

COMPARATIVE EFFECTS OF FELDENKRAIS METHOD AND MCGILL
BIG THREE EXERCISES ON PAIN, QUALITY OF LIFE,
KINESIOPHOBIA, AND ENDURANCE IN CHRONIC NON-SPECIFIC
LOW BACK PAIN: A RANDOMIZED CLINICAL TRIAL

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Abstract

Chronic non-specific low back pain (CNSLBP) is associated with persistent pain, reduced trunk endurance, fear of movement, and impaired quality of life. This randomized clinical trial compared the effects of Feldenkrais Method exercises and McGill Big Three exercises on pain, quality of life, kinesiophobia, and trunk endurance in patients with CNSLBP. The study was conducted in the Physiotherapy Department of Society Hospital, Lahore. Forty participants were analyzed, with 20 participants in the Feldenkrais group and 20 in the McGill group. Both groups received a standardized baseline treatment consisting of a 10-minute moist hot pack and 10-minute transcutaneous electrical nerve stimulation, followed by their allocated exercise program three times weekly for six weeks. Outcomes were assessed at baseline and after six weeks using the McGill Pain Questionnaire, WHOQOL-BREF, Tampa Scale for Kinesiophobia, and Sorensen Test. Both interventions produced significant within-group improvements in all outcomes ($p < .001$). In the Feldenkrais group, pain decreased from 31.60 ± 4.32 to 16.35 ± 3.46 , quality of life increased from 46.80 ± 6.16 to 71.10 ± 6.16 , kinesiophobia decreased from 50.15 ± 5.22 to 33.15 ± 4.45 , and endurance increased from 61.60 ± 12.20 to 94.35 ± 12.39 . In the McGill group, pain decreased from 31.70 ± 4.42 to 21.70 ± 3.40 , quality of life increased from 46.80 ± 6.36 to 59.90 ± 5.53 , kinesiophobia decreased from 50.25 ± 5.47 to 42.05 ± 4.68 , and endurance increased from 62.10 ± 13.14 to 127.10 ± 12.76 . Feldenkrais exercises were more effective for pain, quality of life, and kinesiophobia, whereas McGill exercises were more effective for endurance.

Introduction

Low back pain is among the most common musculoskeletal disorders and a major contributor to disability worldwide [1]. Chronic non-specific low back pain tends to have a duration longer than 12 weeks and is not

caused by a specific pathology [2, 3]. Beyond the pain, its clinical presentation can also encompass a decrease in spinal mobility, impairment in neuromuscular control, changes in movement strategies, muscular deconditioning, fear-avoidance behaviours and

limitations in daily and occupational activities [4]. Thus, CNSLBP is a multidimensional rehabilitation problem and not a problem that is solely related to the impairment of spinal structures [5]. Many factors support the use of exercise therapy as a key element of a conservative approach to CNSLBP, as it can target pain, functional capacity, movement control and muscle endurance [6, 7]. Although strengthening and stabilization have been a lot of focus, there are various factors to consider when deciding if those are enough to address maladaptive movement patterns or fear of movement [8]. Thus sensory awareness and neuromuscular re-education based movement approaches have also been deemed relevant for chronic pain rehabilitation [9, 10]. The Feldenkrais Method is based on gentle, slow, exploratory movement performed within a comfortable range. It focuses on awareness with movement, motor learning, body perception and exploring alternate movement strategies [11]. These principles can help alleviate excessive muscular guarding and guarding in individuals with chronic low back pain, enhance confidence in movement and affect fear-avoidance behavior [12]. The McGill Big Three exercise program focuses on the curl-up, side bridge and bird-dog to encourage spinal stabilization and endurance in the trunk muscles while keeping the spine stable and relatively neutral [13]. Both methods thus work on different therapeutic mechanisms – Feldenkrais mainly on movement awareness and neuro-muscular re-education [14] while McGill training mainly on stabilization and endurance [15]. Both methods have been applied in low back pain rehabilitation, but the evidence base to directly compare the two is limited when looking at pain, quality of life, kinesiophobia and trunk endurance. The effect of the intervention on pain symptoms or quality of life may not necessarily be the same as its effect on physical stamina; a head-to-head comparison is clinically relevant. This study was thus designed to assess the comparative effects of Feldenkrais Method exercises and McGill Big Three exercises on pain, quality of life, kinesiophobia and endurance for patients with CNSLBP. The alternate hypothesis was that the

difference between the two interventions would exist between these outcomes.

Materials and Methods

Study design and setting

A randomized clinical trial was carried out in Physiotherapy Department of Society Hospital, Lahore. The study finished in four months from the date of approval of the synopsis. The sample size calculated was 40 participants, of which 20 will be in each group, and 10% attrition allowance was added, so a recruitment target of 44 was set. A non-probability convenience sampling technique was used. Forty people participated in the final analysis, 20 in the Feldenkrais group and 20 in the McGill group.

Participants and allocation

Participants were both men and women aged 20–45 years [16] with low back pain for more than 12 weeks and baseline pain intensity $\geq 5/10$ [17]. The following exclusion criteria were utilized: spinal pathology (infection, tumour and inflammatory spondylarthritis), fracture or deformity, progressive neurological deficit, previous surgery of the lumbar spine, hyperlordosis or flat back, pregnancy and severe comorbidity. Eligible participants gave written informed consent. Randomization was done with the help of an online tool to research randomize. Sealed, opaque, sequentially numbered envelopes were used for group assignments, which were opened following enrollment. The assessor was masked to treatment allocation and was a senior musculoskeletal physiotherapist with experience of the study outcome measures.

Interventions

Patients received treatment 45 minutes daily, three days per week for six weeks. All participants in both groups were first treated with the same baseline physiotherapy treatment for 10 minutes with a moist hot pack to the lumbar area and 10 minutes of conventional transcutaneous electrical nerve stimulation to the lower back. A six week progression of the Feldenkrais program was created. In weeks 1-2, participants completed 1-2 sets of 8-10 repetitions for knee tilts, pelvic tilts, spine

articulation, side lying pelvic mobility and prone flow movements, with duration of movements in each set 5-8 seconds and 1 minute rest interval between sets. In weeks 3-4 repetitions increased to 10-12, sets to 2-3, rest intervals decreased to 45-60 seconds, and movement duration was increased to 8-10 seconds. Exercises increased to 12-15 reps per set (three sets) with a 30-45 second rest interval, and duration of movement was increased to 10-12 seconds for weeks 5-6. The focus for the entire program was on comfortable, controlled movement, breathing, pelvic and spinal awareness, coordination and movement efficiency. The McGill program was also advanced over a 6 week period [18]. Weeks 1-2: Curl-ups, side bridges, and bird-dog exercises 1-2 sets, 8-10 reps. For curl-up exercises, the hold time was 1-2 seconds, for side bridges and bird-dog exercises, it was 4-5 seconds, and there was a 30-45 second rest period. In weeks 3-4, the number of repetitions went up to 10-12 sets in 2-3 sets, the rest time was reduced to 20-30 seconds, and the duration of the hold was extended to 2-3 seconds for the curl-ups and 5-6 seconds for the side bridges and the bird-dog exercises. In weeks 5-6, participants completed 3 sets of 12-15 repetitions with 15-

20 seconds of rest, with 3-4 seconds hold for curl-up exercises and 6-8 seconds hold for side bridge and bird-dog exercises. These principles of technique, alignment, controlled breathing, core engagement and postural control were stressed throughout the technique [19]. The use of outcome measures and statistical analyses.

Outcome measures and statistical analysis

Assessment was carried out at baseline and 6th week. The McGill Pain Questionnaire was used to assess pain [20]; the WHOQOL-BREF to assess quality of life [21]; the Tampa Scale for Kinesiophobia to assess kinesiophobia [22]; and the Sorensen Test to assess trunk extensor endurance [23]. All the data were analyzed using SPSS for Windows version 26, at significance level of $p=0.05$. The Shapiro-Wilk test was used to determine normality since there were fewer than 50 samples. The distribution of baseline pain, baseline quality of life and kinesiophobia was normal in both the treatment and control groups. Two tailed paired-samples t tests were used to assess pre- to post-treatment difference within each group, and two tailed independent-samples t tests were used for between-group comparison.

Table 1. Baseline demographic characteristics of the study groups.

Characteristic	Feldenkrais (n=20)	McGill (n=20)
Age, years, Mean $\pm$ SD	32.80 $\pm$ 7.06	33.15 $\pm$ 7.45
Weight, kg, Mean $\pm$ SD	72.41 $\pm$ 10.21	73.13 $\pm$ 10.071
Height, cm, Mean $\pm$ SD	169.50 $\pm$ 8.810	170.00 $\pm$ 8.67
BMI, kg/m ² , Mean $\pm$ SD	25.06 $\pm$ 1.39	25.170 $\pm$ 1.48
Male, n (%)	6 (30.0%)	9 (45.0%)
Female, n (%)	14 (70.0%)	11 (55.0%)

Results

Forty participants were included in the final analysis, with 20 participants in each group. The Feldenkrais group included 6 males (30.0%) and 14 females (70.0%), while the McGill group included 9 males (45.0%) and 11 females (55.0%). Mean age, weight, height, and BMI were comparable between groups (Table 1). The Shapiro-Wilk p -values for baseline pain, quality of life, and kinesiophobia were greater than 0.05 in both groups, supporting the use of parametric analyses.

Within-group analysis demonstrated statistically significant improvement in every measured outcome in both groups ($p<0.001$). Pain decreased from 31.60 ± 4.32 to 16.35 ± 3.46 in the Feldenkrais group and from 31.70 ± 4.42 to 21.70 ± 3.40 in the McGill group. Quality of life increased from 46.80 ± 6.16 to 71.10 ± 6.16 in the Feldenkrais group and from 46.80 ± 6.36 to 59.90 ± 5.53 in the McGill group. Kinesiophobia decreased from 50.15 ± 5.22 to 33.15 ± 4.45 in the Feldenkrais group and from 50.25 ± 5.47 to 42.05 ± 4.68 in the McGill

group. Endurance increased from 61.60 ± 12.20 to 94.35 ± 12.39 in the Feldenkrais

group and from 62.10 ± 13.14 to 127.10 ± 12.76 in the McGill group (Table 2).

Table 2. Within-group pre- and post-treatment comparisons.

Outcome	Group	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	Mean diff.	95% CI upper	p-value
Pain	Feldenkrais	31.60 ± 4.32	16.35 ± 3.46	15.25	15.77	<.001
Pain	McGill	31.70 ± 4.42	21.70 ± 3.40	10.00	10.52	<.001
Quality of life	Feldenkrais	46.80 ± 6.16	71.10 ± 6.16	-24.30	-23.72	<.001
Quality of life	McGill	46.80 ± 6.36	59.90 ± 5.53	-13.10	-12.53	<.001
Kinesiophobia	Feldenkrais	50.15 ± 5.22	33.15 ± 4.45	17.00	17.58	<.001
Kinesiophobia	McGill	50.25 ± 5.47	42.05 ± 4.68	8.20	8.61	<.001
Endurance	Feldenkrais	61.60 ± 12.20	94.35 ± 12.39	-32.75	-31.94	<.001
Endurance	McGill	62.10 ± 13.14	127.10 ± 12.76	-65.00	-64.088	<.001

Between-group analysis showed no significant baseline differences for pain ($p=.943$), quality of life ($p=1.00$), kinesiophobia ($p=.953$), or endurance ($p=.901$). After treatment, pain was significantly lower in the Feldenkrais group than in the McGill group (16.35 ± 3.46 vs 21.70 ± 3.40 ; mean difference -5.350 ; $p<.001$). Quality of life was significantly higher in the Feldenkrais group (71.10 ± 6.163) than in the McGill group (59.90 ± 5.53), with a mean difference of 11.20 ($p<.001$). Kinesiophobia was lower after treatment in the Feldenkrais

group (33.15 ± 4.45) than in the McGill group (42.05 ± 4.68), with a reported mean difference of -8.90 and 95% CI of -11.83 to -5.97 ($p<.001$). Endurance was significantly higher after treatment in the McGill group (127.10 ± 12.760) than in the Feldenkrais group (94.35 ± 12.38), with a mean difference of -32.75 ($p<.001$). Thus, Feldenkrais exercises produced greater improvement in pain, quality of life, and kinesiophobia, whereas McGill exercises produced greater improvement in endurance (Table 3).

Table 3. Between-group comparisons at baseline and post-treatment.

Outcome/time	Feldenkrais Mean $\pm$ SD	McGill Mean $\pm$ SD	Mean diff.	p-value
Pain pre	31.60 ± 4.32	31.70 ± 4.42	-.100	.943
Pain post	16.350 ± 3.46	21.70 ± 3.40	-5.350	<.001
QoL pre	46.80 ± 6.16	46.80 ± 6.362	0.00	1.00
QoL post	71.10 ± 6.163	59.90 ± 5.53	11.20	<.001
Kinesiophobia pre	50.15 ± 5.22	50.25 ± 5.48	0.10	.953
Kinesiophobia post	33.15 ± 4.45	42.05 ± 4.68	-8.90	<.001
Endurance pre	61.60 ± 12.20	62.10 ± 13.14	-0.50	.901
Endurance post	94.35 ± 12.38	127.10 ± 12.760	-32.75	<.001

Discussion

The current randomized clinical trial showed that patients with CNSLBP benefited from both Feldenkrais Method exercises and McGill Big Three exercises, with a different pattern of benefit for each outcome. Feldenkrais exercises resulted in greater improvements in pain, quality of life and kinesiophobia, while McGill exercises resulted in greater improvements in trunk endurance. There were no significant differences between the groups at baseline for the measured variables, therefore the difference at post-treatment is unlikely to be due to large initial differences in pain, quality of life, kinesiophobia, and endurance. The findings therefore suggest that both interventions are therapeutic with different aspects of CNSLBP. Significant improvement in pain was seen in both groups with more improvement after the Feldenkrais exercises. The results of this study are in line with the results of Saki and Ziya (2025) who found that using the Feldenkrais principles combined with dynamic neuromuscular stabilization resulted in a positive effect on pain and other clinical outcomes. The Feldenkrais training enables the patient to find movement patterns that are comfortable for him/her, to focus his/her attention on the sensation of the movement, to identify unnecessary muscular effort, and to discover new ways of moving. These features can play a role in chronic pain, in which case guarding and inefficient movement can perpetuate symptoms [14].

However, exercise to stabilise can lessen pain. Supervised and other stabilization exercise formats were reported to be beneficial by Karaduman and Ataş Balci (2024), suggesting that pain reduction is not exclusive to movement-awareness exercises. Variability in supervision, progression, adherence, dosage and participant may affect the size of response. Treatment resulted in an improvement of both groups, but in favor of the Feldenkrais group. In CNSLBP, factors other than movement capacity may affect the quality of life, including pain, confidence in movement, participation in activities of daily living, social functioning, and psychological responses. Feldenkrais exercises have the potential to impact upon these dimensions through symptom reduction,

comfortable exploration of movement and increased perceived control [16]. Rabieezadeh et al. (2024) also found that a structured neuromuscular exercise program resulted in improvements in quality of life, as well as decreases in pain and disability. Yet others studies have demonstrated that increased physical performance is not necessarily uniformly associated with increased improvements in all elements of quality of life. This emphasises the multi-dimensionality of quality of life and the need to understand it in the context of more than just physical outcomes [17].

The level of kinesiophobia also was reduced in both groups, but more so in the Feldenkrais group. Fear of moving can be a risk factor for avoidance, deconditioning, limited participation and chronic disability. The slow and non threatening nature of the Feldenkrais practice can offer the patient repeated exposure to movement without requiring painful ranges, a way of challenging the perception of movement as harmful. When Feldenkrais was combined with a neuromuscular stabilization program, Saki and Ziya (2025) found positive changes in kinesiophobia [15]. Farragher et al. (2024), however, did not find any clear additional benefit of including specific neuromuscular control retraining in resistance training on reducing kinesiophobia, despite obtaining clinically important improvements for both strategies. This implies that fear is reduced as a result of repeated successful movement experiences and that the amount of reduction might be dependent on the type of intervention and the individual's response [24]. The results from the endurance tests were found to be different. While both groups were able to improve, McGill exercises did yield significantly more endurance in the trunk. This is very much in keeping with the specificity of the McGill program, which repeatedly activates trunk flexors, extensors and lateral stabilizers with curl-up, side bridge, side bird-dog exercises, with progressively increased repetitions and hold times [6].

Stabilization exercises also showed to be more effective in improving core endurance and function than conventional exercise according to Sengul et al. (2021). Bi et al., 2022 also

showed that stabilization based programs can also enhance the endurance of the trunk in static and dynamic tasks and that program modification can further impact the magnitude of the gains in trunk endurance [25]. Therefore, the higher endurance response found in the McGill group is consistent with the training stimulus provided with this trial. The results combined highlight the importance of considering what outcome is prioritized when considering the relative effectiveness of an exercise approach. Miyamoto et al. (2022) demonstrated that the effect of the differing types of active rehabilitation measures can differ based on pain, fear-avoidance beliefs, spinal extensor endurance, quality of life, and follow-up time [12]. The present findings also indicate that CNSLBP should not be considered only a problem of stability or strength. If the primary goal of rehabilitation is to reduce pain, improve quality of life, or decrease fear of movement, then the Feldenkrais exercises may be of special relevance for patients. If the main focus is on improving endurance of the trunk, then the exercises from the McGill series can be focused on. In reality, choice of exercise should be kept personal and take into account the main impairments, tolerability, treatment aims, and treatment response of the patient.

Limitations

The study did not involve follow-up, so it was not possible to evaluate whether the benefits seen following treatment will persist. Physical activity and exercise performed outside supervised treatment sessions could not be completely controlled. Furthermore, variation in adherence and response to the exercise regimen could have affected treatment results. Long-term follow-up periods and more detailed monitoring of adherence to exercise and activities outside of supervised sessions are needed for future trials.

Conclusion

The Feldenkrais Method exercises and the McGill Big Three exercises improved the pain, quality of life, kinesiophobia, and endurance for patients with chronic non-specific low back pain. Feldenkrais exercises were more effective in reducing pain and kinesiophobia and

improving quality of life, whereas McGill exercises were more effective in improving endurance.

Declarations

Ethics and consent: Written informed consent was obtained from all participants. Participant information was kept confidential and study procedures followed the ethical requirements described in the approved research protocol.

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Conflict of interest: The authors declare no conflict of interest.

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