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School of Computer Science & Engineering

IILM University Greater Noida

Presents

1st National Conference

on

Technologies for Sustainable Development Goals 2025 (TECH4SDG-2025)

3rd March 2025

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INTERNATIONAL JOURNAL OF RESEARCH IN MODERN ENGINEERING & EMERGING TECHNOLOGY (IJRMEET)

Dear Author / Researcher,

On behalf of the *International Journal of Research in Modern Engineering & Emerging Technology (IJRMEET)*, I extend my heartfelt gratitude to all the authors and research scholars for choosing our platform to publish their valuable research contributions.

IJRMEET, a Refereed, Peer Reviewed, Indexed, and Monthly Journal in Electronic format, has been consistently dedicated since April 2013 to advancing scholarly work in the domains of Modern Engineering and Emerging Technologies. Your innovative and quality research is at the core of our mission to promote academic excellence and practical solutions in the ever-evolving field of engineering and technology.

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Our journal aims not only to disseminate high-quality research globally but also to highlight critical engineering problems and their practical resolutions. I encourage researchers, academicians, faculty members, and industry professionals to continue contributing to IJRMEET and to inspire their peers and students to join us in this academic pursuit.

We sincerely thank our respected Editors, Reviewers, Technical Advisors, Authors, Web Developers, Subscribers, Supporters, and the extended academic community whose efforts and encouragement make each issue of IJRMEET a successful endeavor.

With warm regards,

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डॉ. मोहम्मद रिहान / Dr. Mohammad Rihan
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MESSAGE

I am happy to know about Tech4SDG-2025, a distinguished national conference that aims to explore and highlight the transformative power of technology in achieving the United Nations Sustainable Development Goals (SDGs). This event serves as a critical platform for fostering collaboration among experts, innovators, and leaders who are dedicated to creating solutions that drive sustainable change.

As we face global challenges ranging from environmental sustainability to social equity, it is clear that technological advancements will play a pivotal role in shaping our collective future. Tech4SDG-2025 presents a unique opportunity to examine how cutting-edge technologies can contribute to solving the most pressing issues of our time, from climate change to poverty alleviation.

I look forward to the engaging discussions and innovative ideas that will emerge from this conference. I believe that by working together, we can harness the potential of technology to drive meaningful progress towards a sustainable and equitable world.

I extend my best wishes to all the participants and organizers of Tech4SDG-2025.

27.02.25

(Dr. Mohammad Rihan)

Dated: 27th February, 2025
Place: Gurugram

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Effect of Core Strengthening Exercises on Physical Function in Women

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Abstract : Core strengthening exercises are frequently prescribed to improve trunk capacity and support everyday movement, but their additional benefit over general exercise requires careful evaluation. This paper develops an eight-week randomized controlled study framework for women aged 30–55 years with chronic nonspecific low back pain. The proposed comparison involves progressive core strengthening and a time-matched general exercise programme, each delivered three times weekly. Provisional simulated analyses include 60 women, with 30 participants per group. The primary outcome is change in the Oswestry Disability Index (ODI), while secondary outcomes include five-times sit-to-stand performance, trunk flexor endurance, and pain intensity. Mean ODI improvement is 12.0 points in the core group and 7.0 points in the general exercise group, producing a between-group difference of −5.0 points (95% confidence interval [CI] −9.13 to −0.87; p = .019). Trunk endurance improves by an additional 8.0 seconds with core training (95% CI 0.76–15.24; p = .031). Between-group differences in pain and sit-to-stand performance do not reach statistical significance. This provisional pattern demonstrates why exercise outcomes should be interpreted separately: improved trunk endurance may accompany modest disability improvement without clear superiority across all functional measures. Actual trial data are necessary to establish effectiveness and clinical relevance.

Keywords: Core strengthening; physical function; women; low back pain; exercise therapy; functional disability

Introduction

Physical function includes the capacity to rise from a chair, walk, lift, maintain positions, and participate in household, occupational, and recreational activities. In women experiencing persistent low back pain, these tasks may become limited by discomfort, reduced conditioning, movement-related concern, or difficulty tolerating repeated loading. Rehabilitation should therefore assess meaningful activity as well as pain.

Core strengthening typically involves exercises targeting the abdominal, spinal, and associated pelvic musculature. Programmes may combine sustained contractions, controlled limb movements, and progressive resistance. However, core strength, endurance, and motor control represent related but different capacities. An intervention combining these components should describe its content rather than imply that one isolated muscle explains functional recovery.

Clinical practice guidelines support several forms of exercise for chronic low back pain, including trunk strengthening and endurance activities [1]. The central question is consequently whether a structured core programme provides additional benefits compared with another credible exercise approach. jospt.org

The present paper addresses that question in women aged 30–55 years with chronic nonspecific low back pain. This population provides a defined clinical context for measuring physical function. Results would not automatically apply to asymptomatic women, pregnancy-related conditions, postoperative rehabilitation, or neurological disorders.

Literature Review

Exercise Therapy for Chronic Low Back Pain

Hayden and colleagues' Cochrane review supports exercise therapy for chronic low back pain, particularly in comparison with no treatment, usual care, or placebo [2]. The review also demonstrates that effects depend on the comparator and outcome. Improvement after an exercise programme does not by itself establish that its particular exercise components caused greater benefit than another active intervention. Cochrane Library

George and colleagues' clinical practice guideline recommends exercise interventions within physical therapy management [1]. Its breadth supports selecting exercises according to individual presentation and goals rather than treating core strengthening as universally superior. A comparative study should therefore standardize contact time and retain an active control group.

Core Stability Compared With General Exercise

Wang and colleagues' meta-analysis identified short-term advantages of core stability exercises over general exercise for pain and back-specific functional status [3]. However, the distinction between short-term and sustained outcomes is important. Early gains do not establish lasting superiority, and intervention content varies across studies. PMC

Smith, Littlewood, and May subsequently concluded that stabilization exercises offered limited additional benefit compared with other exercise approaches [4]. Their findings challenge claims that specific stabilization methods should routinely replace general conditioning. They also support a study design capable of detecting modest effects rather than assuming large improvements across every outcome. PMC



Saragiotto and colleagues' Cochrane review examined motor control exercise [5]. Although motor control training may benefit people with chronic nonspecific low back pain, clinically important advantages over other exercises were not consistently demonstrated. Motor control exercise and core strengthening overlap, but the terms should not be used interchangeably without describing the intervention. Cochrane Library

Functional Outcomes and Evidence in Women

Kim and Yim investigated core stability exercise combined with hip interventions [6]. Their trial illustrates that physical function may be influenced by components outside the trunk. Because participants received combined programmes, findings cannot be attributed solely to abdominal strengthening. This supports documenting all exercises and avoiding unexplained co-interventions. jstage.jst.go.jp

Ge and colleagues studied core stability training in older women with low back pain [7]. Their randomized trial assessed disability and mobility alongside muscle thickness. It provides direct evidence in women, but its older population, short intervention, and physiotherapy comparator limit transfer to middle-aged women undertaking a time-matched exercise programme. Springer Nature Link

Outcome Measurement and Clinical Interpretation

Fairbank and Pynsent described the Oswestry Disability Index as a condition-specific measure relevant to spinal disorders [8]. It captures perceived activity limitation but does not directly measure lifting capacity or muscle strength. Combining it with a performance test improves the breadth of functional assessment. pubmed.ncbi.nlm.nih.gov

McGill, Childs, and Liebenson examined trunk endurance testing [9]. Their work supports distinguishing endurance from maximal strength and recognizes that test performance varies by task and participant characteristics. A longer holding time should consequently be interpreted as improved performance on that endurance task. PubMed

Ostelo and colleagues proposed guidance for interpreting meaningful changes in back-pain outcomes [10]. Their suggested relative-change approach concerns individual improvement; it should not be mechanically applied to differences between group averages. Statistical significance, individual response, and clinical importance require separate interpretation. pubmed.ncbi.nlm.nih.gov

Research Gap

The gap addressed here is practical rather than a claim that core training has never been studied. A women-focused comparison should combine a reproducible progressive programme, equivalent therapist contact, a prespecified disability outcome, and separate performance and endurance measures. This would help determine whether benefits extend beyond the trained task.

Aim and Hypotheses

The primary aim is to compare eight-week changes in back-related physical function between progressive core strengthening and general exercise in women with chronic nonspecific low back pain.

Secondary aims are to compare changes in sit-to-stand performance, trunk flexor endurance, and pain intensity.

The primary null hypothesis states that mean ODI change does not differ between groups. Secondary null hypotheses concern the remaining outcomes.

Materials and Methods

Study Design

The proposed design is a parallel-group, assessor-blinded randomized controlled trial. Assessments occur before treatment and after eight weeks. Both groups receive three supervised 40-minute sessions weekly, providing 24 scheduled sessions.

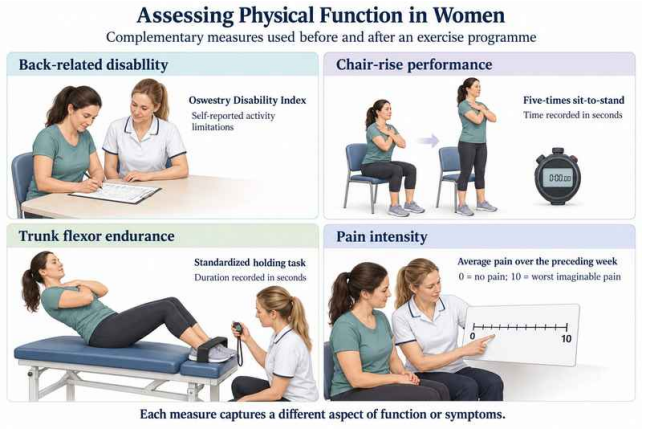
Participants and treating physiotherapists cannot reasonably be blinded to exercise content. Outcome assessors should

remain unaware of allocation, and participants should be asked not to disclose their programme.

Eligibility and Recruitment

Eligible participants are women aged 30–55 years with clinician-assessed nonspecific low back pain lasting at least three months and an ODI score of 20–50 out of 100.

Exclusion criteria include suspected serious spinal pathology, progressive neurological deficits, recent spinal surgery, pregnancy, and medical or musculoskeletal conditions preventing safe participation. These restrictions define the intended population rather than implying that exercise is unsuitable for every excluded group.



Consecutive eligible attendees could be recruited from participating physiotherapy services. Actual recruitment dates, locations, screening counts, and reasons for exclusion must be documented during implementation.

Sample Size and Allocation

A planning assumption of an eight-point ODI difference with a change-score standard deviation of ten points gives approximately 25 participants per group for 80% power and a two-sided significance level of .05 using a normal approximation.

Recruiting 30 participants per group allows a modest margin for incomplete follow-up. This calculation is based on an investigator-selected planning effect, not a universally established clinical threshold.

An independent researcher should generate a concealed allocation sequence using randomly varying blocks. The provisional analysis below assumes 60 complete paired records, equally distributed between groups; it does not represent an observed recruitment flow.

Exercise Interventions

The core programme combines coordination, endurance, and progressive loading. Exercise difficulty advances through longer lever arms, increased repetitions, or longer holds, provided movement remains controlled and symptoms remain tolerable.

The general exercise programme uses walking, mobility activities, and broad upper- and lower-limb conditioning. It avoids dedicated sustained trunk endurance drills while maintaining an equivalent session duration.

Table 1. Proposed intervention structure

Component	Core strengthening group	General exercise group
Frequency and duration	Three sessions weekly for eight weeks	Three sessions weekly for eight weeks
Warm-up: 5 minutes	Comfortable walking and mobility	Comfortable walking and mobility
Main exercise: 30 minutes	Progressive trunk-focused exercises	Walking, mobility, and general conditioning
Weeks 1–2	Abdominal bracing, heel slides, short bridges	Comfortable walking, gentle limb mobility, light conditioning
Weeks 3–5	Bridges, bird-dog variations, modified side supports	Longer walking bouts, light resistance for limbs
Weeks 6–8	Longer-lever bridges, dead-bug variations, progressed side supports	Progressed walking and general resistance exercises
Typical dosage	Two to three sets of 6–12 repetitions; selected holds of 5–20 seconds	Matched activity time with individualized repetitions
Cool-down: 5 minutes	Comfortable movement and relaxation	Comfortable movement and relaxation

Both groups should receive the same brief advice on remaining active. Additional treatment, medication changes, adherence, and symptom exacerbations should be recorded rather than presumed equivalent.



Outcome Measures

The primary outcome is ODI change, scored from 0 to 100, with lower scores indicating less disability. An appropriate validated language version should be used.

Five-times sit-to-stand performance measures the time required to complete five chair rises without arm assistance. Chair height, instructions, footwear, and timing procedures should remain consistent. Lower times indicate better performance.

Trunk flexor endurance is measured using a standardized supported setup followed by an unsupported holding position. Testing ends when the position cannot be maintained or symptoms require stopping. Higher times indicate greater task endurance.

Pain is assessed using a 0–10 numerical rating scale referring to average pain during the preceding seven days.

Statistical Analysis

Change is calculated as week-eight minus baseline. Negative changes indicate improvement for ODI, pain, and sit-to-stand time; positive changes indicate improved endurance.

Between-group changes are compared using Welch's independent-samples *t*-tests, with 95% confidence intervals. The ODI comparison is primary. Secondary tests are exploratory and are not adjusted for multiplicity.

The provisional statistics are calculated from the specified group means, change-score standard deviations, and sample sizes. Distributional assumptions, outliers, missingness, and individual responses cannot be evaluated without participant-level data. A completed trial should report intention-to-treat analyses and a prespecified approach to missing outcomes.

Results

Baseline Characteristics

The provisional sample includes 30 women in each group. Baseline summaries are similar in age, body mass index, and symptom duration. No baseline significance testing is used.

Table 2. Provisional baseline characteristics

Characteristic	Core group, n = 30	General exercise group, n = 30
Age, years	42.3 ± 6.7	41.8 ± 6.9
Body mass index, kg/m²	26.4 ± 3.5	26.1 ± 3.7
Low back pain duration, months	18.2 ± 9.4	17.6 ± 9.8
ODI, 0–100	34.0 ± 8.0	33.0 ± 8.0
Pain, 0–10	5.8 ± 1.2	5.7 ± 1.3

Values are provisional means ± standard deviations.

Changes in Physical Function

Both groups show lower disability scores after eight weeks. Mean ODI decreases from 34.0 to 22.0 in the core group and from 33.0 to 26.0 in the comparison group. Sit-to-stand performance and trunk endurance also improve in both groups.

Table 3. Provisional baseline, follow-up, and change scores

Outcome	Group	Baseline	Week eight	Change
ODI, points	Core	34.0 ± 8.0	22.0 ± 8.0	−12.0 ± 8.0
	General exercise	33.0 ± 8.0	26.0 ± 8.0	−7.0 ± 8.0
Five-times sit-to-stand, seconds	Core	13.8 ± 2.0	10.8 ± 2.0	−3.0 ± 2.0
	General exercise	13.6 ± 2.0	11.6 ± 2.0	−2.0 ± 2.0
Trunk flexor endurance, seconds	Core	38.0 ± 14.0	56.0 ± 16.0	+18.0 ± 14.0
	General exercise	39.0 ± 14.0	49.0 ± 16.0	+10.0 ± 14.0
Pain, points	Core	5.8 ± 1.2	3.6 ± 1.2	−2.2 ± 1.4
	General exercise	5.7 ± 1.3	4.2 ± 1.3	−1.5 ± 1.5

Values are means ± standard deviations. Change-score standard deviations are separately specified; they are not obtained by subtracting baseline and follow-up standard deviations.

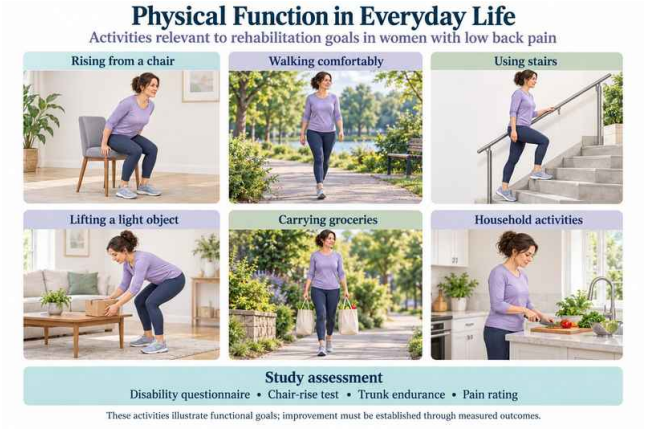
Between-Group Comparisons

The core group has a five-point greater ODI reduction than the general exercise group. The confidence interval excludes zero, although it spans a small to more substantial advantage.

Table 4. Provisional between-group differences in change

Outcome	Core minus general exercise	95% CI	*p* value
ODI, points	−5.00	−9.13 to −0.87	.019
Five-times sit-to-stand, seconds	−1.00	−2.03 to 0.03	.058
Trunk flexor endurance, seconds	+8.00	0.76 to 15.24	.031
Pain, points	−0.70	−1.45 to 0.05	.067

The endurance difference favours core training. Pain and sit-to-stand estimates also favour core training numerically, but their confidence intervals include zero. These findings do not establish equivalence between programmes.



Discussion

The provisional results show a selective pattern: greater disability reduction and trunk endurance improvement with core training, alongside uncertain additional effects on pain and chair-rise performance. This pattern avoids assuming that every outcome must improve significantly because the intervention targets the trunk.

The ODI difference is consistent with a possible short-term advantage, as discussed in Wang and colleagues' review [3]. Its magnitude nevertheless requires caution. A five-point difference between mean changes cannot automatically be described as clinically important for individual women. The interval from −9.13 to −0.87 points includes an advantage that could be relatively small.

The endurance finding is plausible because the programme directly trains sustained trunk activity. However, better endurance-test performance may reflect task familiarity, improved tolerance, or adaptation to similar exercises. It does not establish improved maximal strength, altered spinal structure, or normalization of muscle activation.

The absence of a clear sit-to-stand advantage is also informative. Chair rising depends on lower-limb capacity, balance, pain tolerance, and movement strategy. General conditioning may address several of these contributors. This interpretation is compatible with Kim and Yim's investigation of hip interventions alongside core exercise [6].

Pain decreases in both groups, with an uncertain additional reduction of 0.70 points in the core group. The result accords with the broader literature showing that different exercise approaches can produce benefits without consistent superiority of one method [4,5]. The confidence interval allows a modest benefit as well as little additional effect.

Several mechanisms might contribute to improvement, including increased activity, graded exposure to movement, therapist support, and greater confidence. None is directly measured here. Claims about specific muscle recruitment or biological pathways would require appropriate mechanistic assessments.

The women-focused design improves population specificity but does not establish that women respond differently from men. Likewise, findings in middle-aged women cannot be generalized to pregnancy, early postpartum recovery, or older women without further study.

Practical Implications

Core strengthening may be considered among several exercise options for appropriately assessed women with chronic nonspecific low back pain. Programme selection should consider preferences, tolerance, access, and functional goals.

Assessment should include perceived disability and actual task performance. When chair rising or lifting is a primary concern, rehabilitation may require direct practice of those activities and broader conditioning rather than trunk exercises alone.

Limitations

The numerical findings are simulated and provide no empirical evidence of effectiveness. The proposed sample is small, follow-up is short, and participants and therapists cannot be blinded.

Self-reported disability may be influenced by expectations. Endurance testing resembles trained activities, and secondary findings are exploratory. No participant-level data are available to examine adherence, adverse events, subgroup differences, missing outcomes, or individual clinically meaningful responses.

Conclusion

A rigorous evaluation of core strengthening should compare it with an active programme and distinguish disability, performance, endurance, and pain outcomes. The provisional analysis shows how modest disability and endurance advantages can coexist with uncertain differences in other measures. Actual randomized trial data are required before concluding that core strengthening improves physical function more than general exercise in women.

Ethics Approval and Informed Consent

No human-participant study was conducted for this draft. Implementation requires ethics approval, informed consent, and prospective trial registration. Approval identifiers must reflect actual institutional records.

Funding and Conflicts of Interest

Funding, sponsor involvement, and author conflicts must be declared according to the actual study.

Data Availability

No observed participant dataset underlies this manuscript. The reported between-group tests are reproducible from the provisional change-score summaries and group sizes.

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