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COMPARATIVE EFFECTS OF TAI CHI AND HOME-BASED EXERCISE ON PAIN, FUNCTIONAL DISABILITY, AND MOVEMENT FEAR *IN INDIVIDUALS WITH ACUTE AND SUBACUTE NON-SPECIFIC LOW BACK PAIN*

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ABSTRACT

Background: Acute and subacute non-specific low back pain (NSLBP) is a widespread musculoskeletal problem linked to pain, reduced function, restricted spinal movement, and fear of movement. Exercise-based rehabilitation is commonly recommended for its management, and mind–body practices such as Tai Chi have drawn growing interest for their combined physical and psychological benefits.

Objective: To compare the effectiveness of Tai Chi and Home-Based Exercise on pain severity, functional disability, kinesiophobia, lumbar range of motion, and perceived recovery among individuals with acute and subacute non-specific low back pain.

Methods: This comparative interventional study enrolled 60 young adults diagnosed with acute or subacute NSLBP, divided evenly between Group A (Tai Chi, n = 30) and Group B (Home-Based Exercise, n = 30). Both groups trained three sessions per week for four weeks. The Tai Chi group followed supervised sessions comprising a warm-up, structured Tai Chi forms, and closing relaxation exercises. The home-based group followed a progressive program of aerobic warm-up, flexibility work, strengthening, and cool-down stretching.

Primary outcomes were the Numeric Pain Rating Scale (NPRS), Oswestry Disability Index (ODI), and Tampa Scale of Kinesiophobia (TSK-11); secondary outcomes were lumbar ROM and the Global Rating of Change (GROC). Assessments took place at baseline and after four weeks.

Results: Both groups improved after intervention, with the Tai Chi group showing larger gains across most measures. Mean NPRS fell from 6.33 to 3.07 with Tai Chi versus 6.33 to 3.80 with home exercise. ODI improved from 38.20 to 20.67 with Tai Chi versus 38.00 to 24.33 with home exercise. TSK-11 dropped from 30.80 to 20.47 with Tai Chi versus 29.87 to 20.40 with home exercise. Lumbar ROM increased from 51.20° to 72.27° with Tai Chi versus 48.13° to 63.73° with home exercise. GROC scores, reflecting perceived recovery, were higher with Tai Chi (5.13) than with home exercise (4.47). Between-group comparison showed clinically meaningful advantages favoring Tai Chi.

Conclusion: Both interventions reduced pain and disability in people with acute and subacute NSLBP, but Tai Chi produced greater gains in pain relief, functional recovery, lumbar mobility, and perceived recovery — supporting its use as an effective non-pharmacological rehabilitation option for younger adults with NSLBP.

Keywords: Home-Based Exercise, Kinesiophobia, Lumbar Range of Motion, Non-Specific Low Back Pain, Rehabilitation, Tai Chi

1. INTRODUCTION

Low back pain remains one of the leading causes of disability and reduced quality of life worldwide, interfering with daily activity, work capacity, and general wellbeing. Non-specific low back pain (NSLBP) — low back pain for which no specific pathology can be identified — accounts for close to 90% of all LBP cases and occurs across all age groups **[1, 2]**. An estimated 619 million people were living with LBP in 2020, and this figure is projected to grow substantially over the coming decades **[3]**. With lifetime prevalence estimates ranging from 60% to 85%, LBP represents a major public-health concern that carries considerable economic and healthcare costs. In its acute and subacute stages in particular, NSLBP can disrupt daily activities, occupational performance, social participation, and overall quality of life **[4, 5]**.

Pain, functional disability, and fear of movement sit at the center of the clinical picture in NSLBP. Persistent pain often limits mobility and everyday function, chipping away at independence and physical capability, while the associated disability can lower work productivity and increase absenteeism. Many people with LBP also develop kinesiophobia, an exaggerated and often irrational fear of movement driven by the expectation of pain or reinjury **[6]**. Left unaddressed, this fear can foster avoidance behavior, slow recovery, and raise the risk that the condition becomes chronic. Clinical guidelines consistently endorse exercise therapy as an effective, drug-free way to reduce pain and restore function in NSLBP. Structured exercise improves spinal mobility, strength, flexibility, and postural control, while also supporting patients in managing their own recovery. Home-based programs are particularly valuable in this respect: they are affordable and accessible, and they tend to support adherence and a sense of independence throughout rehabilitation **[7]**. Tai Chi offers a different, meditative route to many of the same goals. It blends controlled body movement, coordinated breathing, and postural awareness in a way that supports both physical and psychological wellbeing **[8]**. Because it pairs physical movement with focused attention, Tai Chi is unusual in targeting physical and mental outcomes at the same time. Prior research links it to reduced pain intensity, improved function, better balance and flexibility, and enhanced emotional wellbeing across a range of musculoskeletal conditions, including low back pain **[9]**. Systematic reviews echo this, reporting favorable effects of Tai Chi on both pain and disability in chronic low back pain **[10]**.

Exercise interventions for chronic LBP have been studied extensively, but the evidence base for acute and subacute NSLBP is comparatively thin. Few studies have directly compared Tai Chi with conventional home-based exercise while evaluating pain intensity, functional disability, and kinesiophobia together, **[11, 12, 13]** and most existing work has focused narrowly on pain, leaving disability and movement-related fear relatively under-examined. Tai Chi has shown promise for chronic low back pain specifically, yet evidence comparing it with home-based exercise in younger adults with acute and subacute NSLBP remains limited, and few studies look at pain, disability, kinesiophobia, lumbar mobility, and perceived recovery side by side. This study was designed to address that gap, offering comparative evidence on the effectiveness of

these two rehabilitation approaches during the early stages of NSLBP.

2. MATERIALS AND METHODS

2.1 Study Design

A comparative interventional study was conducted to examine the effects of Tai Chi and home-based exercise on pain intensity, functional disability, movement fear, lumbar range of motion (ROM), and perceived recovery in individuals with acute and subacute non-specific low back pain (NSLBP).

2.2 Study Setting

The study was carried out in Gandhidham, Gujarat, India. Written informed consent was obtained from every participant prior to enrollment, confidentiality and anonymity were maintained throughout.

2.3 Study Duration

Data collection spanned two months, from April 2026 to May 2026.

2.4 Participants

○ ***Sample Size***

Sample size was calculated using G*Power software version 3.1. Based on a prior study comparing exercise interventions for low back pain, an effect size of 0.80, alpha of 0.05, and statistical power of 80% were applied, yielding a minimum requirement of 52 participants. To allow for possible dropouts, 60 participants were recruited and allocated equally between two intervention groups:

- Group A: Tai Chi group (n = 30)
- Group B: Home-Based Exercise group (n = 30)

○ ***Inclusion Criteria:***

- Were aged between 18 and 35 years
- Had acute or subacute non-specific low back pain
- Had experienced symptoms for fewer than 12 weeks
- Reported pain intensity of ≥3 on the Numeric Pain Rating Scale (NPRS)
- Were able to understand instructions and perform exercises independently
- Were willing to participate and provided informed consent

○ ***Exclusion Criteria:***

- Specific spinal pathology such as fracture, tumor, infection, inflammatory disorder, or spinal deformity
- A history of spinal surgery
- Neurological deficits, radiculopathy, or nerve root compression
- Severe cardiopulmonary or systemic disorders
- Pregnancy
- Recent major trauma involving the lumbar spine
- Any condition that would prevent safe participation in exercise

2.5 Sampling Technique

Participants were recruited through convenience sampling from Factors of Meghpar Borichi, Gandhidham, Gujarat, India. Individuals who met the eligibility criteria and volunteered were enrolled after providing written informed consent. Following baseline assessment, participants were randomly assigned to either the Tai Chi group or the Home-Based Exercise group by an independent investigator who was not involved in outcome assessment.

-Group A: Tai Chi group (n = 30)

-Group B: Home-Based Exercise group (n = 30)

2.6 Outcome Measures

○ ***Primary*** = **1. Numerical Pain Rating Scale (NPRS):** An 11-point scale from 0 ("no pain") to 10 ("worst imaginable pain"), used to rate current low back pain intensity. The NPRS is a reliable and valid tool with excellent test-retest reliability (ICC = 0.991) **[17]**.

2.Oswestry Disability Index (ODI): Ten sections covering activities of daily living, each scored 0–5, converted to a percentage in which higher scores indicate greater disability. The ODI demonstrates good internal consistency (Cronbach's α = 0.828) and excellent test-retest reliability (ICC = 0.871) **[17]**.

3.Tampa Scale of Kinesiophobia-11 (TSK-11): A validated 11-item, 4-point Likert questionnaire assessing fear of movement and reinjury, with total scores from 11 to 44 (higher = greater kinesiophobia). It shows good test-retest reliability (ICC = 0.87, SEM = 2.10, SDC95 = 5.82) in chronic-pain populations, along with established construct validity through correlation with pain intensity, disability, and fear-avoidance behavior **[18]**.

○ ***Secondary*** = **1. Lumbar Range of Motion (ROM):** Assessed using the tape-measure method for flexion, extension, and lateral flexion in standing. Flexion used the Modified Schober technique, marking anatomical landmarks and measuring the distance change during maximal forward bending; lateral flexion was measured as the distance traveled by the middle finger along the thigh during side bending. This method is simple, low-cost, and supported by evidence of good reliability and validity for lumbar mobility; restricted lateral flexion in particular has been linked to greater risk and functional limitation in LBP **[19]**.

2.Global Rating of Change Scale (GROC): A patient-reported measure of perceived overall change in health status following treatment, typically administered at discharge or follow-up as a single comparison-to-baseline question. It is scored on a 15-point scale ranging from −7 ("a very great deal

worse") to +7 ("a very great deal better"), with 0 representing "no change." The GROC is quick and clinically practical, with excellent test-retest reliability and strong face validity in LBP populations, though scores may reflect current pain and discharge status as much as true clinical change; it nonetheless remains a widely accepted measure of perceived recovery **[20]**.

2.7 Intervention Protocol

○ ***Group A — Tai Chi Intervention*** **[21]**

Group A attended supervised Tai Chi sessions three times per week for four weeks, each lasting approximately 60 minutes and structured as follows:

- Warm-up exercises (10 minutes)
- Structured Tai Chi practice (40 minutes)
- Cool-down stretching and relaxation (10 minutes)

The warm-up featured gentle trunk rotation, shoulder rolls, marching in place, deep breathing, and pelvic tilts to prepare the body and increase flexibility. The main session worked through a sequence of traditional Tai Chi forms performed slowly with controlled breathing and postural awareness:

- Commencing Form
- Parting the Wild Horse's Mane
- White Crane Spreads Wings
- Brush Knee and Push
- Playing the Lute
- Repulse Monkey
- Wave Hands Like Clouds
- Golden Rooster Stands on One Leg
- Grasp Sparrow's Tail
- Closing Form

Participants moved slowly and mindfully while maintaining smooth breathing and body awareness, repeating the full sequence twice per session. The cool-down phase included deep breathing, gentle lumbar, hamstring, and calf stretching, and relaxation exercises. **Frequency: 3 sessions/week**, **Duration: 4 weeks**, **Session length: 60 minutes** the full Tai Chi protocol is summarized in **Table 1**.

Table 1: Tai Chi intervention protocol for Group A

Phase	Duration	Activities	Purpose
Warm-up	**10 min**	**•Gentle trunk rotations • Shoulder rolls • Marching in place • Deep breathing exercises • Pelvic tilting exercises**	***Prepare the body for movement and improve flexibility.***
Tai Chi Practice	**40 min**	**• Commencing Form • Parting the Wild Horse's Mane • White Crane Spreads Wings • Brush Knee and Push • Playing the Lute • Repulse Monkey • Wave Hands Like Clouds • Golden Rooster Stands on One Leg • Grasp Sparrow's Tail**	***Improve balance, flexibility, muscular control, and mind–body awareness.***

		• **Closing Form** • **(Full sequence repeated twice, performed slowly with controlled breathing)**	
Cool-down & Relaxation	**10 min**	• **Deep breathing exercises** • **Gentle lumbar stretching** • **Hamstring stretching** • **Calf stretching** • **Relaxation exercises**	***Promote relaxation and reduce muscle tension.***

○ ***Group B — Home-Based Exercise Program [22]***

Group B completed a progressive home-based program three sessions per week for four weeks, combining aerobic warm-up, stretching, strengthening, and cool-down exercises. **Frequency: 3 sessions/week**, **Duration: 4 weeks**

Participants were instructed to perform exercises slowly and with control, maintain proper posture throughout, stop if pain increased, and practice regularly and consistently. The full home-based exercise progression is summarized in **Table 2**.

Table 2: Home-based exercise progression for Group B

Week	Program Components	Progression
Week 1	**Warm-up (5 min): walking, stationary cycling, arm ergometer, or swimming. Stretching: active straight leg raise, hip flexor stretch, child's pose, lumbar rotation stretch. Strengthening: pelvic bridges, heel slides, four-point kneeling with active shoulder flexion, side bridge on knees, prone lumbar extension. Cool-down: child's pose stretching.**	***Baseline program established.***
Week 2	**Same warm-up, stretching, strengthening, and cool-down components as Week 1.**	***Repetitions and holding times gradually increased.***
Week 3	**Added single-leg pelvic bridges, bicycle kicks, bird-dog exercises, side bridges, and prone back extension with arm and leg lifting.**	***Warm-up extended to 10 minutes; intensity increased.***
Week 4	**Continued strengthening and stretching program from Week 3.**	***Repetitions, duration, and hold times further increased.***

2.7 Procedure

Table 3: Study procedure flow, from recruitment to statistical analysis.

STEP 1 RECRUITMENT & SCREENING **Eligible participants recruited from Factors of Meghpar Borichi, Gandhidham, Gujarat, India, based on inclusion/exclusion criteria.**
▼
STEP 2 INFORMED CONSENT **Written informed consent obtained from all participants prior to enrollment.**
▼
STEP 3 BASELINE ASSESSMENT **NPRS, ODI, TSK-11, lumbar ROM, GROC, and demographic characteristics recorded for every participant.**
▼
STEP 4 RANDOM ALLOCATION **Participants randomly assigned to Group A (Tai Chi, n = 30) or Group B (Home-Based Exercise, n = 30).**
▼

STEP 5 4-WEEK INTERVENTION **Both groups trained three sessions per week for four weeks under their assigned protocol.**
▼
STEP 6 POST-INTERVENTION ASSESSMENT **The same assessor re-evaluated all outcome measures at 4 weeks using identical baseline procedures.**
▼
STEP 7 STATISTICAL ANALYSIS **Collected data analyzed using IBM SPSS Statistics v26.0 with appropriate parametric tests.**

Eligible participants were recruited from Factors of Gandhidham, Gujarat, India, and provided written informed consent before enrollment. Baseline assessment covered the NPRS, ODI, TSK-11, lumbar ROM, GROC, and demographic characteristics. Participants were then allocated to either the Tai Chi group or the Home-Based Exercise group, with both groups training three times per week for four weeks. The same assessor re-evaluated all outcome measures at the end of the intervention period using identical procedures, after which the collected data were analyzed statistically.

2.9 Statistical Analysis

Analyses were performed using IBM SPSS Statistics Version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables are reported as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Independent t-tests compared baseline characteristics and post-intervention outcomes between groups; paired t-tests assessed within-group change from pre- to post-intervention; and chi-square tests examined categorical variables such as gender distribution. A p-value below 0.05 was considered statistically significant.

3. RESULTS

3.1 Participant Flow

Of 78 individuals assessed for eligibility, 18 were excluded and 60 participants diagnosed with acute or subacute non-specific low back pain (NSLBP) were screened, enrolled, and randomized into two equal groups: Group A, Tai Chi (n = 30), and Group B, Home-Based Exercise (n = 30). All 60 participants completed the four-week intervention and post-intervention assessment, with no dropouts or adverse events reported during the study period.

3.2 Baseline Characteristics

Baseline demographic and clinical characteristics — including age, gender distribution, height, and pain duration — were comparable between the two groups, with no statistically significant differences observed ($p > 0.05$).

Table 4: Demographic and baseline characteristics.

Variable	Tai Chi Group (n=30)	Home-Based Exercise (n=30)	p-value
Age (years)	25.57 ± 3.15	25.30 ± 3.23	0.73
Male, n (%)	16 (53.3%)	17 (56.7%)	0.80
Female, n (%)	14 (46.7%)	13 (43.3%)	0.80
Height (cm)	167.23 ± 6.21	166.50 ± 5.98	0.64
Duration of pain (weeks)	5.47 ± 1.28	5.33 ± 1.31	0.68

Values are mean ± SD for continuous variables and n (%) for categorical variables (independent t-test / chi-square test). No significant between-group differences at baseline (p > 0.05)

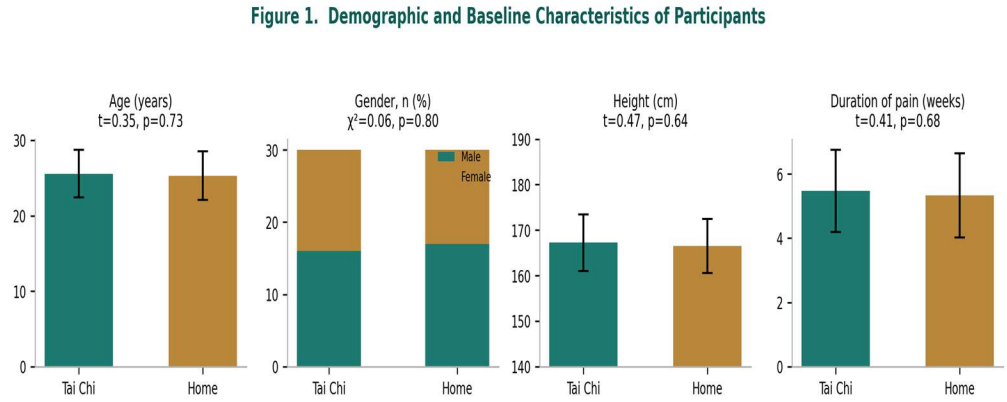


Figure 1: Demographic and baseline characteristics of participants

3.3 Within-Group Comparison

Within-group analysis showed statistically significant improvement across all outcome measures in both groups following the four-week intervention (paired t-test, $p < 0.001$ throughout).

Table 5: Within-group pre- vs. post-intervention comparison

Outcome	Tai Chi: Pre → Post	Home Exercise: Pre → Post
NPRS	6.33 ± 1.28 → 3.07 ± 1.25	6.33 ± 1.21 → 3.80 ± 1.31
ODI (%)	38.20 ± 7.16 → 20.67 ± 6.45	38.00 ± 6.82 → 24.33 ± 6.77
TSK-11	30.80 ± 4.67 → 20.47 ± 4.35	29.87 ± 4.41 → 20.40 ± 4.28
Lumbar ROM (°)	51.20 ± 7.35 → 72.27 ± 7.18	48.13 ± 6.74 → 63.73 ± 6.62
GROC (mean)	5.13 ± 1.11	4.47 ± 1.22

NPRS = Numerical Pain Rating Scale; ODI = Oswestry Disability Index; TSK-11 = Tampa Scale of Kinesiophobia-11; ROM = Range of Motion; GROC = Global Rating of Change. p < 0.05 indicates a statistically significant within-group difference

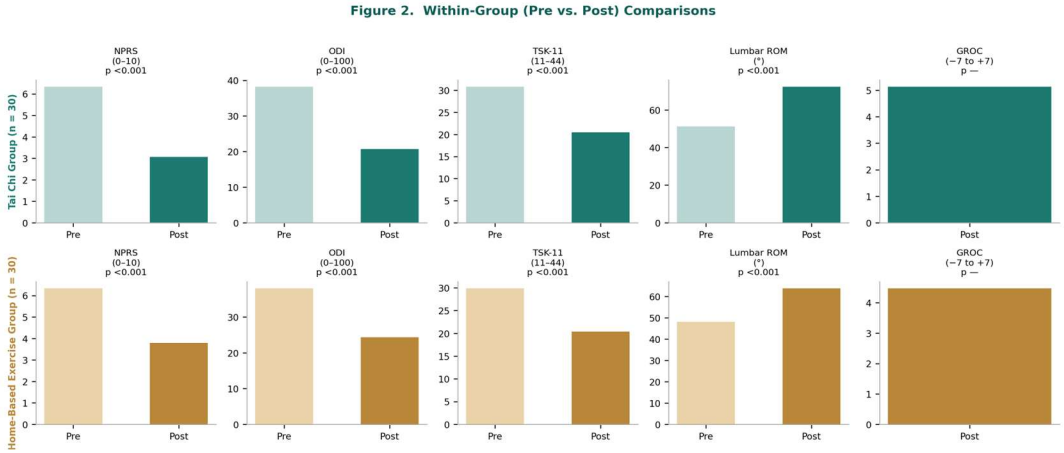


Figure 2: Within-group (pre vs. post) comparisons

3.4 Between-Group Comparison

Between-group analysis showed greater improvement in the Tai Chi group relative to the Home-Based Exercise group across several outcomes. Statistically significant differences favoring Tai Chi were observed for pain intensity, functional disability, lumbar ROM, and perceived recovery, while the improvement in kinesiophobia was comparable between groups.

Table 6: Between-group post-intervention comparison (independent t-test)

Outcome	Result favoring Tai Chi	p-value
Pain intensity (NPRS)	Significant	0.02
Functional disability (ODI)	Significant	0.03
Lumbar ROM	Significant	< 0.001
Perceived recovery (GROC)	Significant	0.03
Kinesiophobia (TSK-11)	Not significant	0.95

NPRS = Numeric Pain Rating Scale; ODI = Oswestry Disability Index; TSK-11 = Tampa Scale of Kinesiophobia; ROM = Range of Motion; GROC = Global Rating of Change

Figure 3. Between-Group Comparisons (Post-Intervention)

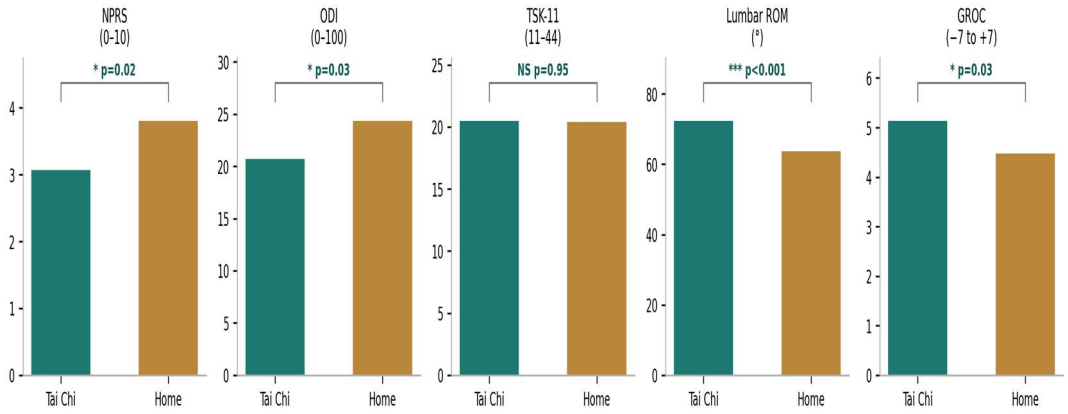


Figure 3: Between-group comparisons (post-intervention). Bracket = significance level; NS = not significant

- Tai Chi produced significantly greater gains than home-based exercise in pain relief, disability, lumbar mobility, and perceived recovery.
- Both approaches improved kinesiophobia to a similar degree, with no significant between-group difference.

3.5 Overall Improvement Trends

Figures 4 and 5 summarize the magnitude of change achieved in each group across the study's outcome measures.

Figure 4. Mean Change (Post – Pre) in Outcome Measures

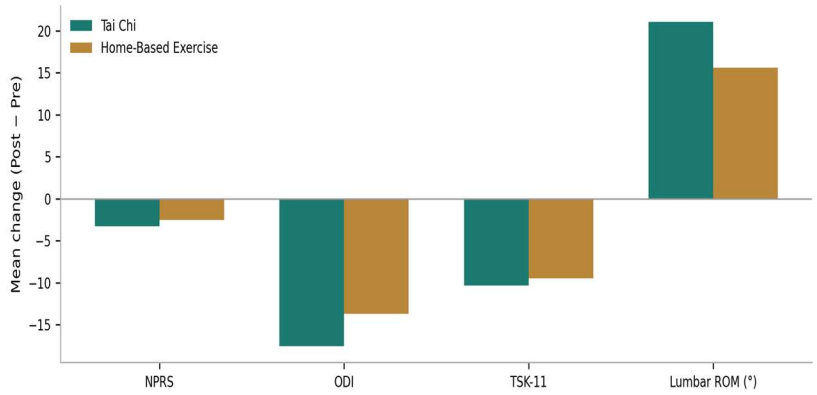


Figure 4: Mean change (post − pre) in outcome measures

Figure 5. Percentage Improvement in Outcome Measures

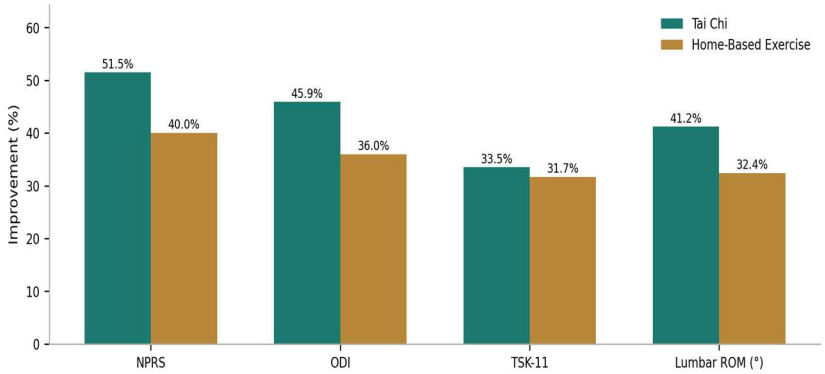


Figure 5: Percentage improvement in outcome measures

- Percentage improvement was calculated as [(Post − Pre) / Pre] × 100; GROC has no baseline value, so percentage change is not applicable.
- For NPRS, ODI, and TSK-11, a decrease in score reflects improvement; for lumbar ROM, an increase reflects improvement.
- A higher percentage indicates greater improvement.

4. DISCUSSION

4.1 Summary of Main Findings

This study set out to compare Tai Chi with home-based exercise across pain intensity, functional disability, movement-related fear, lumbar range of motion (ROM), and perceived recovery in people with acute and subacute non-specific low back pain (NSLBP). Both groups improved meaningfully over the four-week program, but participants who practiced Tai Chi showed larger gains in pain reduction, functional disability, lumbar ROM, and perceived overall recovery than those who followed the home-based program. Kinesiophobia improved in both groups to a similar extent, with only a small difference between them.

4.2 Interpretation of Results

○ ***Pain Outcomes*** = NPRS scores fell significantly in both groups, though the reduction was larger among participants doing Tai Chi. This pattern mirrors earlier work by Qin *et al*., who reported significant pain reductions following Tai Chi in people with low back pain **[9]**, and by Kang *et al*., who found Tai Chi effective for pain across several LBP populations **[11]**. Taken together, these results point to Tai Chi being a particularly effective way of easing pain in acute and subacute NSLBP — plausibly through its combination of slow, controlled movement, breathing regulation, and improved postural control, which together may lower muscle tension and reduce mechanical stress on the lumbar spine.

○ ***Functional Disability Outcomes*** = ODI scores also improved in both groups, again more so with Tai Chi, echoing prior reviews that found Tai Chi meaningfully improves functional disability and physical performance in people with low back pain **[9, 10]**. A plausible explanation is that Tai Chi's emphasis on weight shifting, trunk stability, and postural alignment builds spinal mobility, muscular coordination, and confidence during movement — all of which feed directly into everyday function.

○ ***Kinesiophobia Outcomes*** = Both groups reported less movement-related fear on the TSK-11 by the end of the study, with Tai Chi showing a marginally larger improvement that did not reach statistical significance. Gradual exposure to movement, growing self-confidence, and less pain during exercise are all likely contributors here, and this fits with earlier research linking graded movement exposure and exercise-based rehabilitation to reduced fear-avoidance beliefs in low back pain **[16, 18]**.

○ ***Lumbar Range of Motion Outcomes*** = Lumbar ROM improved in both groups, with a notably larger gain in the Tai Chi group. This fits well with what Tai Chi asks of the body — continuous trunk movement, rotational control, and repeated weight transfer — all of which plausibly build spinal mobility and flexibility over time. Better lumbar mobility after exercise has previously been associated with less pain and functional limitation, **[19]** which may partly explain why the Tai Chi group also fared better on the other outcome measures **[8]**.

○ ***Perceived Recovery Outcomes*** = Participants in the Tai Chi group also reported feeling more recovered overall, which may reflect something beyond the physical

exercise itself: the combination of movement, breathing control, and focused attention that characterises Tai Chi practice. This mirrors what has been observed in other mind–body interventions that pair physical activity with relaxation and concentration **[10, 12]**. Given that Tai Chi needs little equipment and adapts easily to community settings, it looks like a practical, low-cost option worth considering for people recovering from acute and subacute NSLBP.

4.3 Comparison with Previous Studies

These findings sit comfortably alongside earlier research on Tai Chi for low back pain. Qin *et al*. reported significant reductions in pain and disability with Tai Chi relative to control conditions **[9]**, Sherman *et al*. demonstrated its feasibility and clinical benefit in older adults with chronic low back pain **[10]**, and Kang *et al*. documented improvements in pain, physical function, and quality of life across several LBP populations **[11]**. Yang *et al*. similarly found that Tai Chi and Qigong-based programs produced meaningful gains in pain and function **[12]**. Systematic reviews of Tai Chi for chronic low back pain report much the same pattern, and exercise-based rehabilitation more broadly is well established as a way of improving physical function in NSLBP. What sets the present study apart is its focus: where most earlier work centerd on chronic low back pain, this study speaks specifically to the acute and subacute stages, and it looks at movement-related fear and perceived recovery alongside the more commonly studied outcomes.

4.4 Possible Mechanisms

○ ***Tai Chi Effects*** = Tai Chi's combination of slow, coordinated movement, postural control, flexibility work, and breathing regulation plausibly reduces muscular tension, improves spinal stability, and promotes relaxation — a mix of effects that would help explain the pain reduction and functional gains seen here.

○ ***Exercise Effects*** = The home-based program worked differently but toward similar ends: its strengthening, flexibility, and mobility components likely improved muscular endurance, spinal support, posture, and movement efficiency, with the progressive loading built into the program supporting steady gains in conditioning and function.

○ ***Mind–Body Mechanisms*** = Tai Chi's integration of breathing, concentration, and relaxation may also work through a more psychological route — easing stress, sharpening body awareness, and reducing fear of movement, with possible downstream effects on pain perception via central pain-modulation pathways.

4.5 Clinical Implications

Taken as a whole, these results suggest that both Tai Chi and home-based exercise are viable, drug-free rehabilitation options for people with acute and subacute NSLBP. Tai Chi's edge across several outcomes, however, makes a reasonable case for considering it as an alternative or adjunct to conventional exercise. Because it is low-impact and needs little equipment, it fits naturally into community and home settings, which may in turn support better adherence. For clinicians, folding Tai Chi into physiotherapy programs could offer an accessible, cost-effective option that keeps patients engaged and supports long-term self-management.

4.6 Strengths of the Study

- Directly compared two widely used, conservative rehabilitation approaches for NSLBP
- Assessed several clinically relevant outcomes together — pain, disability, kinesiophobia, lumbar ROM, and perceived recovery — rather than in isolation
- Used structured, progressive intervention protocols for both groups
- Focused specifically on acute and subacute NSLBP, a stage of the condition that has received comparatively little research attention
- Captured both physical and psychological outcomes, giving a fuller picture of how each intervention works

4.7 Limitations

A few limitations are worth bearing in mind when interpreting these findings. The sample was relatively small and drawn from a single site, which limits how far the results can be generalized. The four-week intervention period did not extend to a longer-term follow-up, so it remains unclear whether the gains observed here are sustained. Convenience sampling may have introduced some selection bias, and because assessors were not blinded, measurement bias cannot be entirely ruled out.

4.8 Recommendations for Future Research

Larger samples and longer follow-up periods would help establish whether the benefits of Tai Chi and home-based exercise are lasting. It would also be worth examining how Tai Chi performs across different age groups and levels of LBP severity. Multicenter randomized controlled trials that add biomechanical or psychological outcome measures could help clarify the mechanisms behind Tai Chi's benefits in NSLBP rehabilitation, and would strengthen the evidence base considerably.

5. CONCLUSION

Taken together, these findings show that both Tai Chi and home-based exercise benefit

people with acute and subacute non-specific low back pain. Both groups improved, but participants who practiced Tai Chi saw larger gains in pain reduction, functional ability, lumbar mobility, and overall recovery. This points to Tai Chi as a promising complementary approach for managing recent-onset low back pain and helping people regain functional independence.

6. Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

7. Abbreviations

NSLBP — Non-Specific Low Back Pain

NPRS — Numeric Pain Rating Scale

ODI — Oswestry Disability Index

TSK-11 — Tampa Scale of Kinesiophobia-11

ROM — Range of Motion

GROC — Global Rating of Change

8. DECLARATION

-Informed Consent = Written informed consent was obtained from all participants before enrolment

-Funding = The authors declare that no external funding was received for this study. (Modify if applicable.)

-Conflict of Interest = The authors declare no conflict of interest.

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9. REFERENCES

[1] Oliveira CB, Maher CG, Pinto RZ, Traeger AC, Lin CWC, Chenot JF, van Tulder M, Koes BW. Clinical practice guidelines for the management of non-specific low back pain in primary care: an updated overview. Eur Spine J. 2018;27(11):2791-803.

[2] World Health Organization. Low back pain. 2023.

[3] GBD 2021 Low Back Pain Collaborators. Global, regional, and national burden of low back pain, 1990-2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. Lancet Rheumatol. 2023;5(6):e316-e329.

[4] Kahere M, Hlongwa M, Ginindza TG. A scoping review on the epidemiology of chronic low back pain among adults in Sub-Saharan Africa. Int J Environ Res Public Health. 2022;19(5):2964.

[5] IASP. The Global Burden of Low Back Pain. 2021.

[6] Wong CKW, Mak RYW, Kwok TSY, Tsang JSH, Leung MYC, Funabashi

M, Macedo LG, Dennett L, Wong AYL. Prevalence, incidence, and factors associated with non-specific chronic low back pain in community-dwelling older adults aged 60 years and older: a systematic review and meta-analysis. J Pain. 2022;23(4):509-34.

[7] Fatoye F, Gebrye T, Odeyemi I. Real-world incidence and prevalence of low back pain using routinely collected data. Rheumatol Int. 2019;39(4):619-626.

[8] Kong LJ, Lauche R, Klose P, Bu JH, Yang XC, Guo CQ, *et al*. Tai Chi for chronic pain conditions: a systematic review and meta-analysis of randomized controlled trials. Sci Rep. 2016; 6:25325.

[9] Qin J, Zhang Y, Wu L, He Z, Huang J, Tao J, Chen L. Effect of Tai Chi alone or as additional therapy on low back pain: systematic review and meta-analysis of randomized controlled trials. Medicine (Baltimore). 2019;98(37):e17099.

[10] Sherman KJ, Wellman RD, Hawkes RJ, Phelan EA, Lee T, Turner JA. T'ai Chi for chronic low back pain in older adults: a feasibility trial. J Altern Complement Med. 2020;26(3):176-189.

[11] Kang H, Yang M, Li M, Xi R, Sun Q, Lin Q. Effects of different parameters of Tai Chi on the intervention of chronic low back pain: a meta-analysis. PLoS One. 2024;19(7):e0306518.

[12] Yang Y, McCluskey S, Bydon M, Singh JR, Sheeler RD, Nathani KR, *et al*. A Tai chi and qigong mind-body program for low back pain: A virtually delivered randomized control trial. North American Spine Society Journal. 2024:20:100557.

[13] Kahere M, Ginindza T. The burden of non-specific chronic low back pain among adults in KwaZulu-Natal, South Africa: a protocol for a mixed-methods study. BMJ Open. 2020;10(9):e039554.

[14] Amundsen PA, Evans DW, Rajendran D, Bright P, Bjørkli T, Eldridge S, *et al*. Inclusion and exclusion criteria used in non-specific low back pain trials: a review of randomized controlled trials published between 2006 and 2012. BMC Musculoskelet Disord. 2018;19(1):113.

[15] Junkes-Cunha M, Sieczkowska SM, Vilarino GT, Bevilacqua G, Andrade A. A rehabilitation program for individuals with chronic low back pain: protocol for a randomized clinical trial. Jmir Res Protoc. 2022; 11(10):e31345.

[16] George SZ, Fritz JM, Silfies SP, Schneider MJ, Beneciuk JM, Lentz TA, *et al*. Interventions for the management of acute and chronic low back pain: Revision 2021 clinical practice guidelines linked to the International Classification of Functioning, Disability and Health from the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association. J Orthop Sports Phys Ther. 2021;51(11):CPG1-CPG60.

[17] Yao M, Xu BP, Li ZJ, Zhu S, Tian ZR, Li DH, *et al*. A comparison between the low back pain scales for patients with lumbar disc herniation: validity, reliability, and responsiveness. Health Qual Life Outcomes. 2020;18(1):175.

[18] Eiger B, Errebo M, Straszek CL, Vaegter HB. Less is more: reliability and measurement error for three versions of the Tampa Scale of Kinesiophobia (TSK-11, TSK-13, and TSK-17) in patients with high-impact chronic pain. Scand J Pain. 2023;23(1):217-224.

[19] Sadler SG, Spink MJ, Ho A, Janse de Jonge X, Chuter VH. Restriction in lateral bending range of motion, lumbar lordosis, and hamstring flexibility predicts the development of low back pain: a systematic review of prospective cohort studies. BMC Musculoskelet Disord. 2017;18(1):179.

[20] Pierobon A, Fernandes LG, Wilson R, Christopherson RM, Stanley J, Pryymachenko Y, *et al*. Validity of the Global Rating of Change in patients with chronic low back pain. Musculoskelet Sci Pract. 2025;80:103443.

[21] Cho Y. Effects of Tai Chi on pain and muscle activity in young males with acute low back pain. J Phys Ther Sci. 2014;26(5):679-681.

[22] Lumb MJ, Lategan L. A four-week home-based exercise program is effective in treating subacute low back pain in adults. S Afr J Sports Med. 2018;30(1):1-6.