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COMPARATIVE STUDY OF MCKENZIE TECHNIQUE VERSUS NEURAL MOBILIZATION IN CHRONIC LOW BACK PAIN WITH RADICULOPATHY

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ABSTRACT

Background:

Low back pain is an ache or discomfort in the area of lower part of the back and spinal column. Radiculopathy also known as nerve root pain which arise from disc herniation or spinal stenosis or post operative scarring it radiates down the leg in a dermatomal pattern, the unilateral leg pain. Manual therapy techniques like McKenzie and Neural mobilization have been used for treating low back pain but hardly any literature available as per my knowledge which had compared the two techniques. So, the purpose of this study was to compare effectiveness between McKenzie Technique and Neural mobilization in chronic low back pain patients with radiculopathy.

Methodology:

30 participants of chronic low back pain with radiculopathy, were selected according to inclusion criteria after obtaining informed consent. Initially all the participants were assessed for pain by VAS, spinal ROM by MMST, and functional ability by ODI. The participants were divided into two groups, group A and Group B by simple random sampling. Group A received McKenzie Technique and Group B received Neural Mobilization. Reassessment was done after 1 week of treatment program.

Results:

The analyses of significance were carried out by using paired t-test within the group and unpaired t –test between the groups. Intra group analysis both the groups showed improvement but intergroup analysis showed significant reduction of pain, increase in spinal flexion-extension ROM and functional ability in group A which received McKenzie Technique with $p<0.001$.

Conclusion:

In the current study the McKenzie Technique was found to be more effective than neural mobilization in decreasing pain, increasing spinal flexion-extension ROM and improving functional ability in chronic low back pain with radiculopathy.

Keywords: cLBP, McKenzie Technique, MMST, Neural Mobilization, ODI, Radiculopathy.

Introduction

Chronic low back pain is an ache or discomfort in the lower back and spinal column, characterized by a range of symptoms which includes pain, muscle tension or stiffness, localised above the inferior gluteal folds and below the costal margin, with or without leg pain.[1] Low back pain is commonly classified into acute (less than 6 weeks), subacute (6-12 weeks) and chronic (more than 12 weeks). cLBP is a major public and occupational health problem that creates a major professional, social and economic burden. The worldwide prevalence of chronic low back pain (cLBP) ranges between 2–25%.[2] Annual, and lifetime prevalence of LBP in India was 48% (95% CI 40-56%); 51% (95% CI 45-58%), and 66% (95% CI 56-75%), respectively and the rates of pooled prevalence were more among females, the rural population, and among elementary workers.[3]

Most of the normal connective tissue heals within 6-12 weeks, unless pathoanatomic instability persist, so LBP is said to be chronic only after 3 months. The intervertebral disc is the commonest cause of back pain and also the commonest cause of radiculopathy. Radiculopathy is caused by herniated disc with associated compression of the nerve root but lumbar stenosis and less frequently tumors are the possible causes.[3]

There are various interventions such as electrotherapy, exercise therapy and manual therapy techniques like spinal manipulation, neural mobilizations, McKenzie techniques etc. are being used for treating low back pain in various settings. McKenzie technique and neural mobilization are one of the manual therapy techniques used in spine care programs in an effort to reduce pain and to improve range of motion and function.

An increasingly accepted conceptual system is that of Robin McKenzie who believes that the main cause of back pain is intervertebral disc disease manifested by altered and abnormal mechanics resulting from the effect of migration of the intact nucleus within the disc, not frank herniation.[4] McKenzie describes the phenomenon called centralization" of pain where symptoms moves from distally to proximally, towards the midline of the spine, and are eradicated by certain movements.[5] McKenzie techniques utilizes back extension exercise for the management of lumbar radiculopathy.

Butler recommends that neural mobilization technique is another form of manual therapy similar to joint mobilization.[6] Neural mobilization manoeuvres are treatment techniques that produce specific mechanical alterations in the nervous system, which may result in physiological changes that help to reduce symptoms. Basson et al.[7], in their systematic

review, concluded that neural mobilization improved pain and function in groups of patients with nerve-related LBP and nerve-related neck and arm pain. A slider is a neural mobilization exercise that produces a neural tissue sliding movement relative to neighbouring tissue, in which a longitudinal force is applied at one end of the nerve while tension is released at the other.[8]

Various studies have been conducted on McKenzie and Neural mobilization techniques for treatment of chronic low back pain but there appears to be lack of literature available, which compared the two techniques. The purpose of the study was to compare the effectiveness of McKenzie and Neural mobilization techniques in chronic low back pain patients with radiculopathy.

Methodology:

The design chosen for the study was prospective randomized control trial. Ethics committee approval was taken before commencing the study. 30 participants aged 25-60, who met the inclusion criteria such as participants having chronic LBP (>3 months) and symptoms extending distal to the gluteal region and lower extremity, the centralization phenomenon determined by using active movements, VAS > 4 and ODI score at least 20% were recruited for the study from the physiotherapy OPD. The participants having active infections, metabolic diseases of spine and malignancy, history of vertebral fracture and spinal surgery, pregnancy, having neurological defects such as altered sensation were excluded from the study. The written informed consent was taken from each participant before recruiting them for the study. The participants were randomly allocated to group A and group B by sealed opaque envelope method. Each group consisted of 15 participants. Outcome measures such as pain by VAS, lumbar flexion and extension ROM by MMST (Modified-Modified Schober test) and function by ODI (Oswerty Disability Index) were assessed at baseline and after 1 week.

Group A received McKenzie Technique[9]

Participants were asked to be in the static prone position on the treatment couch. The goal was to produce the centralization of symptoms. The activity performed was a sagittal plane extension force, rapidly progress through to the participant overpressure to gain full range.

Back extension exercises were given to the participants. Starting position was static prone position. Next stage was lying prone in extension (prone on elbows). Then progressed to extension in lying (prone on hands with elbow extension). Last step was extension in lying with overpressure. In this stage the participant breaths out fully to gain maximal extension to complete the full extension. Participants performed 3 sets of 10 repetitions of repeated end range extension in prone position.

Group B received Neural Mobilization.[6]

For sciatic nerve NTM, the participants were asked to lie in supine lying and the leg was lifted upward, with the knee extension. The leg was raised up to 35° in order to take up the slack in the nerve. Sciatic nerve was completely stretched at 70°. For additional stretch hip adduction was added to straight leg raise. A gentle short duration 1 second and large amplitude passive movements was performed at 'feather edge' of participants to generate neural symptoms in on/off fashion. A mild degree of discomfort was permitted during 'on' phase which must be completely abated when the tension was withdrawn (off phase). 30 seconds of on/off mobilization of 3 repetitions were performed.

Both the groups received moist heat therapy for 10 minutes prior to the manual therapy techniques.

Results

Table 1: Within group comparison of VAS at baseline and 1 week in both the groups.

	MEAN	SD	t-Test	P value	Inference
GROUP A VAS Pre	6.33	1.11	12.19	<0.0001	Extremely Significant
GROUP A VAS Post	2.53	0.52			
GROUP B VAS Pre	6.53	1.06	7.36	<0.0001	Extremely Significant
GROUP B VAS Post	3.8	0.77			

Table 1 showing pre-post comparison of VAS at baseline and at 1 week of group A and B. Mean and SD values of the VAS at baseline and 1 week were 6.33 ± 1.11 and 2.53 ± 0.52 for group A, 6.53 ± 1.06 and 3.8 ± 0.77 for group B. The pre-post, t test result for group A was t=12.19 and p value <.0001 (p <.05) i.e. extremely significant. Similarly, pre-post t test result for group B was t=7.36 and p value <.0001 (p<.05) which was extremely significant. Both the groups showed significant reduction of pain at 1 week.

Figure 1: Within group comparison of VAS at baseline and 1 week in both the groups.

Figure 1 shows the Within group comparison of VAS at baseline and 1 week in both the groups.

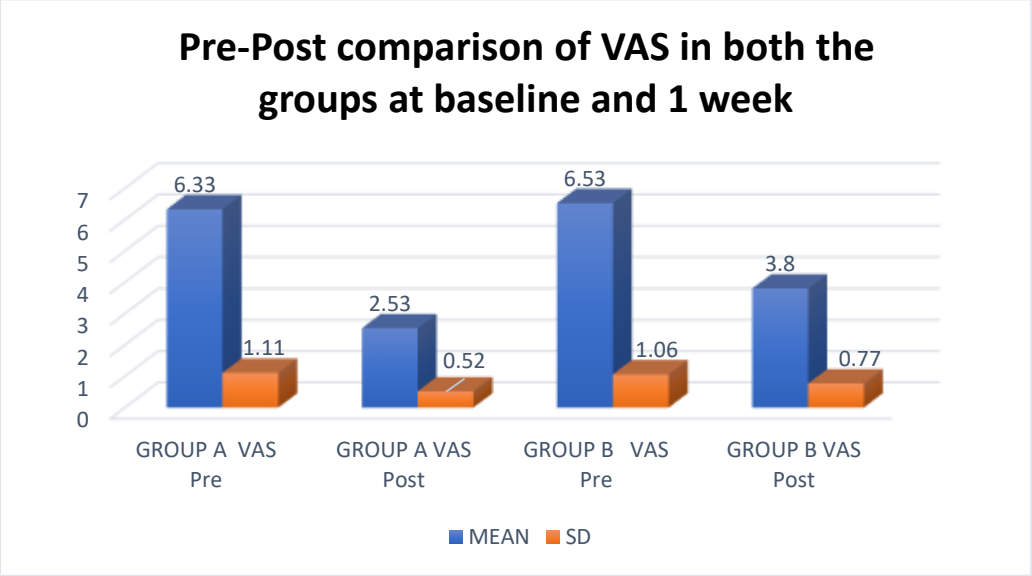


Table 2: Comparison of flexion ROM by MMST at baseline and 1 week in both the groups.

	Mean	SD	t-Test	P value	Inference
Group A Flexion Pre	3.66	0.61			
Group A Flexion Post	7.86	1.12	13.47	<0.0001	Extremely Significant
Group B Flexion Pre	3.53	0.63			
Group B flexion Post	5.8	1.14	6.32	<0.0001	Extremely Significant

Table 2 showing pre-post comparison of flexion ROM by MMST at baseline and at 1 week of group A and B. Mean and SD values of the flexion ROM at baseline and 1 week were 3.66 ± 0.61 and 7.86 ± 1.12 for group A, 3.53 ± 0.63 and 5.8 ± 1.14 for group B. The pre-post, t test result for group A was t=13.47 and p value <.0001 (p <.05) i.e. extremely significant. Similarly,

pre-post t test result for group B was t=6.32 and p value <.0001 (p<.05) which was extremely significant. Both the groups showed significant improvement of flexion ROM at 1 week.

Figure 2: Within group comparison of Flexion ROM at baseline and 1 week in both the groups.

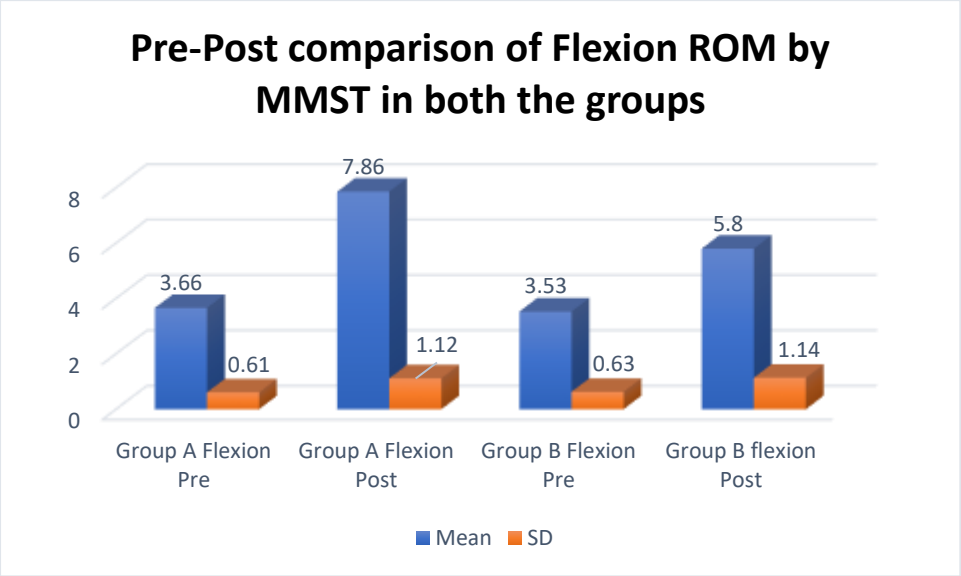


Figure 3 shows the Within group comparison of Flexion ROM at baseline and 1 week in both the groups

Table 3: Within group comparison of Extension ROM by MMST at baseline and 1 week in both the groups.

	Mean	SD	t-Test	p value	
Group A Extension Pre	1.2	0.41			
Group A Extension Post	3.12	0.51	10.45	<0.0001	Extremely Significant
Group B Extension Pre	1.53	0.63			
Group B Extension Post	2.56	0.41	5.13	0.0002	Extremely Significant

Table 3 showing within group pre-post comparison of extension ROM by MMST at baseline and at 1 week of group A and B. Mean and SD values of the extension ROM at baseline and 1 week were 1.2 ± 0.41 and 3.12 ± 0.51for group A, 1.53 ± 0.63 and 2.56 ± 0.41 for group B. The pre-post, t test result for group A was t=10.45 and p value was <.0001 (p <.05) i.e. extremely significant. Similarly, pre-post t test result for group B was t=5.13 and p value was 0.0002 (p<.05) which was extremely significant. Both the groups showed significant improvement of extension ROM at 1 week.

Figure 3: Within group comparison of extension ROM by MMST at baseline and 1 week in both the groups.

Figure 3 shows the Within group comparison of extension ROM by MMST at baseline and 1 week in both the groups.

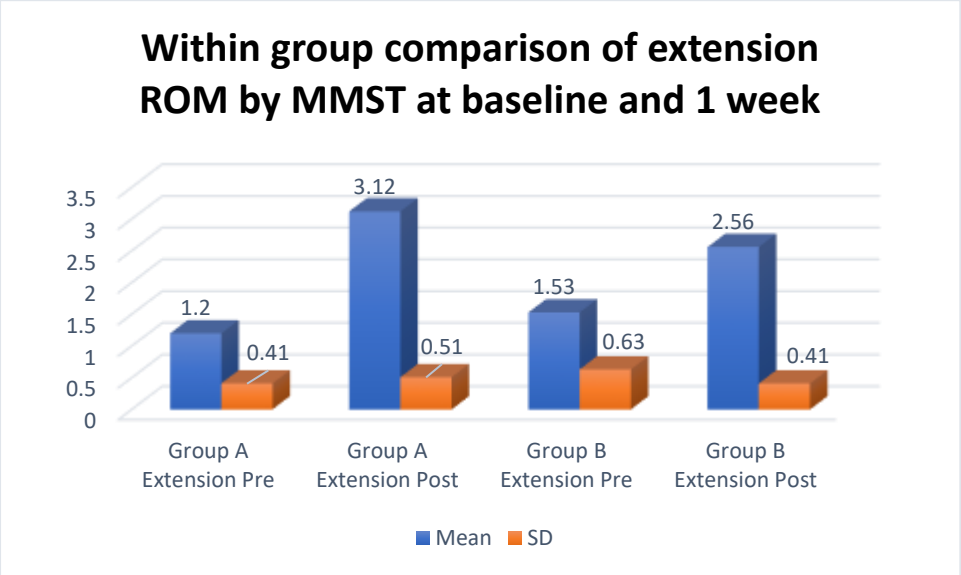


Table 4: Within group comparison of function by ODI at baseline and 1 week in both the groups.

	Mean	SD	t-Test	p value	Inference
Group A ODI Pre	32.8	1.69	40.02	<0.0001	Extremely significant
Group A ODI Post	12.93	0.88			
Group B ODI Pre	32.46	1.88	29.56	<.0001	Extremely significant
Group B ODI Post	19.93	0.96			

Table 4 showing within group pre-post comparison of ODI score at baseline and at 1 week of group A and B. Mean and SD values of the extension ROM at baseline and 1 week were 32.8 ± 1.69 and 12.93 ± 0.88 for group A, 32.46 ± 1.88 and 19.93 ± 0.96 for group B. The pre-post, t test result for group A was t=40.02 and p value was <.0001 (p <.05) i.e. extremely significant. Similarly, pre-post t test result for group B was t=29.56 and p value was <.0001 (p<.05) which was extremely significant. Both the groups showed significant improvement in ODI scores at 1 week.

Figure 4: Within group comparison of function by ODI at baseline and 1 week

Figure 4 shows the Within group comparison of function by ODI at baseline and 1 week

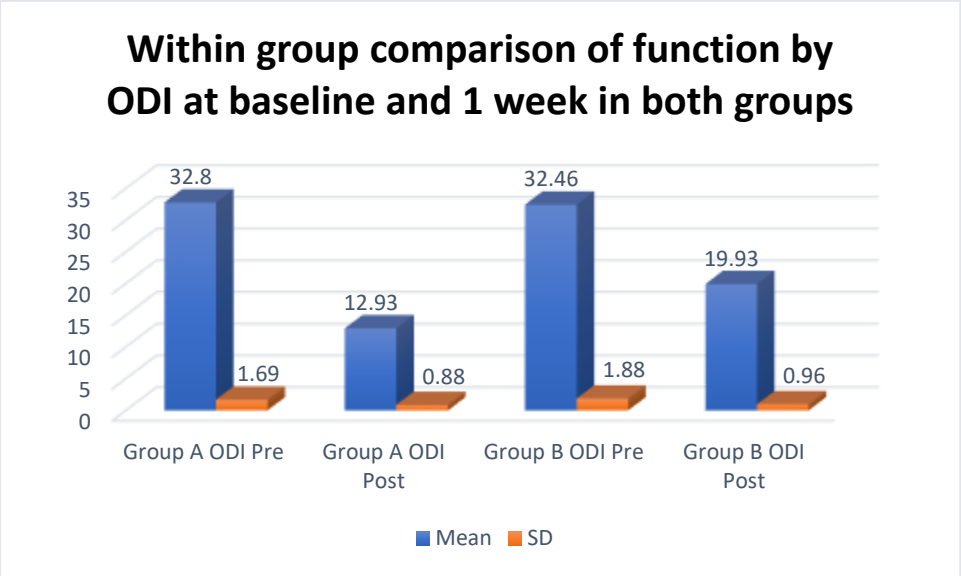


Table 5: Between group comparison of outcome measures at 1 week in both the groups.

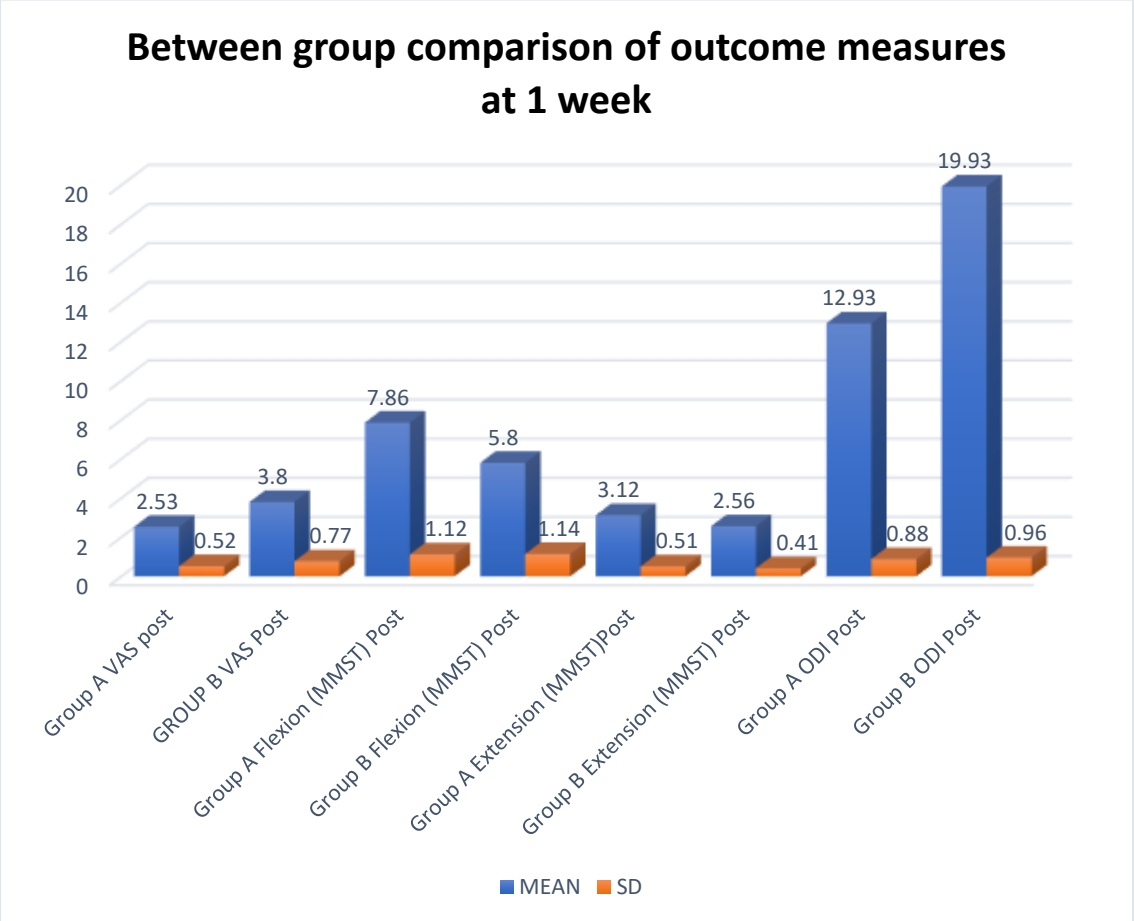
	MEAN	SD	t-Test	p value	Inference
Group A VAS post	2.53	0.52			
GROUP B VAS Post	3.8	0.77	5.29	<0.0001	Extremely Significant
Group A Flexion (MMST) Post	7.86	1.12			
Group B Flexion (MMST) Post	5.8	1.14	4.99	<0.0001	Extremely Significant
Group A Extension (MMST)Post	3.12	0.51			
Group B Extension (MMST) Post	2.56	0.41	3.31	0.0025	Extremely Significant
Group A ODI Post	12.93	0.88			
Group B ODI Post	19.93	0.96	20.81	<.0001	Extremely Significant

Table 5 showing between group post-post comparison of outcome measures at 1 week of group A and B. Mean and SD values of VAS at 1 week were 2.53 ± 0.52 for group A and 3.8 ± 0.77 for group B. Mean and SD values of flexion ROM at 1 week were 7.86 ± 1.12 for group A

and 5.8 ± 1.14 for group B and for extension were 3.12 ± 0.51 for group A and 2.56 ± 0.41 for group B. Mean and SD values of ODI at 1 week were 12.93 ± 0.88 for group A and 19.93 ± 0.96 for group B. The post, t test result for VAS, MMST (flexion), MMST (extension) and ODI were 5.29, 4.99, 3.31 and 20.81 at 1 week. The p value for all the outcome measures were <.05 i.e. extremely significant at 1 week for group A which received Mc Kenzie exercises.

Figure 5: Between group comparison of outcome measures 1 week.

Figure 5 shows the Between group comparison of outcome measures 1 week.



Discussion

The results of the current study showed more reduction of pain, improved spinal range of motion and function in the McKenzie group. The centralization effect of McKenzie Technique was contributed to the reduction of pain and increase ROM. In McKenzie technique patient produced the motion, position, and forces that improved the condition.[10] Prone lying is assumed to had a greater effect in moved the disc content anteriorly away from spinal nerves pathway. Centralization has been reported to occur with high frequency during mechanical assessments of patients with acute spinal syndromes. When centralization is observed, a favourable treatment result is expected.[11]

The results of Lam, Olivier T et al.[12] literature review and meta-analysis showed that there was a moderate- to high-quality evidence that MDT is not superior to other rehabilitation interventions for reducing pain and disability in patients with acute LBP. But in patients with chronic LBP, there is moderate- to high-quality evidence that MDT is superior to other rehabilitation interventions for reducing pain and disability.

The results of this study were similar to a study by Petersen, Tom et al.[13] They compared the effects of the McKenzie method performed by certified therapists with spinal manipulation performed by chiropractors when used adjunctive to information and advice. They found that McKenzie method to be slightly more effective than manipulation when used adjunctive to information and advice.

In current study there was an improvement in the lumbar flexion and extension ROM. Only few studies that used the McKenzie-type exercise have shown this improvement. In a study it was seen that lumbar extension resistance training for 12 weeks did not improve the lumbar ROM during flexion and extension using Schober's test.[14] But in one study it was found that one or two sessions of lumbar extension exercise for 12 weeks resulted in improved lumbar ROM during flexion and extension.[15] This increased ROM may have contributed to the reduction of pain intensity and disability of the patient.

Neural tissue mobilization restores the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces, thereby allowing reduced intrinsic pressures on the neural tissue and thus promoting optimum physiologic function.[16] Effectiveness of Neural mobilization was thought to be due to neural Flossing effect, restore normal mobility and length relationship, and consequently, blood Flow and axonal transport dynamics in compromised neural tissue. Neural mobilization was effective in breaking up the adhesion and bringing about mobility.[17]

In a study by Gilbert, Kerry K et al.[18] on effects of simulated neural mobilization on fluid movement in cadaveric peripheral nerve sections: implications for the treatment of neuropathic pain and dysfunction, found that fluid dispersion occurred within peripheral nerve tissue as a result of neural mobilization. These positive physiological responses may, in turn, limit demyelination[19] as well as changes in neural elasticity, fibrosis, and overall physical structure and function.[20]

Results of the study by Vijayalakshmi, Ravilla et al.[21] on effects of neural mobilization on sciatic nerve excursion, symptoms, and regional function in individuals with nerve-related low back pain supported our study. They concluded that Neural mobilization improves nerve mobility (sciatic nerve excursion) and alleviates symptoms. It can be rendered as a treatment in individuals with N-LBP.

In a meta-analysis by Lin, Long-Huei et al.[22] it was found that NM was more effective in decreasing pain and disability when compared to control treatment groups. The results of a meta-analysis by Neto et al.[23] indicated that NM had moderate effects on flexibility in healthy adults. Notably, it led to a significant pain reduction and disability improvement in individuals with low back pain, highlighting the potential benefits of NM. A study by Beneciuk et al.[24] showed an immediate hypoalgesic effect on C-fiber-mediated pain after specific tensioning NM manoeuvres on the median nerve, as observed in thermal quantitative sensory testing. This effect might be attributed to a decrease in glia fibrillary acid proteins in the dorsal root ganglion and lumbar spinal cord after NM, associated with reduced allodynia and hyperalgesia.[25] NM has also been investigated for its ability to reduce

mechanosensitivity.[26] In a study it was suggested that Schwann cells boost their metabolic activity to facilitate remyelination in response to demyelination, thus decreasing pain and disability.[27]

Conclusion

This study concluded that McKenzie Technique is more beneficial than Neural Mobilization in decreasing pain, improving spinal ROM and functional ability in chronic low back pain patients with radiculopathy.

References:

1. Vrbanić TS. Krizobolja--od definicije do dijagnoze [Low back pain--from definition to diagnosis]. Reumatizam. 2011;58(2):105-107.
2. Van Tulder et al.Conservative Treatment of Acute and Chronic Nonspecific Low Back pain A Systematic Review of Randomized Controlled Trials of most common interventions, Spain 1997;22:2128-2156.
3. Shetty GM, Jain S, Thakur H, Khanna K. Prevalence of low back pain in India: A systematic review and meta-analysis. Work. 2022;73(2):429-452.
4. McKenzie R, May S: Mechanical Diagnosis and Therapy, volume 2. Waikanae, spinal publications; 2003.
5. Hayden JA, Ellis J, Ogilvie R, Malmivaara A, van Tulder MW. Exercise therapy for chronic low back pain. Cochrane Database Syst Rev. 2021 Sep 28;9(9):CD009790.
6. Machado LAC, Souza MS, Ferreira PH, Ferreira ML. The McKenzie Method for Low Back Pain: A Systematic Review of the Literature With a Meta-Analysis Approach. Spine 2006;31(9):254–262.
7. Basson A, Olivier B, Ellis R, Coppieters M, Stewart A, Mudzi W. The Effectiveness of Neural Mobilization for Neuromusculoskeletal Conditions: A Systematic Review and Meta-analysis. J Orthop Sports Phys Ther. 2017;47(9):593-615.
8. Alshami AM, Alghamdi MA, Abdelsalam MS. Effect of Neural Mobilization Exercises in Patients With Low Back-Related Leg Pain With Peripheral Nerve Sensitization: A Prospective, Controlled Trial. J Chiropr Med. 2021;20(2):59-69.
9. Neha Tambekar, Shaila Sabnis, Apoorva Phadke, Nilima Bedekar. Effect of Butler's neural tissue mobilization and Mulligan's bent leg raise on pain and straight leg raise in patients of low back ache, Journal of Bodywork and Movement Therapies. 2016;20(2):280-285.
10. Mann SJ, Lam JC, Singh P. McKenzie Back Exercises. [Updated 2023 Jul 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK539720/
11. Werneke, Mark MS, PT, Dip. MDT[*]; Hart, Dennis L. PhD, PT[†]; Cook, David BS, RN[‡]. A Descriptive Study of the Centralization Phenomenon: A Prospective Analysis. Spine 24(7):p 676-683, April 1, 1999.
12. Lam OT, Strenger DM, Chan-Fee M, Pham PT, Preuss RA, Robbins SM. Effectiveness of the McKenzie Method of Mechanical Diagnosis and Therapy for Treating Low Back

Pain: Literature Review With Meta-analysis. J Orthop Sports Phys Ther. 2018;48(6):476-490.

13. Petersen, Tom PT, PhD; Larsen, Kristian PT, PhD; Nordsteen, Jan DC, MPH; Olsen, Steen PT; Fournier, Gilles MD, DC, BSc*; Jacobsen, Soren MD, DrMsci. The McKenzie Method Compared With Manipulation When Used Adjunctive to Information and Advice in Low Back Pain Patients Presenting With Centralization or Peripheralization: A Randomized Controlled Trial. Spine 36(24): p 1999-2010, November 15, 2011.
14. Steele J, Bruce-Low S, Smith D, Jessop D, Osborne N. A randomized controlled trial of limited range of motion lumbar extension exercise in chronic low back pain. Spine 2013;38(15): 1245-52.
15. Bruce-Low S, Smith D, Burnet S, Fisher J, Bissell G, Webster L. One lumbar extension training session per week is sufficient for strength gains and reductions in pain in patients with chronic low back pain ergonomics. Ergonomics 2012; 55(4): 500-7.
16. Ellis RF, Hing WA. Neural mobilization: a systematic review of randomized controlled trials with an analysis of therapeutic efficacy. J Man Manip Ther. 2008;16(1):8-22.
17. Sarkari E, Multani N.K. Efficacy of Neural Mobilisation in Sciatica. Journal of Exercise Science and Physiotherapy. 2207;3(2):136-141.
18. Gilbert KK, Roger James C, Apte G, et al. Effects of simulated neural mobilization on fluid movement in cadaveric peripheral nerve sections: implications for the treatment of neuropathic pain and dysfunction. J Man Manip Ther. 2015;23(4):219-225.
19. Rydevik B, Nordborg C. Changes in nerve function and nerve fibre structure induced by acute, graded compression. J Neurol Neurosurg Psychiatry. 1980;43(12):1070–82.
20. Millesi H, Zoch G, Reihsner R. Mechanical properties of peripheral nerves. Clin Orthop Relat Res. 1995;314:76–83.
21. Vijayalakshmi R, R L, Kanthanathan S, Aseer AL, Ramachandran S. Effects of neural mobilization on sciatic nerve excursion, symptoms, and regional function in individuals with nerve-related low back pain. Physiotherapy Quarterly. 2022;30(3):27-33.
22. Lin LH, Lin TY, Chang KV, Wu WT, Özçakar L. Neural Mobilization for Reducing Pain and Disability in Patients with Lumbar Radiculopathy: A Systematic Review and Meta-Analysis. Life (Basel). 2023;13(12):2255. Published 2023 Nov 26.
23. Neto T., Freitas S.R., Marques M., Gomes L., Andrade R., Oliveira R. Effects of lower body quadrant neural mobilization in healthy and low back pain populations: A systematic review and meta-analysis. Musculoskelet. Sci. Pract. 2017;27:14–22.
24. Beneciuk J.M., Bishop M.D., George S.Z. Effects of upper extremity neural mobilization on thermal pain sensitivity: A sham-controlled study in asymptomatic participants. J. Orthop. Sports Phys. Ther. 2009;39:428–438.
25. Santos F.M., Silva J.T., Giardini A.C., Rocha P.A., Achermann A.P., Alves A.S., Britto L.R., Chacur M. Neural mobilization reverses behavioral and cellular changes that characterize neuropathic pain in rats. Mol. Pain. 2012;8:57.
26. Zhu G.C., Tsai K.L., Chen Y.W., Hung C.H. Neural Mobilization Attenuates Mechanical Allodynia and Decreases Proinflammatory Cytokine Concentrations in Rats With Painful Diabetic Neuropathy. Phys. Ther. 2018;98:214–222.
27. Menorca R.M., Fussell T.S., Elfar J.C. Nerve physiology: Mechanisms of injury and recovery. Hand Clin. 2013;29:317–330.