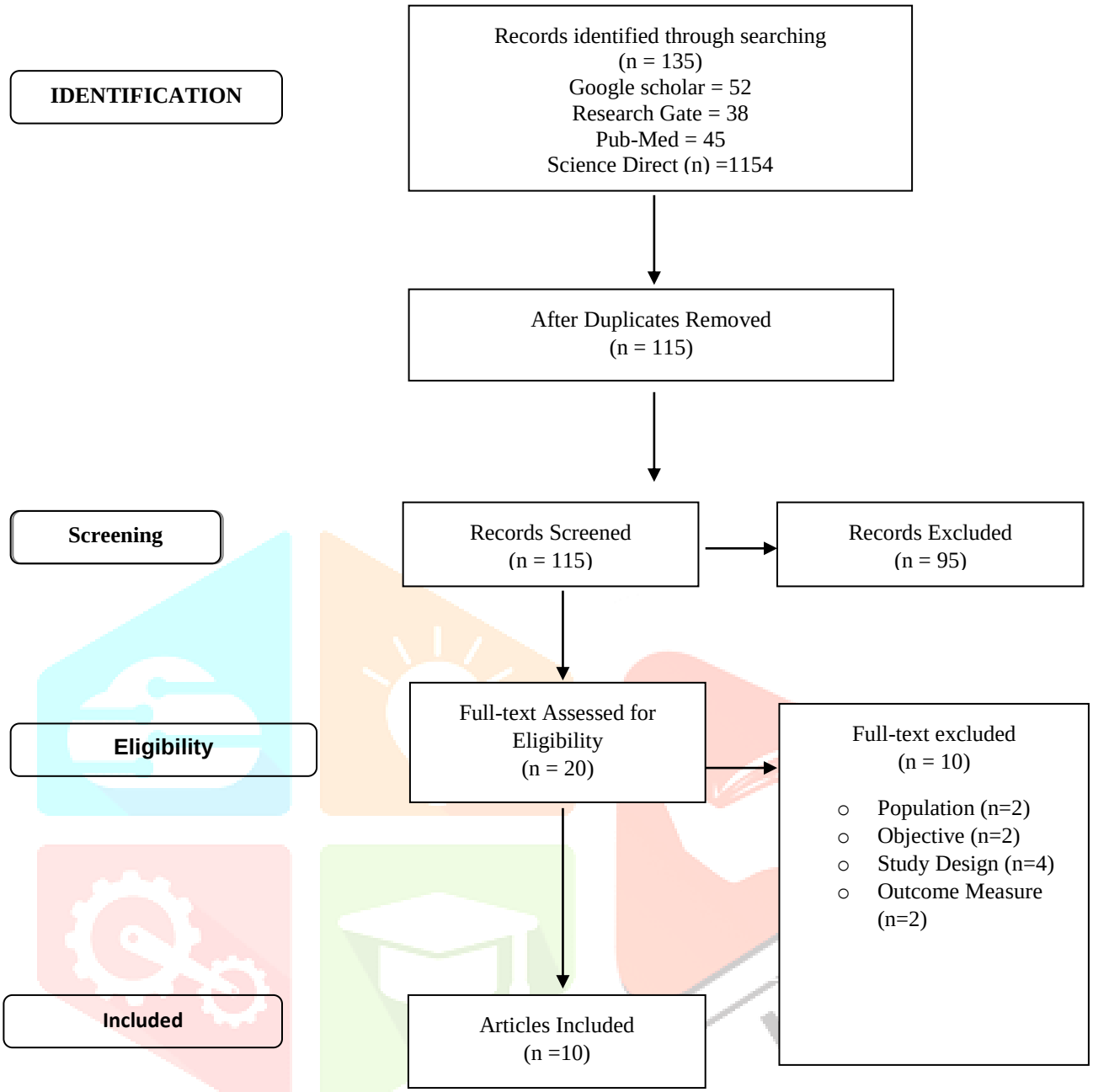
determining the productiveness of Pain Neuroscience Education (PNE). Unlike physical therapy, which primarily targets tissue-related dysfunction, PNE aims to enhance patients' understanding of the neurobiological processes that underlie pain. Emerging evidence indicates that combining PNE with manual therapy may enhance pain reduction and produceimprovements in Kinesiophobia and pain catastrophizing. These positive effects may be attributed to improved patient expectations and a better representation of body perception within the central nervous system.[8]

This review aims to evaluate current evidence on the impact of PNE on clinical outcomes in low back pain.By examining recent findings and identifying existing gaps in research and clinical practice, this review intends to support the development of more comprehensive approaches for the low back pain management

MATERIALS & METHODS

A thorough literature search was performed in electronic databases: Pub-Med, Google-Scholar and Research-Gate. The database search yielded a total of 135 records from PubMed (45 articles), Google-Scholar (52 articles) and Research-Gate (38 articles). After duplicates had been eliminated from the pool of studies, 115 unique studies were screened on their titles and abstracts. Of these, 95 studies were deemed unsatisfactory according to the eligibility criteria applied to the screening process, and therefore, were discarded.

The study selection process was carried out using the following PRISMA methodology.



In above identification process, 20 full texts were accessed and assessed for appropriateness for inclusion. 10 of these studies were subsequently removed as they did not meet the inclusion criteria; four were methodologically incompatible, two used the wrong outcome measures, two had incorrect patient populations and two did not meet the research aims of the review. The final number of articles meeting the inclusion criteria was 10.

SN	Authors and Journal Year	Objective	Study Design	Sample Size	Materials and Methods	Outcome Measures	Results	Limitation
1	Lendraitienėet al. (2024)[11]	Assess effects of PNE + physiotherapy on pain, kinesiophobiaandfunction in CNSLBP	Randomised pilot study	30	Physiotherapy ± PNE, twice weekly for 10 weeks	Pain, ODI, RMDQ, kinesiophobia	Greater reductionin kinesiophobia with PNE + physiotherapy	Small sample; pilot study
2	McConnell et al., (2024)[12]	Determine feasibility and acceptability of VR-based PNE in CLBP	Multicenter feasibility RCT	52 enrolled (32 completed)	Participants received either physical therapy (PT) as usual plus VR-PNE or PT as usual alone. Conducted across 12 outpatient PT clinics with 6-week follow-up	Feasibility, acceptability, pain (NPRS), fear-avoidance (FABQ), catastrophizing (PCS), self-efficacy (PSEQ), beliefs and recovery outcomes	VR-PNE was feasible and acceptable with high satisfaction. No significant between-group differences in pain or psychosocial outcomes at 6 weeks	Small final sample size, high attrition rate, short follow-up, feasibility focus rather than effectiveness
3	Kasimis et al., Medicina (2024)[8]	Evaluate MT + PNE + MI in CNSLBP	Randomized clinical trial	60	Manual therapy + PNE + MI vs manual therapy alone vs home exercise; assessme	Pain, disability, PPT, kinesiophobia, catastrophizing, function	Combined therapy showed greater short- and long-term improv	Optimal dosage not established

					nts at 4 weeks and 6 months		ements than other groups	
4	Yamada A.S. et al., Agri, (2023)[13]	Evaluate physiotherapy + PNE on disability in CNSLBP	Single-blind randomized pilot clinical trial	40	Both groups performed kinesiotherapy twice weekly for 6 weeks; intervention group additionally received 3 individual PNE sessions. Clinical questionnaires and quantitative sensory tests were used	Pain, disability, kinesiophobia, catastrophizing, central sensitization, anxiety, depression, quality of life, QSTs	PNE + physiotherapy showed significant improvement in all variables and greater reduction in kinesiophobia and pain perception compared to exercise alone	Small sample size and pilot study design
5	Modares Gorji et al. , (2022)[14]	Compare PNE + MCE with CSTon pain, disability and balance	Randomized controlled tria	37	Participants received either PNE + MCE or core stability training for 8 weeks. Assessments at baseline	Pain (VAS), disability (RMDQ), static & dynamic balance	Both groups improved; PNE + MCE showed greater reduction in pain and better balance	Small sample size; female-only participants

					and post-intervention		outcomes than CST	
6	Kim et al., Journal of Personalized Medicine (2022)[10]	Examine effects of PNE + lumbar stabilization exercise	Randomized controlled trial	35	PNE + lumbar stabilization exercises vs lumbar stabilization exercises alone, twice weekly for 8 weeks	Muscle strength, pain (NPRS), catastrophizing (PCS), kinesiophobia (TSK-11), flexibility, disability	PNE + LSE showed significantly greater improvement in muscle strength, pain, catastrophizing, and kinesiophobia than exercise alone	Small sample size; female-only participants
7	Rabieiet al.,painpractice (2021)[15]	Compare PNE + MCE with group exercise	Randomized controlled trial	73	PNE + MCE vs group exercise, twice weekly for 8 weeks; baseline & post-test assessment	Pain, disability, fear-avoidance, self-efficacy	Both groups improved; PNE + MCE showed greater reduction in pain and disability	No long-term follow-up
8	Saracoglu et al., Physiotherapy theory and pratice(2020)[16]	Evaluate PNE + MT + HEP on CLBP outcomes	Single-blind randomized controlled trial	69	Participants allocated into three groups: PNE + MT + HEP, MT + HEP, and HEP alone for	Pain intensity, disability, back performance, kinesiophobia	PNE + MT + HEP showed greater improvement in pain and kinesiophobia.	Short intervention duration and limited follow-up

					4 weeks. Assessments at baseline, 4 weeks, and 12 weeks		Disability reduced in both treatment groups compared to control	
9	Saracoglu et al., European Journal of Integrative Medicine (2019)[9]	Examine short-term effects of NPE + MT on QoL	Single-blind randomized controlled trial	35	Participants received manual therapy for 4 weeks with either neuroscience pain education or traditional education	Pain (NPRS), quality of life (SF-36)	Both groups improved; NPE group showed greater reduction in pain and better SF-36 physical function	Short-term follow-up only; small sample size
10	Bodes Pardo et al., Archives of Physical Medicine and Rehabilitation (2017)[3]	Assess effect of PNE + therapeutic exercise	Single-blind randomized controlled trial	56	Participants received therapeutic exercise alone or therapeutic exercise plus pain neurophysiology education. Interventions were delivered in group	Pain intensity (NPRS), disability (RMDQ), pressure pain threshold, flexibility, pain catastrophizing, kinesiophobia, patient global impression of	PNE + TE group showed a large reduction in pain intensity and moderate improvements in secondary outcomes compar	Short follow-up period and group-based intervention may limit generalizability

					sessions (30–50 min). Outcomes assessed post-treatment, at 1- and 3-month follow-up	change	ed to exercise alone	

RESULT

This review looked at ten studies. Across the board, people with chronic low back pain got better results when Pain Neuroscience Education (PNE) was added to standard rehab. Pairing PNE with things like therapeutic exercise, motor control exercise, lumbar stabilization, manual therapy, or home exercise routines made a bigger difference than just doing the usual rehab alone.

Reductions in pain intensity were frequently observed after PNE-based therapies in all of the included investigations. When PNE was combined with exercise or physiotherapy, participants' pain scores improved more than when activity-based therapies were used alone, according to a number of randomized controlled trials. Significant improvements in functional disability were also noted, as determined by tools like the Roland Morris Disability Questionnaire(RMDQ) and the Oswestry-Disability Index (ODI).

PNE also had a positive impact on psychological outcomes. Research revealed decreases in fear-avoidance beliefs, kinesiophobia, and pain catastrophizing, indicating that better comprehension of pain mechanics may lead to better coping and rehabilitation involvement. Additionally, a number of studies reported increases in quality of life, muscle strength, flexibility,balance, and physical performance.

During the short-term follow-up period, a virtual reality-based PNE technique did not show better clinical outcomes than normal physiotherapy, despite being shown to be viable and well-accepted by participants. All things considered, the evidence that is now available suggests that PNE is a useful addition to rehabilitation programs and may improve the physical and psychological results of those with persistent low back pain.

DISCUSSION

Consistent evidence was found to support the use of Pain Neuroscience Education as an addition to rehabilitation in people with persistent low back pain, according to the current review. The results indicate that when PNE is combined with physiotherapy interventions, pain intensity, functional impairment, and psychosocial aspects improve more than when traditional rehabilitation techniques are used alone.

The decrease in kinesiophobia and pain catastrophizing after PNE was one of the review's main conclusions. People with chronic low back pain are known to experience ongoing discomfort and functional difficulties as a result of these issues. PNE may lessen fear-related attitudes and promote active engagement in rehabilitation programs by enhancing patients' comprehension of the neurophysiological factors behind pain.

The research that was analyzed also discovered that PNE can enhance the effectiveness of exercise-based treatments. Overall, patients who received PNE along with manual therapy, lumbar stabilizing exercises, motor control exercise, or therapeutic exercise experienced better clinical outcomes when compared to those who only received physical therapy treatments. This may be due to the biopsychosocial model of pain which states that biological, psychological, and social factors all play a role in the development and chronicity of pain.

While these results are promising, there are some limitations that should be considered. Many of the studies had brief follow-up periods, small sample sizes, and varied intervention techniques. Since there was variation in length of treatment, modality of PNE delivery, and outcome measures, it was hard to compare trials directly to one another. Therefore, we do not know the optimal dosage, frequency, and mode of delivery for PNE.

What we do know is that based on the current evidence, including PNE as part of routine physiotherapy care may help improve patient understanding, decrease dysfunctional pain beliefs, and allow for improved rehabilitation outcomes. Future studies should focus on large randomized control trials with longer follow-up assessments to standardize techniques and determine the efficacy of PNE for long-term management of chronic low back pain.

CONCLUSION

The results of this comparative analysis show that Pain Neuroscience Education is a useful supplemental treatment for people with persistent low back pain. It has been found that PNE alongside physiotherapy and exercise based rehabilitation leads to improvements in physical function and health-related quality of life as well as reductions in pain intensity, disability, kinesiophobia, and pain catastrophizing. The results also suggest that teaching patients about pain can allow for more comprehensive pain management strategies to complement traditional physical rehabilitation methods. Despite needing more high-quality research to determine guidelines for standardization, evidence currently supports the use of Pain Neuroscience Education as a part of multimodal rehabilitation programs to treat chronic LBP.

REFERENCES

1. Ferreira ML, De Luca K, Haile LM, Steinmetz JD, Culbreth GT, Cross M, et al. Global, regional, and national burden of low back pain, 1990–2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. Lancet Rheumatol. 2023;5(6):e316-e329.

2. Alexander CE, Weisbrod LJ, Varacallo M. Lumbosacral radiculopathy. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Feb 27.

3. Bodes Pardo G, Lluch Girbés E, Roussel NA, Gallego Izquierdo T, Jiménez Penick V, Pecos Martín D. Pain neurophysiology education and therapeutic exercise for patients with chronic low back pain: a single-blind randomized controlled trial. Arch Phys Med Rehabil. 2018;99(2):338-347. doi:10.1016/j.apmr.2017.10.016.

4. Eneberg-Boldon K, Schaack B, Joyce K. Pain neuroscience education as the foundation of interdisciplinary pain treatment. Phys Med Rehabil Clin N Am. 2020;31(4):541-551. doi:10.1016/j.pmr.2020.07.004.

5. Ma X, Chen R, Li W, Huang P. A systematic review and meta-analysis of pain neuroscience education for chronic low back pain: short-term outcomes of pain and disability. Physiother Theory Pract. 2024;40(9):2130-2149. doi:10.1080/09593985.2023.2232003.

6. Cancela JG, Vázquez OC, Ledesma SN, Pruimboom L. The effectiveness of pain neuroscience education in people with chronic non-specific low back pain: an umbrella review with meta-analysis. Ann Phys Rehabil Med. 2025;68(8):102020. doi:10.1016/j.rehab.2025.102020.

7. İken A, Karkouri S, Zeroual İ, El Moudane H. Effect of duration of pain neuroscience education on pain catastrophizing and kinesiophobia in patients with chronic low back pain: a systematic review of the literature. Int J Disabil Sports Health Sci. 2024;7(4):937-954.

8. Kasimis K, Apostolou T, Kallistratos I, Lytras D, Iakovidis P. Effects of manual therapy plus pain neuroscience education with integrated motivational interviewing in individuals with chronic non-specific low back pain: a randomized clinical trial study. Medicina (Kaunas). 2024;60(4):556. doi:10.3390/medicina60040556.

9.Saracoglu I, Arik MI, Afsar E, Gokpinar HH. The short-term effects of neuroscience pain education on quality of life in patients with chronic low back pain: a single-blinded randomized controlled trial. Eur J Integr Med. 2019;101046. doi:10.1016/j.eujim.2019.101046.

10. Kim KS, An J, Kim JO, Lee MY, Lee BH. Effects of pain neuroscience education combined with lumbar stabilization exercise on strength and pain in patients with chronic low back pain: randomized controlled trial. J Pers Med. 2022;12(2):303. doi:10.3390/jpm12020303.

11. Lendraitienė E, Styraitė B, Šakalienė R, Misytė G, Bileviciute-Ljungar I. Effects of pain neuroscience education and physiotherapy on chronic low back pain, fear of movement and functional status: a randomised pilot study. J Clin Med. 2024;13(7):2081. doi:10.3390/jcm13072081.

12. McConnell R, Lane E, Webb G, LaPeze D, Grillo H, Fritz J. A multicenter feasibility randomized controlled trial using a virtual reality application of pain neuroscience education for adults with chronic low back pain. Ann Med. 2024;56(1):2311846. doi:10.1080/07853890.2024.2311846.

13. Yamada AS, Antunes FTT, Vaz SMR, Saraiva BV, De Souza AH, Simon D. Physiotherapeutic treatment associated with pain neuroscience education for patients with chronic non-specific low back pain: single-blind randomized pilot clinical trial. Agri. 2023;35(3):153-166. doi:10.14744/agri.2022.33349.

14. Gorji SM, Mohammadi Nia Samakosh H, Watt P, Marchetti PH, Oliveira R. Pain neuroscience education and motor control exercises versus core stability exercises on pain, disability, and balance in women with chronic low back pain. Int J Environ Res Public Health. 2022;19(5):2694. doi:10.3390/ijerph19052694.

15. Rabiei P, Sheikhi B, Letafatkar A. Comparing pain neuroscience education followed by motor control exercises with group-based exercises for chronic low back pain: a randomized controlled trial. Pain Pract. 2021;21(3):333-342. doi:10.1111/papr.12963.

16. Saracoglu I, Arik MI, Afsar E, Gokpinar HH. The effectiveness of pain neuroscience education combined with manual therapy and home exercise for chronic low back pain: a single-blind randomized controlled trial. Physiother Theory Pract. 2022;38(7):868-878. doi:10.1080/09593985.2020.1809046.