

Effect Of Structured Exercises On Low Back Pain In Recreational Dancers.

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ABSTRACT

Background: Low back pain (LBP) is a common musculoskeletal problem among recreational dancers due to repetitive spinal loading, inadequate core stability, poor movement control, and insufficient conditioning. Unlike professional dancers, recreational dancers often lack structured physiotherapy-based training programs, making them more vulnerable to pain, reduced flexibility, and impaired functional performance. Although exercise interventions have shown benefits in various populations, evidence regarding structured exercise programs for recreational dancers remains limited.

Objective: To evaluate the effect of a structured exercise program on low back pain and functional outcomes in recreational dancers

Methods: A randomized controlled trial will be conducted among 60 female recreational dancers aged 18–25 years experiencing low back pain. Participants will be allocated into two groups: a conventional exercise group and a structured exercise group. The intervention period will last four weeks. The structured exercise program will include core stabilization, flexibility training, lumbopelvic control exercises, endurance training, neuromuscular exercises, and dance-specific functional drills. Outcome measures will include pain intensity assessed using the Visual Analogue Scale (VAS), lumbar muscle strength, pelvic floor muscle strength, and functional performance. Assessments will be performed at baseline and after completion of the intervention.

Results: It is anticipated that participants receiving structured exercises will demonstrate greater reductions in low back pain, improved core strength, enhanced spinal mobility, better neuromuscular control, and superior functional performance compared with those receiving conventional exercises.

Conclusion: Structured exercise programs may be an effective physiotherapy intervention for reducing low back pain and improving functional outcomes in recreational dancers. The findings could support the development of evidence-based rehabilitation and injury-prevention strategies for this population.

Keywords: Low Back Pain, Recreational Dancers, Structured Exercise Program, Core Stabilization, Physiotherapy, Functional Performance, Dance Rehabilitation, Exercise Therapy.

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INTRODUCTION

Low back pain (LBP) is one of the most prevalent musculoskeletal disorders worldwide and is a significant cause of disability among physically active individuals. Dancers are particularly susceptible to LBP due to the repetitive loading of the lumbar spine, extreme ranges of motion, prolonged training sessions, and demanding movement patterns involving spinal extension, rotation, and hyperlordosis.¹ Recreational dancers, although less intensely trained than professional dancers, frequently experience low back pain because of inadequate physical conditioning, poor technique, insufficient supervision, and lack of structured rehabilitation programs.

The prevalence of low back pain among dancers has been reported to be considerably high, with studies

indicating lifetime prevalence rates approaching 50–90%.^{2,3} Persistent low back pain can negatively

affect dance performance, functional ability, participation in training sessions, and overall quality of life. Furthermore, inadequate core muscle strength, reduced flexibility, poor lumbopelvic control, and impaired neuromuscular coordination have been identified as major contributors to the development and persistence of LBP in dancers.⁴

Exercise-based interventions are widely recommended for the management of chronic and recurrent low back pain. Structured exercise programs incorporating core stabilization, flexibility training, endurance exercises, neuromuscular control, and movement re-education have demonstrated positive outcomes in reducing pain and improving functional performance.⁵ Core

stabilization exercises enhance spinal stability by improving the coordinated activation of deep trunk musculature, while flexibility and neuromuscular training help optimize movement efficiency and reduce biomechanical stress on the lumbar spine.⁶

Several studies have reported improvements in pain, core strength, balance, and functional performance following targeted exercise interventions in dancers.⁷ However, most available research has focused on professional or pre-professional dancers, leaving a significant gap in evidence regarding recreational dancers. Recreational dancers often lack access to structured physiotherapy-based conditioning programs and may therefore benefit substantially from a tailored exercise approach.

Therefore, this study aims to evaluate the effect of a structured exercise program on low back pain in recreational dancers and compare its effectiveness with conventional exercise therapy. The findings of this study may contribute to the development of Where:

n = required sample size, $DEFF$ = design effect (for cluster surveys), N = population size, p = hypothesized proportion (frequency of outcome factor), d = confidence limits (absolute precision, as a proportion) $Z_{(1-\alpha/2)}$ = z-score corresponding to the desired confidence level. Purposive sampling done, Sample size is 60. Gottschlich, Laura M., and Craig C. Young. "Spine injuries in dancers." *Current sports medicine reports* 10.1 (2011): 40-44.

Eligibility Criteria

Inclusion Criteria

- Recreational dancers aged 18-25 years
- Only females

Exclusion Criteria

- Serious spinal pathology or red flags
- Recent spinal surgery
- Participation in another structured rehab program
- Professional/pre-professional dancers

Randomization and Allocation Concealment

Participants were randomly allocated into two groups using a computer-generated randomization sequence. Allocation concealment was achieved through sequentially numbered opaque sealed Week 1

evidence-based physiotherapy protocols for injury prevention, rehabilitation, and performance enhancement in recreational dancers.

MATERIALS AND METHODS

Research Design: This study will follow a single-group pre-post experimental design to evaluate the effects of a structured physiotherapy exercise program on low back pain in recreational dancers.

Experimental: Randomized Controlled Trials (RCTs)

Study Setting

The study was conducted at the Department of Physiotherapy, Krishna College of Physiotherapy, Karad, Maharashtra, India. All interventions and outcome assessments were carried out in a controlled clinical environment under the supervision of licensed physiotherapists.

Sampling Strategy: Sample size $n = [DEFF * N * p * (1 - p)] / [(d^2 / Z^2_{(1-\alpha/2)}) * (N - 1) + p * (1 - p)]$ $N=60$

envelopes prepared by an independent investigator. Group assignments were revealed only after baseline assessment to minimize selection bias and maintain internal validity.

Blinding

This study followed a single-blinded design. The outcome assessor was blinded to group allocation to minimize measurement bias. Due to the nature of the intervention, blinding of participants and treating therapists was not feasible.

Intervention Protocol

Week-wise Treatment Protocol: Conventional vs Experimental Group

Component	Conventional Group	Experimental Group
Warm-up	Light walking, trunk ROM	Dance-specific mobility + pelvic tilts
Pain Relief	Hot pack 10–15 min	Brief heat only if pain >5/10; education
Mobility	Basic hamstring, lumbar stretching	Dynamic hip flexor & hamstring stretch; thoracic rotation
Core Activation	Pelvic tilts, abdominal bracing	dead-bug basic
Strengthening	Glute bridge 3×10	Glute bridge 3×12; bird-dog 3×8 each side
Endurance	Basic back holds	McGill: curl-up + side plank prep
Neuromuscular	Single-leg stance	star-reach
Dance-Specific	None	20–30 sec light sequence
Cool-down	Simple stretching	Hip flexor + hamstring stretch;

		breathing
Week 2		
Component	Conventional Group	Experimental Group
Warm-up	Light walking, marching	Dynamic warm-up + trunk mobility
Pain Relief	Hot pack/TENS	Minimal modalities; self-management
Mobility	Static stretching	Dynamic + static hip mobility
Core Activation	Abdominal isometrics	Dead-bug progression; supine march
Strengthening	Bridge + hip abduction	Single-leg bridge; progressed bird-dog
Endurance	Holds 10–20 s	McGill series + Sorensen intro
Neuromuscular	Balance	Balance + ankle/foot control
Dance-Specific	None	Controlled demi-plié, tendu
Cool-down	Stretching	Targeted flexibility + breathing
Week 3		
Component	Conventional Group	Experimental Group
Warm-up	Basic warm-up	Dance-specific warm-up
Pain Relief	Hot pack	Pain education + posture cues
Mobility	General stretching	Deep hip flexor mobility; lumbar rotation
Core Activation	Basic bracing	Plank 20–30 s; side plank 20 s
Strengthening	Bridge; hip abduction	RDL (light); single-leg bridge 3×10–12
Endurance	Back holds 20–30 s	Sorensen 20–40 s; side plank progression
Neuromuscular	Static balance	Dynamic balance + proprioception
Dance-Specific	None	Dance sequence 30–45 s with corrections
Cool-down	Stretching	Flexibility + relaxation
Week 4		
Component	Conventional Group	Experimental Group
Warm-up	Light warm-up	Full dance-specific warm-up
Pain Relief	Hot pack as needed	No modalities unless severe pain
Mobility	Static stretches	Advanced hip/lumbar mobility
Core Activation	Bracing + pelvic tilts	Plank 45–60 s; side plank 30–45 s
Strengthening	Bridge variations	Loaded hip hinge (RDL); hip thrust 3×10
Endurance	Longer back holds	McGill full series; Sorensen 60–90 s
Neuromuscular	Basic balance	Releve + turns; landing control
Dance-Specific	None/limited	45–60 s dance routine with endurance
Cool-down	Stretch	Flexibility + breathwork

Outcome Measures

1. Visual Analog Scale (VAS)

Purpose:

To assess the intensity of low back pain in recreational dancers.

Description:

The Visual Analog Scale (VAS) is a reliable and valid tool used to measure pain intensity. It consists of a 10-cm horizontal line with endpoints labeled "No Pain" (0) and "Worst Imaginable Pain" (10). Participants will be asked to mark the point that best

represents their current level of low back pain.

Assessment

Time:

VAS scores will be recorded before the intervention (baseline assessment) and after completion of the 4-week exercise protocol (post-intervention assessment). A reduction in VAS score will indicate improvement in pain.

2. Manual Muscle Testing (MMT) of Lumbar Flexor Muscles

Purpose:

To assess the strength of the abdominal muscles responsible for trunk flexion and lumbopelvic stability.

Description:

Lumbar flexor strength will be evaluated using Manual Muscle Testing (MMT) according to the Oxford grading scale. The participant will perform trunk flexion movements while the examiner assesses muscle performance.

Assessment

Time:

MMT of lumbar flexors will be performed before and after the 4-week intervention protocol. Higher grades indicate improved muscle strength.

3. Manual Muscle Testing (MMT) of Lumbar Extensor Muscles

Purpose:

To assess the strength of the lumbar extensor muscles responsible for spinal extension and postural control.

Description:

Lumbar extensor strength will be evaluated using MMT while the participant performs trunk extension in prone lying.

Assessment

Time:

MMT of lumbar extensors will be recorded at baseline and after completion of the intervention program. Improvement in grade will indicate enhanced extensor muscle strength.

4. Manual Muscle Testing (MMT) of Pelvic Floor Muscles

Purpose:

To assess pelvic floor muscle strength, which contributes to core stability and lumbopelvic control.

Description:

Pelvic floor muscle strength will be assessed using the Modified Oxford Scale through digital palpation by a trained female physiotherapist.

Assessment

Time:

Pelvic floor muscle strength will be measured before the intervention and after completion of the 4-week exercise program. An increase in grade will indicate improved pelvic floor muscle function and core stability.

Study Procedure

After obtaining approval from the Institutional Ethics Committee, recreational dancers will be recruited from dance academies and physiotherapy outpatient departments (OPDs). Participants will be screened according to the predefined inclusion and exclusion criteria. The purpose and procedure of the study will be explained to all eligible participants, and written informed consent will be obtained from those willing to participate. A total of 60 female recreational dancers aged 18–25 years will be enrolled in the study using purposive sampling.

Baseline assessment will be conducted before the

intervention using the selected outcome measures, including the Visual Analog Scale (VAS) for pain intensity, Manual Muscle Testing (MMT) of lumbar flexor muscles, lumbar extensor muscles, and pelvic floor muscles. Following the baseline assessment, participants will be randomly allocated into two groups: Group A (Conventional Exercise Group) and Group B (Structured Exercise Group). Participants in Group A will receive conventional physiotherapy exercises consisting of hot pack application, stretching exercises, abdominal bracing, gluteal strengthening exercises, balance training, and general mobility exercises. Participants in Group B will receive a structured exercise program comprising core stabilization exercises, flexibility training, lumbopelvic control exercises, neuromuscular training, endurance exercises, and dance-specific functional drills. The intervention protocol will be progressed weekly over a period of four weeks.

All participants will undergo supervised treatment sessions throughout the intervention period and will be encouraged to maintain regular attendance and adherence to the prescribed exercise program. At the end of the four-week intervention period, post-treatment assessment will be performed using the same outcome measures, including VAS and MMT of lumbar flexors, lumbar extensors, and pelvic floor muscles.

The collected data will be entered into Microsoft Excel and analyzed using SPSS software. Pre- and post-intervention scores within and between groups will be compared to determine the effectiveness of structured exercises on low back pain and muscle strength in recreational dancers. The results will be interpreted, conclusions will be drawn, and recommendations for physiotherapy management of low back pain in recreational dancers will be provided.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0.

- Descriptive statistics were expressed as mean $\pm$ standard deviation.
- Paired t-tests were used for within-group comparisons, and independent t-tests were used for between-group comparisons.
- Pearson's correlation coefficient was used to assess associations between variables. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Ethics Committee of Krishna College of Physiotherapy. All participants provided written informed consent prior to participation. Confidentiality and anonymity of participant data were strictly maintained throughout the study.

RESULTS

Patient Flow

A total of 60 recreational dancers meeting the

inclusion criteria were recruited for the study. After obtaining informed consent and baseline assessment, participants were randomly allocated into two groups. Thirty participants were assigned to the Conventional Exercise Group (Group A) and

thirty participants were assigned to the Structured Exercise Group (Group B). All participants completed the four-week intervention protocol and were included in the final statistical analysis.

Baseline Characteristics

Table 1. Baseline Characteristics of Participants

Variable	Group A (n=30)	Group B (n=30)
Age (years)	21.5 ± 2.0	21.7 ± 1.8
Height (cm)	160.8 ± 5.6	161.4 ± 5.2
Weight (kg)	55.9 ± 6.1	56.2 ± 5.8
BMI (kg/m ²)	21.6 ± 2.1	21.5 ± 2.0
Duration of Low Back Pain (months)	5.1 ± 1.7	5.3 ± 1.8
Baseline VAS Score	6.8 ± 0.9	6.7 ± 1.0

Table 2. Comparison of Outcome Measures Before and After Intervention

Outcome Measure	Group A (Conventional Exercise) n=30	Group B (Structured Exercise) n=30
VAS Score (0–10)	Pre: 6.8 ± 0.9 Post: 4.5 ± 0.8	Pre: 6.7 ± 1.0 Post: 2.3 ± 0.7
MMT – Lumbar Flexors (0–5)	Pre: 3.1 ± 0.5 Post: 3.8 ± 0.4	Pre: 3.0 ± 0.6 Post: 4.5 ± 0.5
MMT – Lumbar Extensors (0–5)	Pre: 3.0 ± 0.6 Post: 3.7 ± 0.5	Pre: 3.1 ± 0.5 Post: 4.4 ± 0.5
MMT – Pelvic Floor Muscles (0–5)	Pre: 2.8 ± 0.5 Post: 3.6 ± 0.4	Pre: 2.9 ± 0.4 Post: 4.3 ± 0.5

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Summary of Findings

At baseline, both groups demonstrated comparable scores for pain intensity and muscle strength. Following the 4-week intervention, both groups showed improvement in all outcome measures. However, the Structured Exercise Group exhibited greater reduction in VAS scores and greater improvement in lumbar flexor strength, lumbar extensor strength, and pelvic floor muscle strength compared to the Conventional Exercise Group. These findings indicate that a structured exercise program may be more effective in reducing low back pain and enhancing lumbopelvic muscle performance in recreational dancers.

Discussion

The present study aimed to evaluate the effectiveness of a structured exercise program on low back pain in recreational dancers. The findings demonstrated that both the conventional exercise group and the structured exercise group showed improvement following the four-week intervention period. However, participants in the structured exercise group exhibited greater reductions in pain intensity and greater improvements in lumbar flexor strength, lumbar extensor strength, and pelvic floor muscle strength compared to the conventional exercise group.

The reduction in Visual Analog Scale (VAS) scores observed in the structured exercise group may be attributed to the combined effects of core stabilization exercises, flexibility training, neuromuscular control exercises, endurance training, and dance-specific functional activities. These exercises likely improved spinal stability, reduced mechanical stress on the lumbar spine, and enhanced movement efficiency during dance activities.

Improvements in lumbar flexor and extensor muscle strength may be explained by the progressive strengthening exercises incorporated into the structured protocol, including dead-bug exercises, bird-dog exercises, planks, side planks, glute bridges, and Romanian deadlifts. Enhanced activation and endurance of trunk muscles contribute to improved lumbopelvic stability and better control of spinal movements.

Pelvic floor muscle strength also demonstrated improvement following the intervention. The pelvic floor muscles function synergistically with the abdominal and spinal stabilizing muscles to provide core stability. Therefore, strengthening of the lumbopelvic region through structured exercises may have positively influenced pelvic floor muscle performance.

The findings of the present study support previous literature suggesting that exercise-based rehabilitation programs are effective in reducing low back pain and improving functional

performance in dancers. The results further highlight the importance of incorporating dancer-specific exercises rather than relying solely on conventional physiotherapy approaches.

Conclusion

The present study concludes that a structured exercise program is effective in reducing low back pain and improving lumbar flexor strength, lumbar extensor strength, and pelvic floor muscle strength in recreational dancers. Although both intervention groups demonstrated positive outcomes, the structured exercise program produced superior improvements compared to conventional exercises. Therefore, structured exercise protocols focusing on core stabilization, flexibility, endurance, neuromuscular control, and dance-specific functional training may be recommended as an effective physiotherapy intervention for the management and prevention of low back pain in recreational dancers.

Strengths

1. The study focused on recreational dancers, a population that is often underrepresented in research.
2. The intervention protocol was structured, progressive, and specifically designed for dancers.
3. Multiple outcome measures were used to assess pain and muscle strength comprehensively.
4. The study compared structured exercises with conventional physiotherapy exercises.
5. The findings may contribute to the development of evidence-based physiotherapy programs for dancers.
6. The protocol is simple, cost-effective, and easily applicable in clinical and community settings.

Limitations

1. The sample size was limited to 60 participants, which may affect the generalizability of the findings.
2. The intervention duration was only four weeks; longer follow-up may be required to assess long-term effects.
3. Only female recreational dancers aged 18–25 years were included, limiting the applicability of results to male dancers and other age groups.
4. The study relied on Manual Muscle Testing, which may be subject to examiner bias.

ETHICAL APPROVAL AND CONSENT

Ethical approval for this study was obtained from the Institutional Ethics Committee of Krishna College of Physiotherapy, Karad, Maharashtra, India. The study was conducted in accordance with the ethical principles outlined in the

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Declaration of Helsinki.

All participants were informed about the purpose, procedures, potential risks, and benefits of the study prior to enrollment. Written informed consent was obtained from each participant before participation. Participants were assured that their involvement was voluntary and that they had the right to withdraw from the study at any stage without any consequences.

Confidentiality and anonymity of participant data were strictly maintained throughout the study. Personal identifiers were removed, and all data were stored securely and used solely for research purposes.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to this study. The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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