Research Paper

Investigating the Effects of Retro Walking on Pain, Physical Function, and Flexibility in Chronic Non-specific Low Back Pain

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ABSTRACT

Objectives: Chronic non-specific low back pain (CNSLBP) is described as pain whose pathoanatomical cause cannot be determined. The current study aims to evaluate the impact of retro-walking on pain, flexibility, and physical functions in patients with CNSLBP.

Methods: A randomized controlled trial was conducted in the Physical Therapy Department of District Head Quarter Hospital Nankana Sahib, Punjab, Pakistan from September 2021 to March 2022. The trial was conducted on 36 patients, randomly divided into 2 groups of 18 patients. Conventional treatment and retro-walking were given to the experimental group and the conventional treatment alone was provided to the control group for 1 month with 3 sessions per week. The outcome variables were pain, the flexibility of hamstrings and lumbar region, and physical function assessed by numeric pain rating scale, sit and reach test, modified Schober test, and modified Oswestry disability index, respectively. The data were assessed at pre-treatment after the sixth and twelfth sessions.

Results: This study showed a significant difference in the numeric pain rating scale, sit-and-reach test, and modified Oswestry disability index with a $P<0.05$ in both groups after intervention. However, in the group comparison, these variables showed better results in the retro-walking group compared to others with a $P<0.001$ after both the sixth and twelfth sessions.

Discussion: The current study suggested that when added up to conventional treatment, retro-walking was more beneficial in reducing pain and enhancing the flexibility and physical function in patients with CNSLBP when compared to conventional treatment alone; therefore, it should be added to the treatment protocol for chronic non-specific pain in the lower back.

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Highlights

• The addition of retro-walking to conventional treatment for both 2 and 4 weeks can decrease low back pain.

• The flexibility of the lumbar region and hamstring can be improved after following retro-walking protocol both for 2 and 4 weeks.

• Physical function in non-specific lower back pain patients can be improved after adding retro-walking to conventional treatment.

Plain Language Summary

Non-specific pain in the lower back is one of the most significant issues for the public health system. Almost all adult individuals are affected by the problem of pain in their back at least once during their lifespan. Moving ability in a backward direction is vital for daily life and an individual can adapt to this activity without any difficulty. It could be a source of significant improvement in symptoms in patients with back pain and be performed independently without the requirement of supervised care. The current study investigated its effect in addition to conventional treatment in pain, physical function, and flexibility in lower back pain patients. The results showed that retro-walking decreased pain and improved flexibility and physical function after 2 and 4 weeks of treatment.

Introduction

Non-specific pain in the lower back (NSLBP) is described as pain whose pathoanatomical cause cannot be determined. Considering its high prevalence, pain in the lower back is considered a significant health problem worldwide [1]. Almost all adult individuals are affected by the problem of back pain at least once during their lifespan. Pain in the lower back is regarded as a multidirectional medical issue with many causative and risk factors [2, 3].

Several treatments for lower back pain are reported, including medications, physical measures or short waves, acupuncture, infiltration, or blockade [4-6]. Exercise therapy consists of a diverse group of interventions, namely aerobics, stretching, flexion or extension, stretching, stabilization, coordination, or balance various types of exercises [7].

Retro-walking is essential in treating various conditions among effective therapies, such as improving hamstring flexibility [8]. In comparison, forward walking and walking backward are similar in many ways, including their kinematic and kinetic properties and the pattern of their muscle activation. The evidence demonstrates that backward walking is almost precisely the same as forward walking. The only difference is that their characteristics are countermanded regarding motion direction [9]. The twinning things in both include ankle, hip, and knee angular velocities, but the activated muscle patterns are reversed [10].

Ansari et al. compared the conventional and retro-walking treatment in college students in the age range of 18 to 30 years who were suffering from the low mechanical back. After 4 weeks of treatment, pain, and balance were improved in the retro walking group but the flexion motion ranges (ROM) of the lumbar spine showed no significant difference in the group comparison [11]. Retro-walking has been confirmed to increase hamstring flexibility in healthy individuals [8]. In addition, Alghadir et al. compared the effects of 6 weeks of retro-walking and forward-walking protocol in knee osteoarthritis (OA) patients. Retro-walking proved to affect physical function and pain positively in knee OA patients [12]. Kim SH et al. investigated retro walking's outcomes on lower back pain, lumbosacral angle, and muscle strength of lumbar vertebra in 25 unilateral athletes. The study found that retro-walking effectively reduced pain, decreased angle, and increased muscle strength after the following protocol for 10 weeks [13].

Previously, several studies have been conducted on retro-walking to analyze its effects on pain and flexibility. The target population in all these studies was either athletes with low back pain or healthy individuals. There has been no thorough scientific analysis of the effects of retro-walking on the non-athlete population with pain in the lower back. In addition, the outcome of retro-walking on physical functions in knee OA has also been studied; however, no study has analyzed its effect on physical function in patients with pain in the lower back.

The current study aims to investigate the retro-walking impact on pain, flexibility of the lumbar region and hamstring, and physical function in lower back pain patients. It is hypothesized that adding retro-walking to conventional treatment for 4 weeks would be superior in achieving better outcomes compared to conventional treatment alone.

Materials and Methods

Study participants

A total of 36 individuals with NSLBP were recruited for the study from District Head Quarter Hospital Nankana Sahib, Punjab, Pakistan from September 2021 to March 2022. The inclusion criteria for the study were the following items: Subjects of both genders, being in the age range of 25 to 45 years, having pain for more than 12 weeks, and having a disability index within the range of 20% to 60%. The Oswestry disability index consisted of 10 items that were scored from 0 to 5 with 5 showing the greatest disability. The total score is represented as a percentage after multiplying by 2 [14]. The ability to independently walk without any external aid, comprehend, and follow the testing procedure instructions was also included in the inclusion criteria. The exclusion criteria were the following items: The patients with any recent trauma leading to pain in the region of the lower back, current pregnancy or any congenital deformity related to posture, history of surgery as a cause of pain in the lower back, nerve root compression confirmed by two or more of myotome weakness, dermatomal sensory loss or hyporeflexia, dysfunction of sacroiliac joint confirmed by three positive tests among distraction and compression test, Gaenslen test, and sacral and thigh thrust tests [11].

Study design

A single-blinded randomized controlled trial was carried out. The patients' recruitment started on September 15, 2021, and the study was completed in March 2022. A consecutive sampling technique was used. The subjects were allocated randomly to the retro-walking (n=20) and control group (n=20). They were assigned using the lottery method. All participants had an equal choice of group allocation choices and were asked to draw one chit from the box. The participants with an odd number were assigned to the retro-walking group, and the participants with an even number were assigned to the control group. The outcome assessor was blinded to the allocation of participants and did not perform any intervention. The sample size to assess the effects of walking was calculated based on the results of a previous study [11]. The online Epitool sample size calculator calculated the sample size by putting numeric pain rating scale values with a 0.95 confidence level and a power of 0.8. Based on this estimation and after adding a 10% attrition rate, a sample size of 40 was found to be necessary. After a dropout of 2 patients in each group, 36 patients were analyzed. Figure 1 shows the CONSORT diagram.

Study procedure

The experimental group was given conventional treatment plus retro-walking. The subjects underwent retro-walking on a treadmill for 15 min in each session. This protocol was continued for 4 weeks, 3 days per week, at a self-paced speed. Before starting the actual retro-walking protocol, the subjects were accustomed to retro-walking on the treadmill. The retro-walking protocol was as follows: Backward walking was performed for the initial 3 min at 0% inclination; for the next 10 min, the speed was increased to the acceptance level of the patient; walking was continued for the last 2 minutes while decreasing the speed until the treadmill stopped. The control group was given conventional treatment, including hot packs for 10 min and exercises. The exercise program consisted of prone leg extension exercise, chest elevation in prone lying, extension in prone lying with alternate arm and leg lift, bridging in supine lying, and bridging with one leg lift. Each exercise position was maintained for 10 seconds and 2 sets with 12 repetitions for each step [11].

Outcome measurements

Pain

To assess the pain, a numeric pain rating scale was utilized. The scores on this 11-point scale range from 0, showing no problem to 10, showing an extreme level of pain. The subjects were informed about the scores. It was represented on the scale and the numeric pain rating scale sheet was given to them and they were guided to encircle the number which best suited to the level of their pain during the past 24 h [15].

Flexibility

One of the tests used for flexibility was the modified Schober test using a measuring tape. The midpoint between the posterior superior iliac spine was marked by a pen. Then, 10 cm above the point and 5 cm below the posterior superior iliac spine was also marked with the help of a measuring tape. The subject was asked to bend as far as possible, and the distance was recorded between the superior and inferior marked points. The variation in distance of the markings of skin that were taken in the neutral posture and newly taken point in the flexed position was utilized to show the extent of lumbar flexion. The measures were documented to the closest cm [16].

The sit-and-reach test was also utilized to evaluate the flexibility of the lower back and hamstring. The individual sat with their feet almost at the hip distance. The feet were placed against the testing box. The extended position of the knees was maintained. The subject's right hand was placed over the left and slowly reached ahead to the farthest possible extent by gliding their hands through the measuring board [17].

Physical function

The modified Oswestry low back disability questionnaire was utilized to check the patients' physical function. This tool comprised 10 elements concerning different aspects of function. Each element was given a score from 0 to 5, with a higher number describing more disability. The total score was demonstrated as a percentage after multiplying it by two [14].

Statistical analysis

The SPSS software, version 25 was used for analysis. The Shapiro-Wilk test was utilized to assess the normality of the data. The independent t-test was applied to compare the demographic data between groups at baseline. The repeated measure analysis of variance was used to analyze within-group comparison with assumed sphericity; meanwhile, the mixed model analysis of variance was used for the group comparison.

Results

The CONSORT guidelines were followed to report the study. A total of 40 patients were randomized with 20 patients in each group. After the dropout of 2 patients in each group, 18 patients in each group were analyzed. The demographic data were comparable and are provided in Table 1. The Mean±SD for age was 31.00±5.44 years and 35.77±7.42 years, respectively, for the retro-walking and control groups. It did not show any significant difference with P=0.92. For weight, the Mean±SD was 72.75±9.69 kg for the retro-walking group and 66.15±8.66 kg for the control group, respectively, with P=0.97. The Mean±SD for height was 1.67±0.10 m for the retro-walking group and 1.66±0.09 m for the control group with P=0.50. Similarly, for gender (P=0.53) and body mass index (P=0.37), no statistically significant difference was observed in both groups (Table 1). The measurements were taken 3 times, i.e. at baseline, at the end of the sixth session, and the end of the twelfth session. The Mean±SD for all the outcome measurements is given in Table 2.

Within-group analysis by repeated measure analysis of variance showed significant change in both groups in all the variables. In the retro-walking group, significant change in numeric pain rating scale ($F_{(2, 34)}$=108.884, P<0.001, partial η^2=0.865), in the sit-and-reach test ($F_{(2, 34)}$=35.082, P<0.001, ηp^2=0.674), modified Schober test values ($F_{(2, 34)}$=36.405, P<-0.001, ηp^2=0.682), and in the scores of modified Oswestry low back disability questionnaire ($F_{(2, 34)}$=68.616, P<0.001, ηp^2=0.801) was seen. Similarly, in the control group, the numeric pain rating scale ($F_{(2, 34)}$=47.293, P<0.001, ηp^2=0.736), sit-and-reach test ($F_{(2, 34)}$=39.918, P<0.001, ηp^2=0.701), modified Schober test ($F_{(2, 34)}$=14.984, P<0.001, ηp^2=0.468), and modified Oswestry low back disability questionnaire ($F_{(2, 34)}$=33.63, P<0.001, ηp^2=0.664) were also changed significantly. Table 3 shows the mean difference in variables within the group pre-treatment, at the first post-treatment (at the sixth session), and the second post-treatment (at the twelfth session) stages. A significant difference was observed at each pair of times except at baseline-sixth session and sixth session to twelfth session for the modified Schober test in the control group. However, the mean difference from the baseline to the twelfth session was also significant for the modified Schober test in the control group.

The pairwise comparison between groups in terms of mean difference with a 95% confidence interval in retro-walking versus the control group showed a significant difference between both groups (Table 4). A significant difference was observed in both groups (P<0.001), with better results in the retro-walking group. Better results were seen in the numeric pain rating scale with P<0.001 in the retro walking group at the sixth session as well as the twelfth session when compared to the control group. Similarly, the sit-and-reach test, modified Schober test, and modified Oswestry low back disability questionnaire showed better results in the retro-walking group (P<0.001).

Discussion

Retro-walking has shown success in various conditions. This study was done to scrutinize its effects on CLBP patients. It was hypothesized that retro-walking has better results than routine physiotherapy treatment. In both groups, remarkable improvement was observed in all the variables after applying the treatment protocol. Both groups showed significant results with a P<0.05. However, the between-group comparison showed better results in the numeric pain rating scale, modified Oswestry low back disability questionnaire, sit-and-reach test, and modified Schober test in the experimental group with P<0.001.

Table 1. Characteristics of patients

Characteristics		Mean±SD/No. (%)		P Between groups
		Retro-walking	Control	
Age (y)		31±5.44	35.77±7.42	0.29
Height (cm)		1.67±0.1	1.66±0.09	0.50
Weight (kg)		72.75±9.69	66.15±8.66	0.97
Body mass index (kg/m^2)		20.04±4.15	23.82±2.42	0.37
Gender	Male	11(61.11)	8(44.44)	0.53
	Female	7(38.89)	10(55.56)	

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The numeric pain rating scale score reduction was more significant in the experimental group compared to the control group. The present study revealed more pain reduction in retro-walking than plus the conventional treatment group. Pain reduction was also observed in the control group, although it was less compared to the experimental group. These findings are in line with a previous study in which lower back pain patients showed decreased pain scores after following a conventional program [18]. A more significant reduction in the experimental group may be because retro-walking has worked on various factors that cause the pain, such as decreased strength of core muscles, reduced flexibility of hams muscles, and disturbed alignment of the pelvis [19]. Hams flexibility is increased by retro-walking [11]. In addition, muscle strength of the lumbar area was increased due to retro-walking, which is the reason behind pain reduction in the present study after adding walking with conventional protocol [13].

Ranges of flexibility in both lumbar and hamstring areas were enhanced in both groups. However, the sit-and-reach test results used to evaluate the flexibility of the hamstring upgraded appreciably in the experimental group when compared to the control group. These findings are in line with previous studies that showed a considerable increase in sit and reach test values post-treatment in the retro-walking group. However, the target population in the previous study was healthy individuals, and in contrast to this research, the targeted patients were affected by pain in their lower back [8].

These results are inconsistent with a study by Whitley, in which lumbar ROM was determined in healthy people with the help of an electro-goniometer. There was no significant difference across the group [20]. But in one study, the lumbar ROM was assessed in patients with low back pain and healthy individuals; as in the current study, the lower back patients showed improved lumbar motion ranges after retro walking [21].

Table 2. Mean±SD of outcome measures at baseline, post treatment 1, and post treatment 2

Variables	Mean±SD					
	Retro-walking			Control		
	Baseline	Post Treatment 1 (at The End of the 6th Session)	Post Treatment 2 (at The End of the 12th Session)	Baseline	Post Treatment 1 (at The End of the 6th Session)	Post Treatment 2 (at The End of the 12th Session)
NPRS	7.83±1.04	5.88±1.02	3.33±1.23	8.4±1.61	6.5±1.38	5.5±1.54
SRT	21.25±8.12	24.27±7.78	27.96±5.7	19±6.9	20.58±7.22	21.7±7.14
MST	20.02±1.1	21.08±1.03	21.67±0.73	19.66±1.92	20.45±1.45	21±1.19
MODI	43.44±12.26	30.44±11.51	20.33±10.52	40.88±13.34	33.44±15.29	26±11.7

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Table 3. Within group comparison of pain score, sit-and-reach test, modified schober test, modified oswestry disability index

Variables	Mean Differences (95% CI)					
	Retro-walking					
	Baseline-6th Session	P	6th Session-12th Session	P	Baseline-12th Session	P
NPRS	1.94(1.35, 2.53)	<0.001	2.55(1.61, 3.49)	<0.001	4.5(3.63, 5.36)	<0.001
SRT	-3.02(-4.41, -1.62)	<0.001	-3.68(-5.99, -1.38)	0.002	-6.71(-9.23, -4.18)	0.002
MST	-1.05(-1.61, -0.50)	<0.001	-0.59(-9.82, -2.07)	<0.001	-1.65(-2.24, -1.05)	<0.001
MODI	13.00(8.31, 17.68)	<0.001	10.11(6.38, 13.84)	<0.001	23.11(16.26, 29.95)	<0.001

Variables	Mean Differences (95% CI)					
	Control					
	Baseline-6th Session	P	6th Session-12th Session	P	Baseline-12th Session	P
NPRS	1.88(1.18, 2.59)	<0.001	1.00(0.25,1.74)	0.007	2.88(1.95,3.82)	0.007
SRT	-1.58(-2.4, -0.76	<0.001	-1.12(-1.68, -0.55)	<0.001	-2.70(-3.69, -1.72))	<0.001
MST	-7.94(-1.50, -0.80)	>0.05	-0.55(-1.10, -0.007)	>0.05	-1.34(-2.24, -1.05)	<0.001
MODI	7.44(3.53, 11.35)	<0.001	7.44(3.05, 11.83)	0.001	14.88(8.96, 20.81)	0.001

*Significant at P≤0.05

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In a study by Ansari [11], the effects of retro-walking were assessed in combination with conventional treatment compared to the conventional method alone. The result showed an increase in flexion ranges in both groups. These results are in line with the current study, but in contrast to the current study, the P was 0.93 when comparing both groups, which showed an insignificant difference in ranges after adding backward walking to conventional treatment. The present study showed different results with significant differences in both groups. These changes in both groups are probably because, in comparison to forward, more hip extension occurs in retro-walk. This greater extension and accompanying extension of the lumbar spine cause increased load on the facet joints, leading to opening up the disc space, and as an outcome, compressive load reduction in intervertebral discs occurs [22]. This unloading is the mechanistic outcome of retro-walking, as proved by patients' decreased pain levels. Additionally, enhanced motion ranges are also explained by this increased facet loading [21].

Table 4. Pairwise comparison between the retro-walking and control group

Variables	Baseline-6th Session			6th session-12th Session			Baseline-12th Session		
	Mean Difference	95% CI	P*	Mean Difference	95% CI	P	Mean Difference	95% CI	P
NPRS	1.91	1.48, 2.32	<0.001	1.77	1.20, 2.34	<0.001	3.69	3.091, 4.298	<0.001
SRT	-2.30	-3.06, -1.53	<0.001	-2.40	-3.53, -1.28	<0.001	-4.70	-5.99, -3.42	<0.001
MST	-0.925	-1.34, -0.49	<0.001	-0.57	-0.89, -0.25	<0.001	-1.49	-1.92, -1.06	<0.001
MODI	10.22	7.32, 13.11	<0.001	8.77	6.04-11.51	<0.001	19.00	14.70, 23.29	<0.001

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Abbreviations: NPRS: Numeric pain rating scale; SRT: Sit-and-reach test; MST: Modified Schober test; MODI: Modified Oswestry low back disability questionnaire.*Significant at P≤0.05.

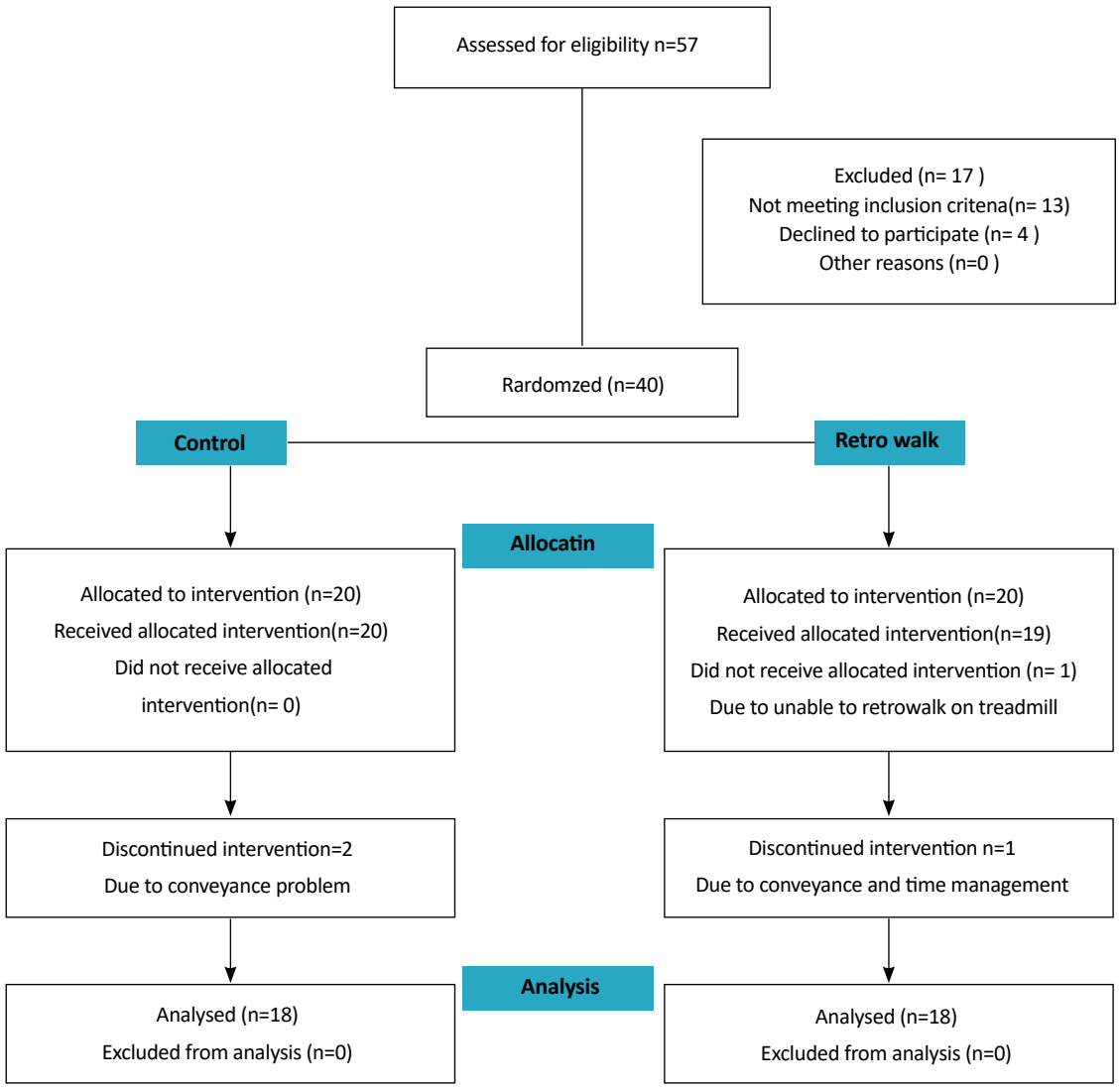

Figure 1. CONSORT diagram

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There is a significant modified Oswestry low back disability questionnaire score reduction in both groups on the statistical analysis. A study on knee OA patients showed substantial improvement in physical function after retro-walking [23]. However, the direct relation of retro-walking with physical functions in lower back pain patients has not been studied. The current research has found a direct association between walking backward and physical function in patients with chronic pain in the lower back and displayed significant results by showing betterment in functions. This physical function improvement may be due to a decrease in pain, abatement in abnormal joint kinematics and kinetics during functional movements, and improvement in activation patterns of muscles, as explained by one study [24].

There were some limitations in the study as some external factors were not controlled in this research as different frequencies and speeds of routine forward walking had additional effects on the outcomes. In addition, the fear of retro-walking was also a limiting factor. Furthermore, fatigue during the backward walk was also one of the limiting factors. Future studies can compare the effects of different degrees of inclination with forward walking. In addition, the effects of back walking can also be compared in both genders. In the future, this walking procedure is recommended to be added to treat back pain of non-specific origin.

Conclusion

When added to conventional treatment, retro-walking was more beneficial in pain reduction and increasing flexibility and physical function in patients with CNSLBP.

Ethical Considerations

Compliance with ethical guidelines

This randomized controlled trial was registered on "clinicaltrials.gov" with the following ID: NCT05044702. The Ethics Committee approved this study at Riphah International University Lahore (Code: REC/RCR&AHS/21/0126) on June 14, 2021. All the participants who volunteered in the study offered their written consent.

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Authors' contributions

Conceptualization and supervision: Tahreem Raza, and Saima Riaz; Methodology: Tahreem Raza, Saima Riaz, Sidra Ali and Nimra Ijaz; Data collection: Tahreem Raza, Faraz Ahmad, Nimra Ijaz and Iqra Shehzadi; Data analysis: Tahreem Raza, Saima Riaz, Faraz Ahmad and Sidra Ali; Investigation, writing–original draft, review & editing: All authors.

Conflict of interest

The authors declared no conflict of interest.

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