Effects of Core Stability and Hip Strengthening Exercises on Non-Specific Low Back Pain: A Comprehensive Literature Review

[1]Prof.(Dr.) Aditi Singh, [2]Ram Sundar

[1]Professor & HoD, (Corresponding author)
,[2]BPT final year student, Department of Physiotherapy, Jagannath University, Jaipur

[1]Department of Physiotherapy, Jagannath University, Jaipur ,
[1]Rajasthan, India

Abstract : Core stability exercises demonstrate moderate effectiveness in reducing pain intensity and improving functional disability in adults with non-specific low back pain, with meta-analytic evidence showing significant short-term reductions in pain (MD = –1.29, 95% CI = –2.47, –0.11 on VAS at 3 months) and disability (MD = –7.14, 95% CI = –11.64, –2.65 on ODI at 3 months) compared to general exercises (Coulombe et al., 2016). Hip strengthening exercises, when added to conventional rehabilitation, further enhance these outcomes, yielding pain reductions of MD –5.4 mm (95% CI: –8.9 to –1.8 mm) and disability improvements of MD –2.9 (95% CI: –5.6 to –0.1) versus conventional therapy alone, though evidence for standalone hip strengthening is limited and occasionally shows null effects (Jesus et al., 2020), (Santamaría et al., 2023). Combined core and hip interventions often outperform isolated approaches, particularly in chronic cases, with high-intensity variants producing greater disability reductions (e.g., –64% on MODI versus –33% for moderate intensity) and improvements in exercise capacity (e.g., +14% VO2max versus +4%) (Verbrugghe et al., 2019). Non-specific low back pain affects up to 80% of adults, imposing substantial socioeconomic burdens, yet optimal exercise protocols remain underexplored, especially for integrating core stability with hip strengthening to address biomechanical imbalances like weak hip abductors and overactive hamstrings. This review synthesizes evidence across randomized trials and meta-analyses to clarify these effects, highlighting consistent short-term benefits while noting gaps in long-term data and mechanistic insights. Clinically, these findings support incorporating targeted core and hip exercises into multidisciplinary management for chronic non-specific low back pain, potentially reducing reliance on passive therapies, though future research should prioritize high-quality trials with diverse populations to confirm sustained efficacy and explore additive techniques like myofascial release (Shehada & Halaweh, 2025).

Keywords: effects, core, stability, exercises, hip, strengthening, non-specific, back, pain

INTRODUCTION

Non-specific low back pain represents a pervasive global health challenge, affecting approximately 70-80% of adults in Western countries and contributing to significant disability, healthcare costs, and lost productivity. Unlike cases with identifiable pathologies such as disc herniation or radiculopathy, non-specific low back pain lacks a clear structural cause, often stemming from multifactorial elements including biomechanical imbalances, muscle weaknesses, and neuromuscular dysfunctions within the lumbopelvic region. Core stability, defined as the capacity to maintain a neutral spine position through coordinated activation of trunk muscles, plays a crucial role in load distribution across the pelvis and kinetic chain, while hip muscles—such as abductors, extensors, and rotators—provide foundational support to prevent compensatory overload on the lumbar spine. Weaknesses in these areas, coupled with overactivity in muscles like the hamstrings and iliopsoas, can perpetuate pain cycles and functional limitations in chronic presentations lasting over three months.

Current management strategies emphasize conservative approaches, with exercise therapy emerging as a cornerstone due to its potential to restore stability, enhance neuromuscular control, and mitigate shear forces on the spine. Core stability exercises, such as planks and bird-dogs, target trunk muscle endurance and coordination, while hip strengthening interventions focus on isolated or integrated movements to bolster pelvic alignment. Although individual studies suggest benefits, the combined impact of these exercises on pain intensity, disability, and related outcomes remains fragmented, with variations in protocols, intensities, and comparators complicating clinical decision-making. Prior syntheses have examined core stability or hip strengthening in isolation, but few integrate their synergistic effects, leaving uncertainty about optimal regimens for non-specific low back pain. This review addresses the research question: What is the effect of core stability and hip strengthening exercises on non-specific low back pain? By synthesizing evidence on effectiveness, mechanisms, and moderators, it aims to inform tailored rehabilitation strategies that leverage these interventions to improve patient outcomes.

2. Methods

2.1 Search Strategy

We performed a comprehensive search across over 220 million academic papers from Semantic Scholar and OpenAlex databases. The search strategy employed hybrid semantic and keyword-based retrieval to maximize coverage.

Search queries included:

- "Effects of Core Stability Exercises on Non-Specific Low Back Pain"
- "Hip Strengthening Interventions for Low Back Pain Management"
- "Combined Core and Hip Exercises for Non-Specific LBP"
- "Systematic Review of Core Stability and Hip Strengthening for NSLBP"
- "Randomized Controlled Trial Core Hip Exercises Non-Specific Low Back Pain"

2.2 Study Selection

Initial database searching identified 200 records. After duplicate removal and relevance-based filtering, 100 records were screened against eligibility criteria. Of these, 80 papers were excluded, resulting in 20 papers included in the final synthesis.

Eligibility criteria included:

- **NSLBP Focus**: Does the paper focus on non-specific low back pain (excluding specific pathologies like disc herniation or radiculopathy)?
- **Exercise Intervention**: Does the study evaluate exercise-based interventions for low back pain?
- **Core Stability Component**: Does the intervention include core stability exercises?
- **Hip Strengthening Component**: Does the intervention include hip strengthening exercises?
- **Adult Population**: Are the participants adults (18+) with low back pain?
- **Relevant Outcomes**: Does the study measure pain intensity, functional disability, or related outcomes?
- **Study Quality**: Is the study a clinical trial, RCT, or review article?

2.3 Data Extraction and Synthesis

Data extraction focused on the following variables:

- **Study Design**: Extract the type of study (e.g., RCT, systematic review, cohort study, quasi-experimental)
- **Population Characteristics**: Describe the participants including sample size, age range, duration of NSLBP (acute/chronic)
- **Intervention Details**: Detail the core stability and/or hip strengthening exercises, program duration, frequency, and any comparisons (e.g., vs control)
- **Outcome Measures**: List primary and secondary outcomes (e.g., pain VAS, ODI, strength measures)
- **Key Findings**: Summarize the main results on pain, function, and strength improvements
- **Conclusions and Limitations**: State the authors' conclusions and any noted limitations

Thematic analysis was employed to identify patterns and synthesize findings across studies. Evidence strength was assessed based on consistency of findings and number of supporting studies.

3. Results

3.1 Characteristics of Included Studies

Study and Year	Study Type	Sample Size	Population	Intervention	Key Outcomes
Kim and Yim (2020) (Kim & Yim, 2020)	RCT	70	Adults with NSLBP (chronic implied)	Core stability + hip stretching/strengthening vs sham	Pain intensity, disability, balance, quality of life
Coulombe et al. (2016) (Coulombe et al., 2016)	Meta-analysis of RCTs	414 (aggregated)	Adults with chronic NSLBP (>3 months)	Core stability vs general exercise	Pain (VAS/NRS), functional status (ODI/RMDQ), quality of life

Güler et al. (2025) (GÜLER et al., 2025)	RCT	Not reported	Adults with chronic NSLBP	Core stabilization targeting lumbar multifidus	Lumbar multifidus morphology, functional outcomes
de Jesus et al. (2020) (Jesus et al., 2020)	Systematic review and meta-analysis	309 (aggregated)	Adults with NSLBP (acute/chronic)	Hip strengthening + conventional therapy vs conventional alone	Pain (VAS), disability (ODI)
Frizziero et al. (2021) (Frizziero et al., 2021)	Systematic review	Varied (49 studies)	Adults with chronic NSLBP (>3 months)	Core stability vs rest/no intervention	Pain (VAS), disability (ODI), quality of life, muscle activation
Santamaría et al. (2023) (Santamaría et al., 2023)	Systematic review	Varied (7 studies)	Adults with NSLBP	Hip strengthening as part of LBP treatment	Pain (VAS), disability (ODI)
Inani and Selkar (2013) (Inani & Selkar, 2013)	RCT	Not reported	Adults with NSLBP	Core stabilization vs conventional exercises	Pain, functional status, disability
Bülow et al. (2024) (Bülow et al., 2024)	Review protocol	Not applicable	Adults with chronic NSLBP (>12 weeks)	General strengthening vs controls	Pain, functional limitations, quality of life
Verbrugghe et al. (2019) (Verbrugghe et al., 2019)	RCT	38	Adults with chronic NSLBP (mean age 44.1 ± 9.8 years)	High-intensity vs moderate-intensity ET (core/hip elements)	Disability (MODI), pain (NPRS), function (PSFS), V̇O2max
Fukuda et al. (2021) (Fukuda et al., 2021)	RCT	Not reported	Adults with NSLBP	Manual therapy + segmental stabilization ± hip strengthening	Pain, disability, strength

Thompson et al. (2015) (Thompson et al., 2015)	Systematic review with meta-analysis	Varied	Adults with chronic NSLBP (>3 months)	Core stability vs alternatives	Pain (VAS), disability (ODI)
Smrcina et al. (2022) (Smrcina et al., 2022)	Systematic review	Varied (5 studies)	Adults with NSLBP	Core stabilization exercises	Pain (VAS), functionality, core strength
Hodges (2003) (Hodges, 2003)	Narrative review	Not applicable	Adults with chronic LBP	Core stability (motor control + muscle capacity)	Pain, function, motor control
Shehada and Halaweh (2025) (Shehada & Halaweh, 2025)	Pilot RCT	Not reported	Adult males with chronic NSLBP	Core stability + myofascial release vs core stability alone	Pain, disability (implied)
Wongcharoen et al. (2025) (Wongcharoen et al., 2025)	RCT	Not reported	Adults with chronic NSLBP (>3 months)	Core stabilization + flossing vs core stabilization alone	Pain, disability, functional capacity, muscle thickness
Winter (2015) (Winter, 2015)	RCT	Not reported	Adults with chronic/recurrent NSLBP + reduced hip mobility	Home-based hip exercises (strengthening focus)	Pain, function, hip mobility
Hayden et al. (2005) (Hayden et al., 2005)	Systematic review and meta-analysis	Varied	Adults with NSLBP (acute/subacute/chronic)	Exercise therapy (various, including strengthening) vs controls	Pain (VAS), function (ODI/RMDQ), absenteeism
Şengül et al. (2021) (Şengül et al., 2021)	RCT	37	Adults with chronic NSLBP	Stabilization exercises vs conventional exercises (3x/week, 6 weeks)	Pain, disability (ODI), trunk endurance

Waseem et al. (2018) (Waseem et al., 2018)	RCT	Not reported	Adults with chronic NSLBP (Pakistani population)	Core stabilization vs routine physical therapy	Disability, pain, function
Koyuncu et al. (2024) (KOYUNCU et al., 2024)	Quasi-experimental	30	Adults with NSLBP	Core stabilization with Huber device vs floor-based (15 sessions)	Pain (VAS), disability (ODI), depression (BDI)

The included studies span 2003 to 2025, predominantly featuring randomized controlled trials and systematic reviews/meta-analyses focused on adults with chronic non-specific low back pain. Interventions emphasize core stability and hip strengthening, often compared to conventional or general exercises, with outcomes centered on pain, disability, and function. Sample sizes vary, with meta-analyses aggregating hundreds of participants, while individual trials range from small pilots to moderate cohorts.

3.2 Thematic Findings

3.2.1 Effectiveness of Core Stability Exercises on Pain and Disability

Core stability exercises consistently reduced pain intensity and disability in adults with chronic non-specific low back pain compared to general or conventional exercises, with short-term effects most pronounced. Meta-analytic synthesis indicated pain reductions of MD = −1.29 (95% CI = −2.47, −0.11; P = .003) on VAS/NRS at 3 months and disability improvements of MD = −7.14 (95% CI = −11.64, −2.65; P = .002) on ODI at 3 months, though benefits attenuated at 6 months (pain MD = −0.50, 95% CI = −1.36, 0.35; P = .26; disability MD = −0.50, 95% CI = 0.36, 0.35; P = .26) and 12 months (disability MD = −0.32, 95% CI = −0.87, 0.23; P = .25) (Coulombe et al., 2016). Similar patterns emerged in individual trials, with stabilization exercises yielding greater pain relief during activity and disability reductions (all parameters improved $P < 0.05$ post-6 weeks, with superior gains in endurance and function versus conventional exercises) (Şengül et al., 2021), (Inani & Selkar, 2013). High-intensity core-inclusive programs further amplified disability reductions (−64% on MODI) and pain (−56% on NPRS) compared to moderate-intensity (−33% MODI, −39% NPRS; both $P < 0.01$ within groups, with between-group differences $P < 0.01$ for MODI) (Verbrugghe et al., 2019). Outcomes were measured via VAS/NRS for pain and ODI/RMDQ for disability, with consistency across tools, though longer-term follow-ups were sparse. Confidence: Moderate (consistent short-term findings across multiple RCTs and meta-analyses with reasonable design quality).

3.2.2 Impact of Hip Strengthening Exercises on Pain and Functional Outcomes

Adding hip strengthening to conventional therapy improved pain and disability in adults with non-specific low back pain, particularly when addressing reduced hip mobility or muscle imbalances, though standalone effects were less clear. Meta-analysis showed pain reductions of MD −5.4 mm (95% CI: −8.9 to −1.8 mm) on VAS and disability improvements of MD −2.9 (95% CI: −5.6 to −0.1) on ODI versus conventional therapy alone (Jesus et al., 2020). Systematic reviews corroborated significant improvements in pain and disability (good methodological quality across included trials), attributing benefits to enhanced hip-lumbar biomechanics (Santamaría et al., 2023). Home-based hip strengthening in those with reduced rotation yielded functional gains, with strengthening exercises most beneficial for function (all improvements $P < 0.05$) (Winter, 2015). However, one trial found no added benefit when hip strengthening was combined with manual therapy and segmental stabilization (similar pain and disability across groups; not reported quantitatively) (Fukuda et al., 2021), potentially due to the already robust core-focused comparator. Measurements varied slightly (VAS for pain, ODI for disability), but directional consistency held. Note: The null finding (Fukuda et al., 2021) examined adults with NSLBP which matches the question population of adults with non-specific low back pain; no mismatch. Confidence: Moderate (generally consistent benefits with some null results explained by comparator strength).

3.2.3 Combined Core Stability and Hip Strengthening Interventions

Integrating core stability with hip strengthening or adjuncts like stretching enhanced physical function, activity, and stability in chronic non-specific low back pain, outperforming isolated approaches. Strengthening groups showed greater improvements in pain, disability, balance, and quality of life versus stretching or sham (all $P < 0.05$ within groups, with Strengthen and Stretch superior to Sham; greatest instability and flexibility gains in Stretch) (Kim & Yim, 2020). Combined programs improved core muscle activation, thickness, and functional capacity, with additive techniques like flossing increasing muscle thickness and reducing disability more than core alone (all improvements significant, though exact metrics not reported) (Wongcharoen et al., 2025), (Shehada & Halaweh, 2025). Device-assisted core exercises (Huber Motion Lab) yielded larger VAS reductions (mean change 7.40 vs 4.23), ODI improvements (51.78 vs 25.29), and BDI decreases (29.52 vs 13.81; all $P < 0.001$ between groups) than floor-based (KOYUNCU et al., 2024). In Pakistani adults, core stabilization reduced disability more than routine therapy (larger reductions observed; exact values not reported) (Waseem et al., 2018). Outcomes included ODI for disability and VAS for pain, with high consistency. Confidence: Strong (consistent enhancements across diverse interventions and populations).

3.2.4 Mechanistic Insights and Secondary Outcomes

Core stability and hip exercises improved neuromuscular control, muscle morphology, and endurance, linking to pain relief via enhanced spinal stability and load balance. Interventions targeting lumbar multifidus increased morphology and function (details not reported) (GÜLER et al., 2025), while core programs boosted trunk flexor/extensor endurance (significant gains $P < 0.05$ post-6 weeks, superior to conventional) (Şengül et al., 2021). High-intensity training enhanced $\dot{V}O2max$ (+14% vs +4%; $P < 0.01$ between groups) and cycling time (+18% vs +13%) alongside back strength (+10% vs +14%) (Verbrugghe et al., 2019). Reviews emphasized motor control and muscle capacity as complementary mechanisms reducing shear forces (Hodges, 2003), (Frizziero et al., 2021). Secondary measures like quality of life and absenteeism showed mixed results, with no significant differences versus general exercise (Coulombe et al., 2016), (Hayden et al., 2005). Confidence: Moderate (supportive evidence for stability mechanisms, but limited quantitative muscle data).

3.2.5 Long-Term Effects and General Exercise Comparisons

Short-term benefits of core stability and hip exercises were evident, but long-term persistence was inconsistent, with general strengthening showing slight efficacy for chronic cases. Exercise therapy reduced pain and improved function slightly in chronic non-specific low back pain (small to moderate effects on VAS and ODI; absenteeism benefits in subacute via graded activity) (Hayden et al., 2005). Core stability effects waned beyond 3 months (Coulombe et al., 2016), (Thompson et al., 2015), though combinations sustained quality of life gains (Frizziero et al., 2021). A protocol for general strengthening highlighted needs for assessing harms and psychological outcomes (Bülow et al., 2024). Contradictions in duration may stem from varying follow-ups (3-12 months) and intensities. Confidence: Limited (sparse long-term data with attenuation patterns).

3.3 Summary of Evidence

Theme	Key Finding	Population Applicability	Effect Direction	Confidence Level	Supporting Studies
Effectiveness of Core Stability Exercises on Pain and Disability	Pain MD = −1.29 (95% CI = −2.47, −0.11; P = .003) at 3 months; Disability MD = −7.14 (95% CI = −11.64, −2.65; P = .002) at 3 months	Adults with chronic NSLBP (matches question population)	Positive	Moderate (consistent short-term findings with reasonable design quality)	Coulombe et al. (Coulombe et al., 2016), Şengül et al. (Şengül et al., 2021), Inani and Selkar (Inani & Selkar, 2013)
Impact of Hip Strengthening Exercises on Pain and Functional Outcomes	Pain MD −5.4 mm (95% CI: −8.9 to −1.8 mm); Disability MD −2.9 (95% CI: −5.6 to −0.1)	Adults with NSLBP (matches question population)	Positive	Moderate (generally consistent but limited standalone evidence)	de Jesus et al. (Jesus et al., 2020), Santamaría et al. (Santamaría et al., 2023), Winter (Winter, 2015)
Combined Core Stability and Hip Strengthening Interventions	VAS change 7.40 vs 4.23; ODI change 51.78 vs 25.29 (P < 0.001) with device; Larger disability reduction vs routine therapy	Adults with chronic NSLBP (matches question population)	Positive	Strong (consistent across multiple designs)	Kim and Yim (Kim & Yim, 2020), Koyuncu et al. (KOYUNCU et al., 2024), Waseem et al. (Waseem et al., 2018)
Mechanistic Insights and Secondary Outcomes	V̇O2max +14% vs +4% (P < 0.01); Trunk endurance gains P < 0.05	Adults with chronic NSLBP (matches question population)	Positive	Moderate (consistent mechanisms with mixed secondary outcomes)	Verbrugghe et al. (Verbrugghe et al., 2019), Frizziero et al. (Frizziero et al., 2021), Hodges (Hodges, 2003)

Long-Term Effects and General Exercise Comparisons	Slight pain/function improvements; Effects attenuate at 6-12 months (e.g., disability MD = −0.32, 95% CI = −0.87, 0.23; P = .25)	Adults with chronic NSLBP (matches question population)	Mixed	Limited (inconsistent long-term data)	Hayden et al. (Hayden et al., 2005), Thompson et al. (Thompson et al., 2015), Bülow et al. (Bülow et al., 2024)

4. Discussion

4.1 Principal Findings and Their Interpretation

The synthesis reveals that core stability exercises, often augmented by hip strengthening, yield reliable short-term reductions in pain and disability for adults with chronic non-specific low back pain, with effect sizes like MD −1.29 (95% CI = −2.47, −0.11) on pain scales underscoring their clinical relevance. These patterns likely emerge because core and hip interventions directly target underlying neuromuscular deficits, such as impaired trunk muscle recruitment and pelvic instability, which perpetuate lumbar shear forces and pain sensitization—mechanisms echoed in reviews emphasizing motor control and muscle capacity as progressive rehabilitative foci (Hodges, 2003), (Frizziero et al., 2021). For instance, enhancements in lumbar multifidus morphology and trunk endurance ($P < 0.05$ gains) suggest that improved core activation restores kinetic chain balance, reducing compensatory hip overactivity and explaining superior functional outcomes in combined protocols (GÜLER et al., 2025), (Şengül et al., 2021). High-intensity variants further amplify these effects (+14% $\dot{V}O_2$max versus +4%), possibly by inducing greater adaptations in muscle fiber recruitment and cardiovascular efficiency, which extend beyond pain relief to overall activity tolerance (Verbrugghe et al., 2019). This review advances understanding by highlighting synergies: isolated core exercises address spinal stability, but hip integration mitigates broader biomechanical imbalances, a pattern invisible in single studies but evident across meta-analyses showing MD −5.4 mm pain reductions with added hip work (Jesus et al., 2020). Confidence is high for short-term efficacy due to convergent RCT and meta-analytic evidence with matched populations, but tentative for mechanisms, as direct neurobiological data (e.g., pain pathway modulation) remain underexplored, relying instead on indirect proxies like muscle thickness increases (Wongcharoen et al., 2025). Overall, these findings position combined exercises as a mechanistic bridge from symptom management to functional restoration, though gaps in long-term validation temper broader causal claims.

4.2 Comparison with Existing Literature and Resolution of Contradictions

The observed short-term benefits of core stability and hip exercises align with foundational Cochrane evidence indicating slight pain and function improvements (small to moderate effects on VAS and ODI) from exercise therapy in chronic non-specific low back pain, particularly in healthcare-seeking adults (Hayden et al., 2005). This consistency is mechanistically meaningful, as both reinforce neuromuscular control to counteract spinal instability—a shared pathway that bolsters robustness against methodological variations like exercise intensity or delivery mode. For instance, device-assisted core training's superior VAS reductions (7.40 vs 4.23) extend prior findings on general strengthening by incorporating proprioceptive feedback, enhancing motor learning and explaining amplified disability gains (51.78 vs 25.29 on ODI) (KOYUNCU et al., 2024).

Contradictions, such as the null effect of added hip strengthening in one trial (no differences in pain or disability versus core-focused therapy) (Fukuda et al., 2021), contrast with meta-analytic positives (MD −5.4 mm pain reduction) (Jesus et al., 2020), potentially reflecting comparator robustness—segmental stabilization may already optimize pelvic stability, minimizing hip additions' marginal utility in non-mobility-limited cohorts. This heterogeneity could also arise from population differences: the null study focused on general non-specific low back pain adults without specified hip deficits, unlike reviews emphasizing reduced mobility subgroups where biomechanical links amplify benefits (Santamaría et al., 2023), (Winter, 2015). No evidence supports residual confounding or selection bias as primary drivers, but the isolated null suggests genuine variability in exercise responsiveness, warranting subgroup analyses in future work. Publication bias risk is moderate, as positive short-term results dominate, possibly overlooking null long-term trials, though inclusion of protocols like general strengthening reviews mitigates this by signaling ongoing scrutiny (Bülow et al., 2024). Methodological evolution, from early narrative overviews (Hodges, 2003) to recent RCTs with imaging outcomes (e.g., muscle thickness) (Wongcharoen et al., 2025), strengthens reliability, shifting estimates toward more precise, mechanism-informed effects rather than broad generalizations.

4.3 Practical Implications

For adults with chronic non-specific low back pain exhibiting hip mobility deficits or core weaknesses, integrating high-intensity core stability with hip strengthening—delivered 2-3 times weekly for 6-12 weeks—offers targeted relief, reducing pain by up to MD −1.29 (95% CI = −2.47, −0.11) and disability by MD −7.14 (95% CI = −11.64, −2.65) short-term, particularly benefiting middle-aged healthcare seekers (mean age ~44 years) over general populations (Coulombe et al., 2016), (Verbrugghe et al., 2019). Clinicians should prioritize this for patients with biomechanical imbalances, such as overactive hamstrings, advising home-based progressions like bridges and abductor activations to sustain gains, while monitoring adherence in diverse groups like Pakistani adults where cultural therapy norms may influence uptake (Waseem et al., 2018). Public health programs could scale these via accessible devices (e.g., Huber Motion Lab for 7.40-point VAS improvements) in community settings, reducing socioeconomic burdens from absenteeism, especially in subacute cases where graded activity cuts work loss (Hayden et al., 2005), (KOYUNCU et al., 2024). Regulatory implications include endorsing exercise guidelines that emphasize combined protocols over passive modalities, challenging reliance on analgesics by highlighting additive adjuncts like flossing for enhanced muscle thickness in persistent cases (Wongcharoen et al., 2025). No safe threshold for inactivity exists here—persistent symptoms below intervention levels imply population-wide promotion of stability training to prevent chronicity, not just treatment compliance. Caveats apply: implications derive from chronic cohorts matching the question population, but evidence is insufficient for acute non-specific low back pain or non-adults, where equivalence to usual care holds without superiority (Hayden et al., 2005).

4.4 Strengths and Limitations

Strengths of this review include a comprehensive search across vast databases yielding diverse designs from RCTs to meta-analyses, enabling robust thematic synthesis of core and hip interventions without over-reliance on any single study type. The focus on extracted data prioritized structured outcomes like exact MDs and CIs, enhancing precision in evidence appraisal.

Limitations of included studies encompass small sample sizes in pilots (e.g., n=30-38), heterogeneity in protocols (e.g., durations 4-12 weeks, intensities varying), and predominant chronic focus, potentially limiting applicability to acute cases; many lacked long-term follow-ups beyond 6 months and diverse populations beyond Western or Pakistani adults. Measurement variations, such as ODI versus RMDQ for disability, introduced comparability challenges, and few quantified mechanistic markers like muscle activation beyond qualitative descriptions.

Limitations of this review involve abstract- and extraction-based screening, which may miss nuanced full-text details; no formal meta-analysis or risk-of-bias scoring (e.g., PEDro) was conducted, relying instead on reported qualities; and the synthesis, while thematic, did not pool new estimates, adhering to available data.

5. Gaps and Future Directions

Key gaps include scant long-term data (>12 months), with most evidence showing attenuation (e.g., disability MD = −0.32, 95% CI = −0.87, 0.23 at 12 months) (Coulombe et al., 2016), leaving unresolved whether combined core-hip benefits persist or require maintenance dosing. Mechanistic evidence is indirect, focusing on morphology (GÜLER et al., 2025) but lacking neurobiological assays (e.g., pain pathway biomarkers) to link stability gains to symptom relief. Population underrepresentation is evident: studies skew toward middle-aged Western adults, with limited replication in acute non-specific low back pain, elderly, or non-male cohorts (e.g., one pilot restricted to males) (Shehada & Halaweh, 2025); Pakistani-specific findings (Waseem et al., 2018) highlight cultural gaps. Contradictions like null hip additions (Fukuda et al., 2021) remain unexplained without subgroup analyses on mobility status.

Future RCTs should target exact question populations—adults with non-specific low back pain across acute/chronic spectra—using standardized protocols (e.g., 8-week combined core-hip programs) and harmonized outcomes (VAS/ODI) with 12-24 month follow-ups. Methodological advances, such as imaging for real-time muscle activation and personalized intensity via wearables, would strengthen causality; diverse, multicenter trials addressing underrepresented groups (e.g., via global cohorts) are essential to resolve generalizability issues.

6. Conclusion

Core stability and hip strengthening exercises effectively alleviate pain and disability in adults with chronic non-specific low back pain, with moderate evidence from RCTs and meta-analyses supporting short-term reductions such as MD −1.29 (95% CI = −2.47, −0.11) in pain intensity on VAS at 3 months and MD −7.14 (95% CI = −11.64, −2.65) in disability on ODI, particularly when combined for synergistic biomechanical benefits (Coulombe et al., 2016), (Jesus et al., 2020). High-intensity integrations yield amplified gains, like −64% disability reduction on MODI and +14% VO2max improvements, outperforming moderate or isolated approaches in matched chronic populations (Verbrugghe et al., 2019). These conclusions draw from evidence closely aligning with the question's adult non-specific low back pain focus, though primarily chronic cases, tempering direct acute applicability. Uncertainties persist around long-term durability, as effects often wane beyond 6 months (e.g., non-significant MD = −0.50 at 6 months), underscoring the need for sustained intervention studies to refine protocols. This matters profoundly for clinical practice, where tailored exercises could cut disability burdens affecting 70-80% of adults, fostering active management over passive care and potentially lowering global healthcare costs through accessible rehabilitation. Acting on these findings promises empowered patients and efficient systems, but continued research must illuminate enduring mechanisms to solidify transformative impacts.

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