Original article

Effects of pulsed electromagnetic field and retrowalking in patients with chronic non-specific low back pain: a pilot study

Efeitos do campo eletromagnético pulsado e do retrowalking em pacientes com dor lombar crônica inespecífica: um estudo piloto

Sujata Sharma[1]
Shabnam Joshi[2]

[1]Guru Jambheshwar University of Science & Technology (Hisar). Haryana, India.
[2]Corresponding author. Guru Jambheshwar University of Science & Technology (Hisar). Haryana, India. shabnamphysio@gmail.com

ABSTRACT | INTRODUCTION: Chronic non-specific low back pain (CNSLBP) is a major worldwide condition that has severe emotional, social, and economic consequences. Management is difficult, requiring the development of new, effective, and safe approaches. **OBJECTIVES:** This study was conducted to examine the effects of Pulsed Electromagnetic Fields (PEMF) and retrowalking on pain, disability, spinal mobility, hamstring tightness, balance, and kinesiophobia in patients with chronic non-specific low back pain. **MATERIALS AND METHODS:** Participants (n = 48) with CNSLBP were randomised into four groups; Group A: Conventional group, Group B: PEMF group, Group C: retrowalking group, and Group D: PEMF and retrowalking group. The interventions were given three times per week for six weeks. The outcomes were pain, disability, hamstring tightness, balance, spinal mobility and kinesiophobia, measured at baseline and after 6 weeks. **RESULTS:** The result suggested a significant improvement in pain, disability, hamstring tightness, kinesiophobia and balance. However, no significant improvement in spinal mobility (flexion and extension ROM) was observed during the sixth week between-group comparison. The maximum improvement was seen in group D followed by group C and group B in comparison to group A. **CONCLUSION:** It can be concluded that PEMF and retrowalking when given in combination significantly decrease pain, disability, hamstring tightness, kinesiophobia and improve balance patients with chronic non-specific low back pain.

KEYWORDS: Electromagnetic Fields. Low Back Pain. Kinesiophobia. Clinical Trial.

RESUMO | INTRODUÇÃO: A dor lombar crônica inespecífica (DLCI) é uma condição importante em todo o mundo que tem graves consequências emocionais, sociais e econômicas. O gerenciamento é difícil, exigindo o desenvolvimento de abordagens novas, eficazes e seguras. **OBJETIVOS:** Este estudo foi realizado para examinar os efeitos dos Campos Eletromagnéticos Pulsados (CEMP) e do *retrowalking* sobre a dor, a incapacidade, a mobilidade da coluna vertebral, a rigidez dos isquiotibiais, o equilíbrio e a cinesiofobia em pacientes com dor lombar crônica não específica. **MATERIAIS E MÉTODOS:** Os participantes (n = 48) com DLCI crônica foram divididos aleatoriamente em quatro grupos: Grupo A: Grupo convencional, Grupo B: Grupo CEMP, Grupo C: Grupo *retrowalking* e Grupo D: Grupo CEMP e *retrowalking*. As intervenções foram realizadas três vezes por semana durante seis semanas. Os resultados foram dor, incapacidade, tensão nos isquiotibiais, equilíbrio, mobilidade da coluna vertebral e cinesiofobia, medidos na linha de base e após seis semanas. **RESULTADOS:** O resultado sugeriu uma melhora significativa na dor, na incapacidade, na tensão dos isquiotibiais, na cinesiofobia e no equilíbrio. Entretanto, não foi observada melhora significativa na mobilidade da coluna vertebral (flexão e extensão da ADM) quando a comparação entre os grupos foi feita na sexta semana. A melhora máxima foi observada no grupo D, seguida pelo grupo C e pelo grupo B, em comparação com o grupo A. **CONCLUSÃO:** Pode-se concluir que a CEMP e o *retrowalking*, quando administrados em combinação, diminuem significativamente a dor, a incapacidade, a rigidez dos isquiotibiais, a cinesiofobia e melhoram o equilíbrio dos pacientes com dor crônica não espinhal.

PALAVRAS-CHAVE: Campos Eletromagnéticos. Dor lombar. Cinesiofobia. Ensaio Clínico.

Submitted Feb. 12th, 2024, Accepted June 21st, 2024,
Published Aug. 9th, 2024
J. Physiother. Res., Salvador, 2024;14:e5608
http://dx.doi.org/10.17267/2238-2704rpf.2024.e5608 | ISSN: 2238-2704
Assigned editors: Katia Sá, Bruno Goes

How to cite this article: Sharma S, Joshi S. Effects of pulsed electromagnetic field and retrowalking in patients with chronic non-specific low back pain: a pilot study. J Physiother Res. 2024;14:e5608. http://dx.doi.org/10.17267/2238-2704rpf.2024.e5608

1. Introduction

Low back pain is highly prevalent and the main reason for years lived with disability. In their lifetimes, 30% to 80% of people usually experience low back pain (LBP). The incidence rate of LBP is about 15% in adults worldwide, with 30% point prevalence.[1] It is also estimated that at least 50% of adults have gone through an episode of LBP.[2] According to research, LBP affects both men and women equally and constitutes one of the most frequent reasons for people to contact their physician and experience at least one episode of LBP occurs in 30% of adolescents globally.[3,4]

The common risk factors for chronic non-specific low back pain (CNSLBP) are age, gender, disc degeneration, history of spinal injury, a family history of LBP, a high amount of physical activity, stress, depression, and smoking.[4]

The exact pathophysiological mechanism and etiology of CNSLBP is still difficult to understand in 85 to 90% of the cases.[1] Chronic non-specific low back pain (CNSLBP) is a term used to describe pain in the lower back that lasts more than twelve weeks. Various therapeutic interventions popularly used for the treatment of CNSLBP are analgesic medications, exercises, cognitive behavioural therapy, yoga, acupuncture, physical therapy modalities, spinal manipulation, interdisciplinary rehabilitation, and progressive relaxation.[2,3] Physical therapy approaches have gained popularity as an alternative to avoid their adverse effects. Some common physical therapy interventions used to treat CNSLBP are Pulsed electromagnetic fields (PEMF), transcutaneous electrical nerve stimulation (TENS), interference currents (IFC), hot pack, therapeutic ultrasound (US) in physical therapy clinics, but their efficacy remains unclear.[4]

Retro-walking or backward walking is a relatively new concept in rehabilitation. Various studies have suggested an improvement in balance and gait in patients with neurological disorders such as stroke, cerebral palsy, and parkinsonism.[5] Studies have also investigated how retrowalking affects knee osteoarthritis and have shown positive effects in improving pain, disability, and balance.[5] Various researches are being conducted to explore the role of retro-walking in chronic low back pain, and the results were likewise encouraging. PEMF is been shown to be useful in reducing pain, encouraging bone formation in osteoporosis, and bone growth in acute fractures.[6] It has been described that the use of PEMF improves tissue oxygen consumption, local cellular activity, and vasodilation without increasing the local temperature.[6] The use of PEMF in CNSLBP has been explored in various studies, but retrowalking is a new approach to treat CNSLBP. Thus the present study was undertaken to explore the combined effect of PEMF and retrowalking as well as the isolated application of these interventions in patients with CNSLBP and to estimate the feasibility of the study to conduct a fully powered Randomised controlled trail.

2. Method

The study was conducted as per the Consolidated Requirements of Reporting Studies (CONSORT) guidelines. The 2013 Helsinki Declaration's ethical guidelines for studies involving human subjects were followed. The ethical approval for the study was taken on December 29, 2020, vide letter nº A.Psy/20/8487. The present study is also registered with Clinical trial Registry of India with no. CTRI/2021/06/034230. All the participants signed an informed consent before their participation in the study.

2.1 Trialdesign

Randomized, Parallel Group, Active Controlled Trial.

2.2 Participants and setting

The study was conducted at the Outpatient Department (OPD), Department of Physiotherapy Guru Jambheshwar University of Science and Technology and various hospitals in Hisar, Haryana, India, from February 2022 to August 2022. The following inclusion criteria and exclusion criteria were applied during recruitment.

2.2.1 Inclusion criteria

The study included males and females of the age group thirty to sixty years with non-specific low back pain for more than three months.

2.2.2 Exclusion criteria

Patients with a history of back pain due to any specific spinal pathology, recent fractures, previous surgeries, deformities of lower limb and spine, any acute or chronic cardiac or musculoskeletal problems apart from LBP, pregnant and lactating women, patients with the pacemaker and unstable heart conditions, epilepsy, presence of open wounds on back, any neurological deficit, history inflammatory joint disorders, malignant disease, any other reason affecting their participation in the study, unable to walk without walking aid, uncooperative or unwilling participants.

2.3 Recruitment and interventions

Participants with CNSLBP were screened for participation in the study and a total of 48 participants were selected following the eligibility criteria for the study and the selected participants were randomly divided into 4 groups. After randomization, the participants were given interventions as per the respective groups. The basic demographic details, such as age, height, weight, and BMI were taken at the baseline. The outcome variables were measured at recruitment and after 6 weeks. Table1 illustrates the details of interventions given to respective groups.

Table 1. Show the details of interventions given to respective groups

Group A	Participants accomplished conventional exercises such as supine and prone lying leg lifts and abdominal crunches. Each exercise was given for 10 repetitions per session and hold the position for 5 seconds and returned to neutral.[7]
Group B	Participants received PEMF at 200 microtesla, sinus waveform at 30 Hz for 20 minutes on the lumbar region along with conventional exercises same as given to group A.
Group C	Participants were engaged in 20 minutes of comfortable treadmill retrowalking with five-minute warm-up and cool-down periods along with conventional exercises same as given to group A.[8]
Group D	Participants were given a combination of PEMF, retrowalking and conventional exercises same as given to group A.

Source: the authors (2024).

All the interventions were administered three times weekly for six weeks, and during data collection, participants were instructed not to alter their activity levels or engage in alternative treatment regimens.

2.4 Outcomes

The primary outcome measures in the study comprised pain, spinal mobility, hamstring tightness. The secondary outcome measures comprised disability, balance and kinesiophobia. The pain was assessed by Visual Analogue Scale (VAS), disability was assessed by Owestry Disability Index (ODI), spinal mobility by measuring spinal flexion and extension range of motion by using modified schober test, hamstring tightness by Straight Leg Raising (SLR) test of both lower limbs, balance by using Star Excursion Balance Test (SEBT) of both lower limbs, and kinesiophobia by using Tampa scale. The recruitment administration of interventions and assessment of outcome variables were done by the principal investigator of the study only the participants were kept blinded till the end of study.

The number of participants in the study was used to assess the feasibility of the participant recruiting rate. The acceptance and validity of the outcome variables were determined using the pre- and post-intervention completion rates. The primary criteria for the pilot trial were 70% subject recruiting rate, 90% subject completion rate, 95% post-study follow-up data submission rate, and 75% participant attendance rate.[9]

2.5 Sample size

Forty-eight participants were enrolled, and the pilot study's minimal sample size criteria of twelve subjects in each group was taken.[10]

2.6 Randomization

According to the eligibility criteria, the participants were selected and they were divided using a random number table generated by a computer into four groups and were divided randomly into four groups with an allocation ratio 1:1.

2.7 Allocation concealment

The allocation concealment of the participants was done by using a sealed opaque envelope.

2.8 Blinding

The participants were blinded from the intervention and were not revealed to the participants till the end of the study. The administration of interventions and assessment of the outcome variables were done by the principal investigator of the study.

2.9 Statistical analysis

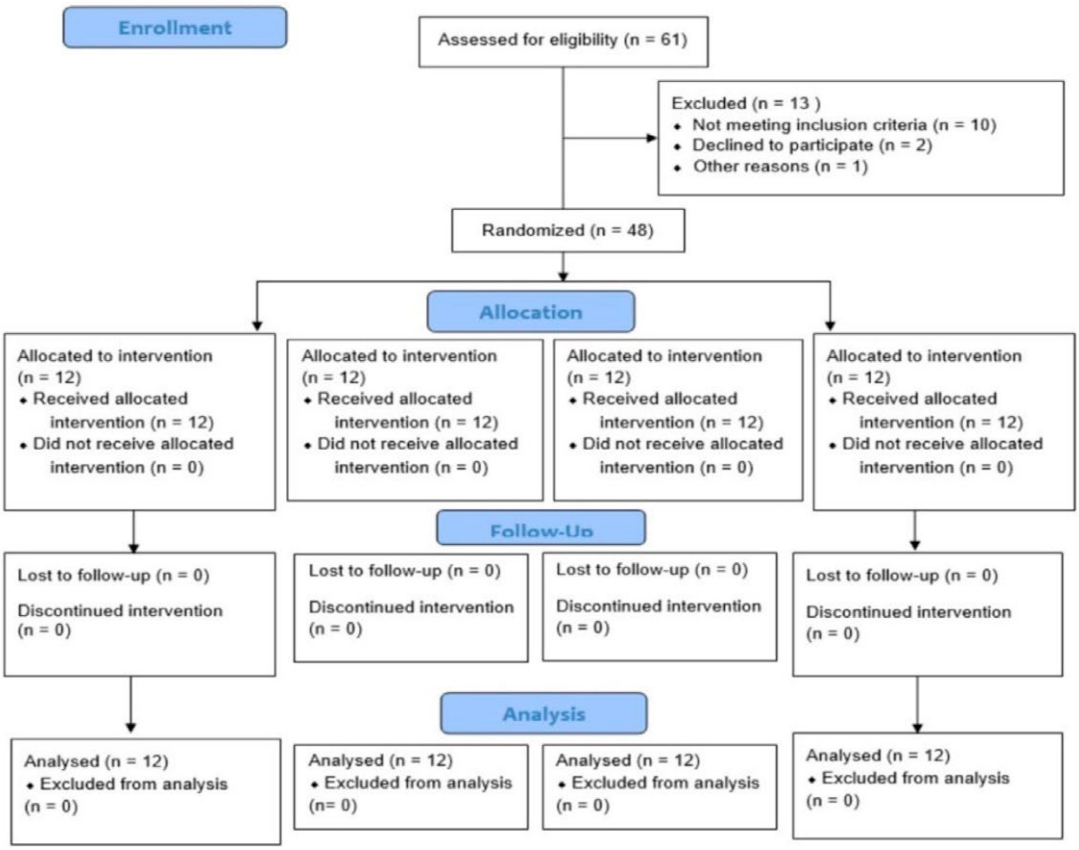
The SPSS Version 21.0 was used for the analysis. The data was presented as mean and standard deviation. The normality was assessed by the Kolmogorov-Smirnov test. For assessing pain for between-group comparisons, the Kruskal-Wallis test was used, and for within-group comparisons, the Mann-Whitney test was used. One-way ANOVA was used for between-group comparison for the variables Spinal mobility, Disability, Hamstring tightness, Balance, and Kinesiophobia. If found significant, the Scheffe test was used to do post hoc multiple comparisons. The within-group comparison was done using a Related t-Test. During the analysis, the Intention to treat principle was used. The significance level was fixed at $P < 0.05$.

3. Results

3.1 Participants flow

Based on the selection criteria, a total of 61 participants were screened. Out of which 51 participants (83.60%) were selected as per inclusion and exclusion criteria, and 48 (94.11%) expressed their interest to participate in the study. Figure1 illustrates the Flow of the study.

Figure 1. Flow chart for the study



Source: the authors (2024).

3.2 Recruitment

The participants were recruited between February 2022 and August 2022.

3.3 Baseline data

The mean age of participants was 43.21±8.51 years, height was 161.68±6.35 cms, weight was 69.90±5.62 kgs and BMI was 26.74±1.62 kg/m^2. The demographic characteristics were found to be similar at baseline. Table 2 illustrates the demographic characteristics of participants and outcomes variable at the baseline.

Table 2. Demographic characteristics of participants and outcomes variable at the baseline

			Group A (n=12)	Group B (n=12)	Group C (n=12)	Group D (n=12)	P-value
Age			43.5±9.63	42.5±7.30	43.3±9.72	43.5±8.24	.991
Height			158.6±6.91	162.4±5.48	164.0±6.19	161.6±6.27	.204
Weight			69.7±6.88	69.9±5.72	70.9±4.81	68.9±5.42	.857
BMI			27.7±2.51	26.5±1.16	26.3±0.93	26.3±1.03	.087
Pain (VAS)			6.67±0.49	6.58±0.67	6.50±0.80	5.92±1.00	.144
Disability (ODI)			26.5±4.66	27.16±2.82	29.9±4.10	27.9±3.82	.190
Spinal mobility (ROM)	**Flexion**		6.22±0.38	6.06±0.74	5.99±0.67	0.23	.23
	Extension		2.54±0.33	2.27±0.31	2.47±0.29	0.10	.10
Hamstring tightness (SLR) right leg			81.9±2.96	82.08±4.77	82.4±4.31	82.08±4.12	.992
Hamstring tightness (SLR) left leg			80.7±2.90	87.0±4.31	86.3±3.52	82.06±4.12	.963
Kinesiophobia (Tampa Scale)			31.1±6.61	33.5±5.36	33.2±7.81	34.7±6.68	.622
Star Excursion Balance Test (right leg)	**Anterior**	Mean± SD	65.7±2.34	65.5±3.02	65.8±3.58	65.8±3.58	.849
	Posterior		58.9±1.83	59.3±3.22	57.5±2.74	57.5±2.74	.237
	Medial		64.8±3.04	65.1±2.65	63.5±2.90	63.5±2.90	.521
	Lateral		55.9±4.73	55.2±5.11	54.3±6.63	54.3±6.63	.734
	Anterolateral		65.0±5.77	65.3±4.67	64.0±5.79	64.0±5.79	.875
	Anteromedial		64.1±3.78	65.3±2.53	63.3±2.83	63.3±2.83	.401
	Posterolateral		44.9±3.70	46.9±4.29	46.0±5.87	46.0±5.87	.758
	Posteromedial		64.3±4.16	64.3±4.88	63.2±4.61	63.2±4.61	.891
Star Excursion Balance Test (left leg)	**Anterior**		65.7±2.34	65.5±3.02	65.8±3.58	65.8±3.58	.877
	Posterior		58.5±1.72	59.5±2.96	57.7±3.01	57.7±3.01	.294
	Medial		65.5±2.06	64.8±2.94	64.4±3.20	64.4±3.20	.751
	Lateral		56.1±4.98	57.5±3.96	53.8±7.90	53.8±7.90	.396
	Anterolateral		65.5±6.09	63.7±4.43	63.1±5.70	63.1±5.70	.705
	Anteromedial		63.2±3.84	65.5±2.43	63.1±2.97	63.1±2.97	.204
	Posterolateral		44.6±3.72	46.6±4.67	46.0±5.87	46.0±5.87	.743
	Posteromedial		64.08±4.44	64.5±4.88	62.6±3.70	62.6±3.70	.658

Source: the authors (2024).

3.4 Outcomes and estimation

The study findings showed significant improvement in pain, disability, hamstring tightness, kinesiophobia and balance. However, there was no significant improvement in spinal mobility (flexion and extension ROM). The post hoc comparisons showed maximal pain in group D (Median = 4.40, P < .001**) followed by group B (Median = 4.14, P < .001**) and group C (Median = 4.12, P < .001**) as compared to group A. The disability, kinesiophobia, Right Leg Star Excursion Balance Test (SEBT) Posterior, SEBT Anterolateral, SEBT Posteroterolateral and SEBT Posteromedial was found to be reduced in group D (MD = 3.66; P = 0.35*), (MD = -8.25; P < .001*), (MD = -4.50; P < .001*), (MD = -5.08; P = 0.21*), (MD = -5.66; P = 0.18*) and (MD = -4.16; P = 0.26*) as compared to group A. The Hamstring tightness, SEBT Anterior and SEBT Lateral was found to reduce in group D (MD = -6.00; P < .001**), (MD = -4.08; P < .001**), (MD = -7.41; P < .001**) followed by group C (MD = -5.58; P < .001**), (MD = -3.75; P < .001*), (MD = -6.75; P = 0.22*) as compared to group A. The SEBT Medial and SEBT Anteromedial do not show any improvement on comparison with group A. Left Leg Star Excursion Balance Test (SEBT) Anterior, SEBT Posterior, SEBT Posterolateral was found to reduce in group D (MD = -4.58; P < .001**), (MD = -4.58; P = 0.25*), (MD = -7.00; P < .001**) followed by group C (MD = -4.25; P < .001**), (MD = -4.16; P = 0.48*), (MD = -5.41; P = 0.27*) as compared to group A. SEBT Lateral, SEBT Anterolateral was found to reduce in group D (MD = -8.83; P < .001**), (MD = -6.41; P < .001**) followed by group C (MD = -9.83; P < .001**), (MD = -4.33; P = 0.50) and then followed by group B (MD = -6.00; P = 0.045*), (MD = -5.41; P < .001**). SEBT Medial was found to reduce equally in group B and in Group D (MD = -3.41; P < .001*), (MD = -3.41; P < .001*). SEBT Anteromedial and SEBT Posteromedial do not show any improvement on comparison with group A.

A fully powered "RCT" was found to be feasible as 48 individuals finished the treatment sessions of 6 weeks showing a 100% retention rate. The study showed significant improvements in all variables except spinal mobility in pre and post-comparisons among all four groups. Table 3 illustrates the between-groups comparison of the primary outcome variables - Pain, Spinal mobility and Hamstring tightness; and Table 4 illustrates the between-groups comparison of the secondary outcome variables- Disability, Kinesiophobia and Balance.

Table 3. Demonstrates the between-groups comparison of the primary outcome variables - pain, spinal mobility and hamstring tightness

Variables		Group A		Group B		Group C		Group D		Between Group (Baseline)		Between Group (6 Week)	
		Baseline	At 6 week	Base line	At 6 week	Base line	At 6 week	Base line	At 6 week	χ2 and F-value	P- value	χ2 and F-value	P- value
Pain (VAS)		6.67±0.49	4.92±0.79	6.58±0.67	2.50±0.52	6.50±0.80	2.58±0.51	5.92±1.00	1.83±0.39	χ2=5.411	0.144	χ2=34.09	.0001**
Spinal mobility (ROM)	Flexion	6.22±0.38	7.26±0.52	6.06±0.74	7.05±0.71	5.99±0.67	6.82±0.51	6.45±0.42	6.79±0.49	F=1.48	0.23	F=1.82	0.157
	Extension	2.54±0.33	2.96±0.30	2.27±0.31	2.75±0.38	2.47±0.29	2.71±0.21	2.53±0.20	2.69±0.35	F=2.20	0.10	F=1.84	0.153
Hamstring tightness (SLR) Right leg	81.9±2.96	82.6±5.12	82.08±4.77	85.0±3.36	82.4±4.31	88.2±1.95	82.08±4.12	88.6±1.87	F=0.31	0.992	F=8.54	.0001**	
Hamstring tightness (SLR) Left Leg	80.7±2.90	82.07±3.45	87.0±4.31	81.8±2.98	86.3±3.52	85.04±5.11	82.06±4.12	82.04±5.13	F=0.30	0.963	F=8.52	.0001**	

VAS- Visual Analog Scale, ROM-Range of Motion,SLR-Straight Leg Raise Test,* -Statistically Significant at P < 0.05* and P ≤ 0.001.
Source: the authors (2024).

Table 4. Demonstrates the between-groups comparison of the secondary outcome variables - disability, kinesiophobia and balance

Variables		Group A		Group B		Group C		Group D		Between Group (Baseline)		Between Group (6 Week)	
		Baseline	At 6 week	Base line	At 6 week	Base line	At 6 week	Base line	At 6 week	χ2 and F- value	P- value	χ2 and F- value	P- value
Disability (ODI)		26.5±4.66	23.0±3.46	27.16±2.82	22.2.±2.52	29.9±4.10	21.0± 3.24	27.9±3.82	19.33±2.30	F=1.65	0.190	F=3.60	.021*
Kinesiophobia (Tampa Scale)		31.1±6.61	23.7±5.18	33.5±5.36	26.3±5.33	33.2±7.81	26.1±6.78	34.7±6.68	32±5.30	F=.594	0.622	F=4.53	.007**
Star Excursion Balance Test (right leg)	Anterior	66.5±2.77	65.5±2.31	65.7±2.34	68.0±2.73	65.5±3.02	69.3±2.57	65.8±3.58	69.6±3.08	F=.267	.849	F=5.70	.002**
	Posterior	59.5±2.39	61.5±4.92	58.9±1.83	63.5±3.94	59.3±3.22	65.6±1.82	57.5±2.74	66.0±3.19	F=1.46	.237	F=3.95	.014*
	Medial	64.8±2.44	64.5±2.46	64.8±3.04	66.6±3.22	65.1±2.65	67.5±2.84	63.5±2.90	67.8±2.40	F=.762	.521	F=3.36	.027*
	Lateral	56.8±5.70	55.4±5.75	55.9±4.73	59.7±4.75	55.2±5.11	62.1±5.98	54.3±6.63	62.8±3.61	F=.428	.734	F=5.25	.003**
	Anterolateral	64.0±3.86	64.0±4.46	65.0±5.77	68.0±4.48	65.3±4.67	68.2±2.83	64.0±5.79	69.1±3.12	F=.230	.875	F=4.23	.010**
	Anteromedial	65.0±3.10	64.8±3.27	64.1±3.78	65.3±3.70	65.3±2.53	67.9±3.31	63.3±2.83	68.6±2.60	F=.1.00	.401	F=4.05	.012*
	Posterolateral	46.1±4.04	47.4±3.77	44.9±3.70	49.2±4.61	46.9±4.29	52.0±3.52	46.0±5.87	53.0±4.54	F=.393	.758	F=4.71	.006**
	Posteromedial	64.5±4.44	65.2±4.33	64.3±4.16	66.2±3.16	64.3±4.88	67.4±2.35	63.2±4.61	69.4±2.57	F=.207	.891	F=3.75	.017*
Star Excursion Balance Test (left leg)	Anterior	66.5±2.57	65.0±2.39	65.7±2.34	68.0±2.73	65.5±3.02	69.3±2.57	65.8±3.58	69.6±3.08	F=.228	.877	F=7.13	.001**
	Posterior	59.5±2.39	61.5±4.92	58.5±1.72	64.7±3.25	59.5±2.96	65.6±1.82	57.7±3.01	66.0±3.26	F=1.27	.294	F=4.23	.010**
	Medial	65.0±2.13	64.0±2.44	65.5±2.06	67.4±2.71	64.8±2.94	66.7±2.73	64.4±3.20	67.4±2.71	F=0.40	0.751	F=4.51	.008**
	Lateral	57.0±5.06	54.3±5.86	56.1±4.98	60.3±5.15	57.5±3.96	64.1±5.09	53.8±7.90	63.1±3.51	F=1.01	0.396	F=9.44	0.0001**
	Anterolateral	63.7±3.86	62.8±4.26	65.5±6.09	68.2±4.63	63.7±4.43	67.1±2.16	63.1±5.70	69.2±2.98	F=0.470	0.705	F=7.19	0.0001**
	Anteromedial	64.7±3.19	65.9±3.11	63.2±3.84	63.7±3.93	65.5±2.43	68.2±3.51	63.1±2.97	68.7±2.59	F=1.59	0.204	F=5.74	0.002**
	Posterolateral	45.2±4.20	46.0±3.47	44.6±3.72	49.3±4.65	46.6±4.67	51.5±3.96	46.0±5.87	53.0±4.54	F=0.415	0.743	F=6.28	0.001**
	Posteromedial	64.6±4.35	64.1±3.80	64.08±4.44	67.1±3.51	64.5±4.88	67.8±2.51	62.6±3.70	69.3±2.74	F=0.539	0.658	F=5.55	0.003**

ODI - Oswestry Disability Index, SEBT - Star Excursion Balance Test, * - Statistically Significant at P < 0.05* and P ≤ 0.001.
Source: the authors (2024).

4. Discussion

The study evaluated the combined and individual effects of PEMF and retrowalking, and assessed the feasibility of conducting a fully powered RCT. The results of the study revealed significant improvements in pain, disability, hamstring tightness, kinesiophobia, and balance when comparing between groups. However, no significant improvement was seen in spinal mobility when between groups comparison was done. The post hoc comparison showed maximum improvement in Group D followed by Group C & Group B in comparison to Group A.

The results of the study also indicate that it is feasible to perform a fully powered RCT to assess the efficacy of retrowalking and PEMF alone as well as in combination with CNSLBP. The current study's recruitment rate was 94.11% attainable; the retention rate was 100%. All the treatment sessions were completed by 97.91% of the participants, showing a good adherence rate.

The possible reasons for the significant improvement in Group D with the application of retrowalking and PEMF may be due to significant reduction in pain because PEMF works at a cellular level by promoting the passage of ions, particularly calcium ions, between cells, resulting in several beneficial biological consequences that alleviate pain and inflammation[11] and retrowalking significantly enhances the hamstring muscles flexibility.[12] The Patients with CNSLBP often avoid physical activities due to pain, causing hamstring tightness and lumbopelvic rhythm disturbances, which increase stress on spinal soft tissues and worsen back pain.[13] The gait cycle pattern differs in retrowalking compared to forward walking, as in retrowalking stance starts with toe contact and ends with heel raising, causing extra hip extension and flexion, this kinematic adjustment causes the pelvis to align more anteriorly, which may contribute to relieving strain on the facet joints, increases disc space opening, reduces compressive loads on the intervertebral discs and thus reduces LBP.[14] Retrowalking, when combined with a conventional exercise regimen, is reported to strengthen the muscles of the lumbar region, providing more pain relief.[15]

CNSLBP is a significant cause of disability, preventing individuals from performing their Activities of Daily Living (ADLs). Numerous studies have demonstrated a moderate to mild correlation between the severity of low back pain and disability.[16] It means that pain and disability are interrelated. The role of the hamstring muscle is important in maintaining balance by shifting the position of COG and its tightness impacts an individuals, balance is important for preventing injuries during ADLs and exercises. A positive correlation was found between hamstring muscle tightness and dynamic balance, suggesting that SEBT performance decreases with increased hamstring tightness.[17] Another study revealed that hamstring tightness significantly impacts the medial reach distance of SEBT in junior high school basketball players.[18]

Clinical research indicates that LBP and associated disabilities are related to Kinesiophobia, a fear of movement and re-injury.[19]

According to the findings of our study, there was no significant improvement in spinal mobility and similar results was found suggesting spinal ROM is not a reliable predictor of disability in individuals with chronic LBP.[20] It states that the limited spinal ROM is entirely independent of the degree of disability.

The increased retention rate and low subject drop-out rates imply that the intervention is a successful and widely accepted treatment for chronic non-specific low back pain.

The innovative combination of two distinct therapies with various mechanisms of action, the study's major strength of the study was the use of a new intervention such as PEMF in the Indian population as its potential for the treatment of chronic non-specific low back pain. The combination of PEMF and retrowalking can alleviate pain, disability, hamstring tightness, and kinesiophobia, while enhancing balance and spinal mobility. To prevent any bias that may affect the findings of the study, the administration of drugs for pain relief was closely monitored. Additionally, we achieved 100% retention and 97.31% adherence rates.

The present study encounters some limitations such as loss of long-term follow-up, single-blinded nature of the study and a small sample size.

5. Conclusion

It can be concluded that when PEMF is combined with retrowalking may significantly decrease pain, disability, hamstring tightness, kinesiophobia and improve spinal mobility and balance in chronic non-specific low back pain.

Authors contributions

The authors declare that they have made sufficient contributions to the work, including: the conception or design of the research; the acquisition, analysis or interpretation of data for the work; and the writing or critical review for relevant intellectual content. All authors approved the final version to be published and agreed to take public responsibility for all aspects of the work.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, private companies, and foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

Indexers

The Journal of Physiotherapy Research is indexed by DOAJ, EBSCO, LILACS and Scopus.

References

1. Fatoye F, Gebrye T, Ryan CG, Useh U, Mbada C. Global and regional estimates of clinical and economic burden of low back pain in high-income countries: a systematic review and meta-analysis. Front Public Health. 2023;11:1098100. https://doi.org/10.3389/fpubh.2023.1098100

2. Mattiuzzi C, Lippi G, Bovo C. Current epidemiology of low back pain. Journal of Hospital Management and Health Policy. 2020;4. https://doi.org/10.21037/jhmhp-20-17

3. O'Keeffe M, Ferreira GE, Harris IA, Darlow B, Buchbinder R, Traeger AC, et al. Effect of diagnostic labelling on management intentions for Non-Specific low back pain: A randomized Scenario-Based experiment. European Journal of Pain. 2022;26(7):1532-45. https://doi.org/10.1002/ejp.1981

4. Rahman NAA, Li S, Schmid S, Shaharudin S. Biomechanical factors associated with non-specific low back pain in adults: A systematic review. Physical Therapy in Sport. 2023;59:60-72. https://doi.org/10.1016/j.ptsp.2022.11.011

5. Joshi S, Singh SK, Vij JS. Effect of Retrowalking, a Non-Pharmacological Treatment on Pain, Disability, Balance and Gait in Knee Osteoarthritis: A Randomized Controlled Trial. Indian Journal of Public Health Research & Development. 2019;10(2):214-219. http://doi.org/10.5958/0976-5506.2019.00288.2

6. Sharma S, Joshi S. Potential Use of Pulsed Electromagnetic Field in Musculoskeletal Disorders: A Narrative Review. Journal of the Dow University of Health Sciences. 2024;18(1). https://doi.org/10.36570/jduhs.2024.1.1703

7. Karnati VNP, Reddy SK. Core Stabilization Program and Conventional Exercises in the Patients with Low Back Pain-A Comparative Study. International Journal of Physiotherapy. 2015;2(1):352-60. https://doi.org/10.15621/ijphy/2015/v2i1/60041

8. Hodges PW, Richardson CA. Altered trunk muscle recruitment in people with low back pain with upper limb movement at different speeds. Archives of physical medicine and rehabilitation. 1999;80(9):1005-12. https://doi.org/10.1016/s0003-9993(99)90052-7

9. Eldridge SM, Chan CL, Campbell MJ, Bond CM, Hopewell S, Thabane L, et al. CONSORT 2010 statement: extension to randomised pilot and feasibility trials. BMJ. 2016;355. https://doi.org/10.1136/bmj.i5239

10. Julious SA. Sample size of 12 per group rule of thumb for a pilot study. Pharmaceutical Statistics: The Journal of Applied Statistics in the Pharmaceutical Industry. 2005;4(4):287-91. https://doi.org/10.1002/pst.185

11. Su DB, Zhao ZX, Yin DC, Ye YJ. Promising application of pulsed electromagnetic fields on tissue repair and regeneration. Prog Biophys Mol Biol. 2024;187:36-50. https://doi.org/10.1016/j.pbiomolbio.2024.01.003

12. Raza T, Riaz S, Ahmad F, Shehzadi I, Ijaz N, Ali S. Investigating the Effects of Retro Walking on Pain, Physical Function, and Flexibility in Chronic Non-specific Low Back Pain. Iranian Rehabilitation Journal. 2023;21(2):309-18. https://doi.org/10.32598/irj.21.2.1880.1

13. Whitley CR, Dufek JS. The Effect Of Retro Locomotion On Flexibility Of The Low Back And Hamstrings. Medicine & Science in Sports & Exercise. 2009;41(5):358. http://dx.doi.org/10.1249/01.MSS.0000355640.23833.8b

14. Ansari S, Raza S, Bhati P. Impact of retrowalking on pain, range of motion, muscle fatigability, and balance in collegiate athletes with chronic mechanical low back pain. Sport Sci Health. 2021;17:307-16. https://doi.org/10.1007/s11332-020-00682-y

15. Parikh PR, Desai DS. Effectiveness of Forward Walking Versus Retro Walking on Balance, Gait Speed and Lower Body Functional Strength among the Elderly Population-A Comparative Study. International Journal of Health Sciences and Research. 2022;12(4):283-91. https://doi.org/10.52403/ijhsr.20220433

16. Woby SR, Roach NK, Urmston M, Watson PJ. The relation between cognitive factors and levels of pain and disability in chronic low back pain patients presenting for physiotherapy. European journal of pain. 2007;11(8):869-77. https://doi.org/10.1016/j.ejpain.2007.01.005

17. Zagyapan R, Iyem C, Kurkcuoglu A, Pelin C, Tekindal MA. The relationship between balance, muscles, and anthropomorphic features in young adults. Anat Res Int. 2012;2012:146063. https://doi.org/10.1155/2012/146063

18. Endo Y, Sakamoto M. Relationship between lower extremity tightness and star excursion balance test performance in junior high school baseball players. J Phys Ther Sci. 2014;26(5):661-3. https://doi.org/10.1589/jpts.26.661

19. Fritz JM, George SZ, Delitto A. The role of fear-avoidance beliefs in acute low back pain: relationships with current and future disability and work status. Pain. 2001;94(1):7-15. https://doi.org/10.1016/S0304-3959(01)00333-5

20. Atya AM. The validity of spinal mobility for prediction of functional disability in male patients with low back pain. Journal of Advanced Research. 2013;4(1):43-9. https://doi.org/10.1016/j.jare.2012.01.002