RESEARCH PAPER

Physiotherapy-Based Rehabilitation and Assessment Methods for Postpartum Diastasis Recti Abdominis: A Scoping Review

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ABSTRACT

Background: Diastasis Recti Abdominis (DRA), characterised by pathological separation of the rectus abdominis muscles along the linea alba, is among the most clinically significant consequences of pregnancy and childbirth. With a reported postpartum prevalence ranging from 30% to 68%, DRA imposes a substantial burden on women's physical functioning, quality of life, and psychological well-being.

Objective: To find the available evidence on physiotherapy-based rehabilitation strategies and diastasis recti assessment methods used in postpartum women with DRA, identify dominant themes, and highlight evidence gaps.

Methods: This scoping review followed the Joanna Briggs Institute methodology and PRISMA-ScR reporting guidelines, aligned with the pre-registered protocol INPLASY202540042. A Population–Concept–Context (PCC) framework was applied. Comprehensive searches were conducted across PubMed, EMBASE, Cochrane CENTRAL, Scopus, Web of Science, ProQuest, and PEDro.

Results: Twenty studies were included, comprising randomised controlled trials, controlled and quasi-experimental studies, prospective cohort and longitudinal studies, measurement-reliability studies, and systematic and scoping reviews. Five dominant themes emerged: (i) comprehensive, multi-component exercise programs produce the most consistent IRD reductions (mean difference [MD] = −6.82 mm versus no intervention); (ii) neuromuscular electrical stimulation (NMES) is effective as an adjunct, with IRD reductions from 2.78 ± 0.75 to 2.31 ± 0.56 cm above the umbilicus, 3.72 ± 0.58 to 2.97 ± 0.48 cm at the umbilicus, and 1.58 ± 1.0 to 1.22 ± 0.84 cm below the umbilicus; (iii) passive strategies (kinesiotaping, binders) show smaller or inconsistent effects; (iv) ultrasound is the most valid and reliable IRD assessment (intraclass correlation coefficients [ICCs] > 0.90; standard error of measurement [SEM] 0.17–0.18 cm); and (v) diagnostic heterogeneity (≥2 fingerbreadths to IRD >2.2 cm) contributes to inter-study variability.

Conclusions: Active, multi-component physiotherapy — particularly programs combining core strengthening with NMES — is the most promising rehabilitation strategy for postpartum DRA. Ultrasound is the most defensible assessment modality. Standardisation of diagnostic thresholds, intervention protocols and outcome definitions is urgently required.

Keywords: Diastasis recti abdominis; postpartum; physiotherapy; neuromuscular electrical stimulation; inter-rectus distance; scoping review.

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1. INTRODUCTION

Diastasis Recti Abdominis (DRA) refers to an abnormal separation of the paired rectus abdominis muscles due to pathological widening of the linea alba. Stretching of the linea alba is normal during pregnancy, but a persistent separation after early postpartum might affect core musculoskeletal function, pelvic stability, and quality of life. The research reports 30%–68% postpartum DRA prevalence. [1,2] which is due to the heterogeneity of diagnostic thresholds and measurement methods in different studies.

Multifactorial DRA pathogenesis involves hormonal and mechanical stresses. Relaxin and progesterone affect connective tissue laxity, uterine mechanical stress, intra-

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abdominal pressure, and lumbopelvic load sharing. [3,4] These changes decreases Linea alba rigidity, abdominal wall muscle force transfer, and integrated core muscular cylinder stability decrease. Women with this condition often have diminished abdominal strength, endurance, postural control, lumbopelvic pain, pelvic floor dysfunction, and incontinence. [2,5]

The inter-rectus distance (IRD) at defined anatomical markers along the linea alba (usually above the umbilicus at 3 cm, at the umbilical level and below the umbilicus at 2cm) remains the key quantitative marker of the severity of DRA. [6,7] Most reliable and valid method for IRD quantification is Ultrasound imaging. Caliper-based measurement provides a simpler option with adequate reliability. Finger-width palpation is too imprecise for clinical assessment and research standardization but clinically it is widely used method. [7,8]

Conservative intervention is gaining support, and postpartum DRA management has changed from surgery to rehabilitation [9,10.] Structured exercise programmes targeting the transverse abdominis, core stability training, neuromuscular electrical stimulation (NMES), kinesiotaping, abdominal binders, manual therapy, and postural re-education programmes have been studied. [11,12,13] Individual trials show that exercise-based therapies, alone or in combination with NMES, kinesiotaping, or supportive garments, reduce IRD and improve functional results. [14,15,16]

Given this heterogeneity, a scoping review approach is well suited to mapping the breadth of the evidence and identifying gaps. The specific objectives were to: (i) map the range of physiotherapy interventions used in postpartum women with DRA; (ii) describe the IRD assessment methods used and their reported validity/reliability; (iii) summarise reported outcomes on IRD, core function and related domains; and (iv) identify methodological and evidence gaps.

2. METHODS

2.1 Protocol and Registration

Although the review was originally registered as a systematic review (INPLASY202540042), the substantial heterogeneity encountered in populations, interventions, IRD measurement sites and outcome definitions precluded meaningful quantitative pooling; the synthesis was therefore conducted and reported as a scoping review following the Joanna Briggs Institute methodology and PRISMA-ScR reporting extension [17,18]. The shift from a systematic-review to a scoping-review synthesis reflects the observed heterogeneity of the retrieved evidence, not a change in the underlying research question.

2.2 Eligibility Criteria (PCC Framework)

Population: postpartum women aged ≥18 years, between 6 weeks and 2 years postpartum, with clinical or imaging-based confirmation of DRA via IRD measurement (ultrasonography, calipers or finger-width palpation). Mixed-population studies were eligible only if postpartum DRA subgroup data were reported separately.

Concept: physiotherapy-based conservative interventions (core stability and transversus abdominis training, PFMT, NMES, manual therapy, kinesiotaping, abdominal binders/splints, postural and functional re-education) and/or IRD assessment methods (ultrasound, calipers, finger-width palpation) and their validity/reliability properties.

Context: any clinical or home-based setting under professional supervision; no geographical restrictions.

Comparators (where applicable): no intervention, wait-list, usual postpartum care, or alternative physiotherapy/active treatment modalities.

Outcomes: primary — reduction in IRD; secondary — core strength, pelvic floor function, pain, posture, quality of life, and validity/reliability of IRD assessment.

Study designs: randomised controlled trials (RCTs), non-randomised and quasi-experimental trials, prospective and retrospective cohort studies with comparison data, case series with standardised protocols, measurement-reliability studies, and systematic, scoping and narrative reviews (for contextual synthesis). Exclusions: pregnant-women-only studies, participants without confirmed DRA, surgical interventions, editorials, incomplete case reports, and studies without pre- and post-intervention data.

2.3 Information Sources and Search Strategy

Comprehensive searches were conducted across PubMed (MEDLINE), EMBASE, Cochrane CENTRAL, Scopus, Web of Science, ProQuest Dissertations & Theses Global, and PEDro from database. Core search terms included: "diastasis recti", "rectus diastasis", "linea alba separation", "postpartum", "physiotherapy", "physical therapy", "rehabilitation", "exercise therapy", "transverse abdominis", "core stability", "pelvic floor", "neuromuscular electrical stimulation", "NMES", "kinesiotaping", "abdominal binder", "inter-rectus distance", "ultrasonography", "caliper", and "palpation".

2.4 Selection, Charting and Synthesis

Retrieved records were exported to a reference manager and de-duplicated. Two reviewers independently screened titles/abstracts, followed by full-text screening; disagreements were resolved through discussion or by a third reviewer. The selection process is illustrated in Figure 1. Data were charted using a standardised form capturing first author and year, country, study design, population characteristics, DRA diagnostic criteria, intervention type and dosage, comparator, IRD assessment method and sites, primary and secondary outcomes, follow-up timing and authors' principal conclusions. Given substantial heterogeneity, a narrative and thematic synthesis was undertaken in preference to quantitative pooling. A formal risk-of-bias appraisal is not required for scoping reviews under PRISMA-ScR guidance and was not conducted; methodological features are described narratively.

3. RESULTS

3.1 Selection of Sources of Evidence

Of 240 records identified through database searching, 100 remained after removal of duplicates and initial relevance-based filtering. Following title/abstract and full-text screening, 80 records were excluded and 20 studies met all eligibility criteria and were included in the final synthesis (Figure 1).

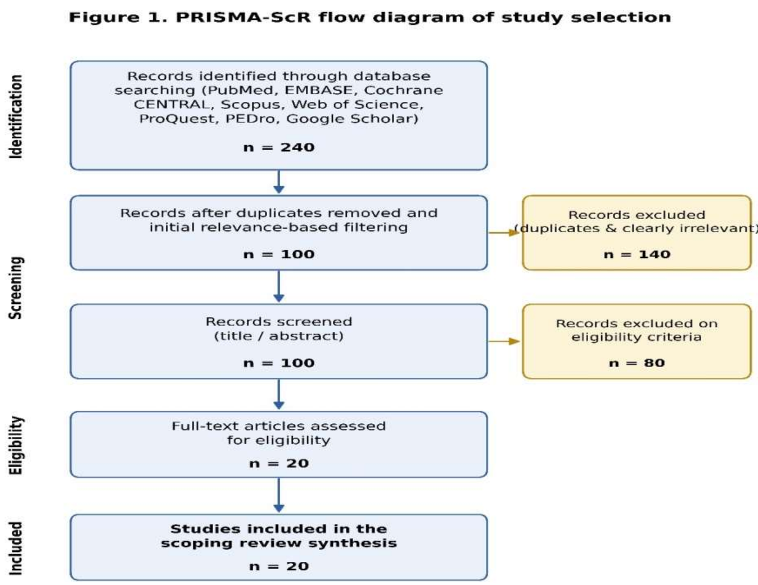

Figure 1. PRISMA-ScR flow diagram of study selection.

3.2 Characteristics of Included Studies

The 20 included studies comprised RCTs, controlled and quasi-experimental trials, a pilot RCT, prospective longitudinal and matched-cohort studies, measurement-reliability/clinimetric studies, and systematic, scoping and narrative reviews. Populations were predominantly postpartum women of reproductive age, with postpartum timing varying from 3 weeks to more than 12 months. Ultrasound was the most common objective IRD assessment modality, followed by caliper and finger-width palpation. Study characteristics are summarised in Table 1.

Table 1. Characteristics of included studies (n = 20).

Author (Year)	Study design	Population	Intervention / focus	IRD assessment
Sperstad et al. (2016)[19]	Prospective cohort study	300 first-time pregnant women	Natural prevalence and risk factors	Finger-width palpation
Liaw et al. (2011)[20]	Prospective longitudinal study	40 postpartum women; 20 nulliparous controls	Natural recovery; no intervention	Ultrasound at four sites around umbilicus
Skoura et al. (2024)[21]	Scoping review	Postpartum women	Exercise therapy and other physiotherapy approaches	Ultrasound and calipers
Michalska et al. (2018)[8]	Review of treatment methods	Postpartum women	Core strengthening, manual therapy, taping, education	Ultrasound and palpation
de Oliveira et al. (2025)[22]	Systematic review + meta-analysis	Postpartum women	Conservative approaches	Millimetre-based IRD across included RCTs
Gluppe et al. (2021)[23]	Systematic review with meta-analysis	Postpartum women	Abdominal and pelvic floor training	Varied
Benjamin et al. (2014)[11]	Systematic review	Antenatal and postpartum periods	Non-specific exercise	Varied

Author (Year)	Study design	Population	Intervention / focus	IRD assessment
Benjamin et al. (2019)[24]	Systematic review + meta-analysis	Postpartum women	Conservative interventions and QoL/pain	Varied
Yalfani et al. (2024)[25]	Systematic review + network meta-analysis	Postpartum women 18–45 years	Exercise, NMES, PFM training, manual therapy, kinesiotape, binders	Ultrasound or calipers
Fang et al. (2025)[26]	Prospective matched study	78 postpartum women within 8 weeks	Neuromuscular electrical stimulation	Ultrasound at three sites
Delgado et al. (2025)[27]	Randomised clinical trial	60 postpartum women >6 months postpartum	Kinesiotherapy + physical agents (including NMES)	Ultrasound; abdominal perimeter
Keshwani et al. (2015)[28]	Reliability and validity study	21 postpartum women	Extended field-of-view ultrasound techniques	Conventional USI, panoramic USI, stand-off pad
Keshwani & McLean (2015)[29]	Clinimetrics (reliability) study	20 postpartum women with DRA	Measurement reliability only	Ultrasound at four locations
Jiang et al. (2024)[30]	Reliability study	46 women, 42–60 days postpartum	Measurement reliability only	Ultrasound (supine, crunch, standing)
Gluppe et al. (2018)[31]	Randomised controlled trial	175 primiparous women	Supervised pelvic floor + abdominal training plus home PFMT	Finger-width palpation at three sites
Toner et al. (2022)[32]	Prospective non-randomised trial	40 postpartum women,	Online core strengthening program	Ultrasound
Sancho et al. (2015)[33]	Two-dimensional ultrasound study	Postpartum women with DRA	Abdominal crunch and drawing-in exercises	2D ultrasound
Thabet & Alshehri (2019)[15]	Randomised controlled trial	Postpartum women with DRA	Deep core stability exercise program	Standard IRD assessment
Keshwani et al. (2021)[34]	Pilot randomised controlled trial	32 primiparous postpartum women	Abdominal binding + trunk exercises	Ultrasound; clinical tests
Alexandre et al. (2025)[35]	Randomised trial	Postpartum women with DRA	Kinesiotherapy + physical agents	Clinical examination

Abbreviations: *DRA, diastasis recti abdominis; IRD, inter-rectus distance; NMES, neuromuscular electrical stimulation; PFMT, pelvic floor muscle training; QoL, quality of life; USI, ultrasound imaging.*

3.3 Thematic Findings

3.3.1 Comprehensive exercise-based rehabilitation shows the most consistent benefit.

Interventions targeting numerous abdominal functions outperformed passive or narrowly targeted therapies in the literature. In postpartum women 3–36 weeks postpartum, a structured core-strengthening program reduced IRD by −0.57 cm above the umbilicus at rest, −0.31 cm below it at rest, and −0.4 cm during contraction. In an online core-training cohort, IRD decreased from 2.79 cm to 1.95 cm at 24 weeks in the group that continued training[32]. An immediate-effects two-dimensional ultrasonography investigation found that abdominal crunch workouts lowered IRD whereas abdominal drawing-in did not, emphasizing exercise specificity[33]. Meta-analytic syntheses show that abdominal workouts resulted in a mean difference (MD) of -6.82 mm, while multimodal exercise with co-interventions resulted in an extra MD of -3.56 mm[22]. A network meta-analysis found that multimodal therapies including deep and superficial abdominal training and adjuncts had the largest effect estimates, ranging from -22.6 to -26.3 mm compared to no-treatment options[25]. This topic has moderate confidence: direction of impact is constant, but program content, dosage, postpartum timing, and diagnostic thresholds vary greatly.

3.3.2 NMES is a promising adjunct, particularly when combined with abdominal exercise.

An early-postpartum matched study found that NMES significantly reduced IRD from 2.78 ± 0.75 cm to 2.31 ± 0.56 cm above the umbilicus, from 3.72 ± 0.58 cm to 2.97 ± 0.48 cm at the umbilicus, and from 1.58 ± 1.0 cm to 1.22

± 0.84 cm below it, with better outcomes than health education alone[26]. In an RCT of women >6 months postpartum, kinesiotherapy and physical agents (tecar treatment, electromagnetic shock waves, and NMES) reduced supraumbilical IRD by 0.80 cm and infraumbilical IRD by 0.74 cm[27]. The combination therapy outperformed either component alone in another RCT[35]. This supports the network meta-analysis, which found electrical stimulation to be an effective adjunct[25]. Findings are convergent but from packaged protocols rather than independent NMES therapies, therefore confidence is limited.

3.3.3 Passive or low-intensity strategies show smaller or inconsistent effects.

Passive therapies were less effective than vigorous abdominal training or NMES regimens. Network meta-analysis revealed limited effectiveness of kinesiotaping (MD = -3.93; 95% CI -6.20 to -1.65) and moderate-to-low effectiveness of abdominal binders (MD = -10.32; 95% CI -13.81 to -6.83)[25]. A pilot RCT of abdominal binding with trunk exercises found beneficial benefits on body image in both binding-alone and combined-therapy groups, with the combination group improving trunk flexion strength the greatest (Cohen's d = 0.7)[34]. Conservative therapies rarely reduce IRD, according to a larger systematic analysis[24].

3.3.4 Ultrasound is the most valid and reliable IRD assessment method.

Extended field-of-view ultrasound techniques showed no significant difference from conventional ultrasound (P = 0.441), great correlation with conventional imaging (r > 0.95, P < 0.0001), SEM of 0.17–0.18 cm, and high between-trial reliability ($ICC_{3,1}$ > 14. ICCs > 0.90, SEM < 0.17 cm, and minimum clinically relevant difference values < 0.46 cm at or above the umbilicus indicated strong between-session reliability for experienced ultrasonography investigators[29]. Intra- and inter-image ICCs were all > 0.75 in early postpartum women, with the highest agreement for dynamic measurements at or above the umbilicus in the supine position (0.972, 0.974, 0.975, and 0.956 at the superior margin, 3 cm above, 5 cm above, and 3 cm below the umbilicus)[30].

3.3.5 Diagnostic heterogeneity is a major source of variability.

DRA operational definitions vary widely: some studies use palpated separation of ≥2 fingerbreadths [1]; others use ≥2 finger widths at multiple sites; while ultrasound-based studies apply thresholds such as IRD ≥2.0 cm or >2.2 cm measured 2 cm above the umbilicus. Prevalence estimates vary substantially over time — 60.0% at 6 weeks, 45.4% at 6 months and 32.6% at 12 months postpartum in one cohort[19] — but these values reflect palpation-based definitions rather than a unified imaging threshold. Because palpation and ultrasound are not equivalent in precision, classification differences may partly explain why some trials report stronger intervention effects than others [8,20]. Confidence is moderate: heterogeneity clearly matters, but no single harmonised standard exists.

3.4 Summary of Evidence

Table 2. Summary of thematic findings.

Theme	Key finding	Population applicability	Direction	Confidence
Comprehensive exercise rehabilitation	Abdominal exercises vs no intervention: MD = −6.82 mm; multimodal + co-interventions: additional MD = −3.56 mm	Postpartum women with imaging- or clinically-confirmed DRA	Positive	Moderate
NMES and multimodal adjuncts	NMES reduced IRD from 2.78±0.75 to 2.31±0.56 cm, 3.72±0.58 to 2.97±0.48 cm, and 1.58±1.0 to 1.22±0.84 cm across three sites	Early postpartum and >6 months postpartum women	Positive	Moderate
Passive adjuncts	Kinesiotaping MD = −3.93; abdominal binders MD = −10.32; less effective than active programs	Postpartum women in conservative rehabilitation studies	Mixed	Limited
Measurement validity	Extended field-of-view USI: r > 0.95, P < 0.0001; SEM 0.17–0.18 cm; ICCs > 0.90	Postpartum women; strongest when measurements are standardised	Positive	Strong
Diagnostic heterogeneity	Thresholds range from ≥2 fingerbreadths on palpation to IRD ≥2.0 cm or >2.2 cm on imaging	Postpartum women across studies	Mixed	Moderate

Abbreviations: *ICC, intraclass correlation coefficient; IRD, inter-rectus distance; MD, mean difference; NMES, neuromuscular electrical stimulation; SEM, standard error of measurement; USI, ultrasound imaging.*

4. DISCUSSION

4.1 Principal Findings

This scoping review provides a map of the current physiotherapy-based evidence for postpartum DRA in both the rehabilitation and measurement domains. Postpartum DRA rehabilitation is most likely to benefit from active, multi-component physiotherapy approaches rather than isolated passive measures. Programs combining abdominal strengthening with additional modalities—particularly NMES—offer the better IRD reductions, with change seen at multiple abdominal measurement sites rather than one, supporting genuine change in abdominal wall behaviour rather than localised measurement artefact[26,32]. This is consistent with conceptualising DRA as a functional impairment of the abdominal wall rather than a purely static widening of tissue: interventions that recruit both superficial and deep abdominal structures may provide a stronger mechanical stimulus for restoring linea alba tension than strategies that primarily compress or cue without substantial muscle loading.

This synthesis is most supported by measurement literature. Ultrasound reliability is good, especially above and at the umbilicus in the supine position, and extended field-of-view techniques allow wider separations without reducing validity 14–16. Treatment trials are only as interpretable as their response quantification methodologies. Palpation-based classification is imprecise and may bias classification[8,19]. Methodological ambiguity in postpartum DRA rehabilitation may be greater than biological.

4.2 Comparison with Existing Literature

The review literature agrees that conservative exercise may assist, but evidence is low to extremely low and there is no common protocol [21,22–24]. Use caution when interpreting null results. A supervised postpartum training program that focused on pelvic floor strength did not lower DRA prevalence despite adequate duration[31]; pelvis-dominant programs may not provide enough direct abdominal wall loading to change IRD. Exercise specificity is also important, since abdominal drawing-in exercises did not lower IRD but abdominal crunches did [33]. Thus, study discrepancies may be due to exercise dose, target musculature, and outcome definition rather than therapeutic potential.

4.3 Practical Implications

In clinical experience, postpartum women with DRA benefit more from active abdominal rehabilitation than passive assistance. Compared to pelvis-dominant or compressive programs, core strengthening, gradual abdominal loading, and NMES are more promising. When accessible, ultrasound should be used for assessment; measures at or above the umbilicus in the supine position are most accurate, and expanded field-of-view approaches are best for bigger separations. For services and policy, findings recommend organized postpartum recovery paths over advice-only alternatives.

4.4 Strengths and Limitations

Strengths: integration of intervention, longitudinal observational and measurement-validation research within a single postpartum-specific framework; pre-registration (INPLASY202540042); PRISMA-ScR-compliant reporting. Limitations: substantial heterogeneity in intervention protocols, comparators, diagnostic thresholds and outcome definitions across included studies; many primary studies were small or non-randomised; English-language restriction; and abstract-based extraction for a subset of studies. Consistent with PRISMA-ScR guidance, no formal risk-of-bias appraisal was conducted.

5. CONCLUSION

Physiotherapy can alleviate postpartum diastasis recti abdominis, although aggressive, multi-component programs are more effective than passive support or low-intensity treatments. Core-strengthening and NMES-containing regimens can reduce IRD by 0.5–0.8 cm across abdominal sites, yielding the best results. The most defendable measurement modality is ultrasound, including expanded field-of-view techniques ($r > 0.95$; SEM 0.17–0.18 cm; ICCs > 0.90). Which standardized physiotherapy routine improves IRD and patient-important functional outcomes over time is the main question.

DECLARATIONS

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