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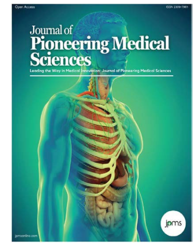

Effect of Structured 6-Inch Double Leg Raise Hold Exercises in Improving Abdominal Muscle Endurance and Functional Recovery of Women Following Lower-Segment Cesarean Section

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Abstract **Objectives:** Globally, the Lower Segment Cesarean Section (LSCS) was the most commonly performed abdominal procedure, with an incidence of 25%. It is an obstetric operative procedure where a surgical incision is made in the abdominal wall and the lower uterine segment to deliver the fetus. It is performed for maternal and fetal issues and at the mother's request. This assessor-blinded, quasi-randomised controlled clinical trial aimed to evaluate, in a structured manner, the efficacy of 6-inch Double Leg Raise Hold exercises compared with conventional postnatal exercises after LSCS. An odd-even sequence of quasi-randomisation was used for the assigned thirty women (15/group). Outcome assessment was blinded. The main outcomes were the Trunk Flexor Endurance Test (TFET) and the Postpartum Physical Function Scale (PPFS). Normality was tested with the Shapiro–Wilk test. Paired t-tests were used for within-group comparisons and independent t-tests for between-group differences. Cohen's d and 95% confidence intervals were reported. Sample size was calculated using G*Power (80% power, α=0.05). Both groups improved trunk flexor endurance, but the intervention group was more effective in improving postpartum physical function outcomes. Structured 6-inch double-leg-raise hold exercises may be included in post-LSCS rehabilitation to improve trunk endurance and functional recovery.

Key Words Cesarean Section, Randomised Controlled Trial, Postpartum Rehabilitation, Core Stability and Exercise Therapy

INTRODUCTION

The physiological state of women, characterised by progressive maternal adaptations to support the growing uterus, is called Pregnancy. It is defined by a gestational age of 40 weeks. The mode of delivery can be vaginal or lower-segment cesarean section [LSCS]. Globally, the LSCS was the most commonly performed abdominal procedure with an incidence of 25% [1] It is an obstetric operative procedure where a surgical incision is made in the abdominal wall and the lower uterine segment to deliver the fetus, so it is known as Lower Segment Cesarean Section (LSCS) [2]. LSCS is a surgical procedure performed due to maternal and fetal issues and also at the request of the mother. After the LSCS procedure, most women experience discomfort or pain at the suture site, followed by Lower back pain, abdominal pain and pelvic floor muscle weakness [3]. LSCS is performed when a normal vaginal delivery is contraindicated for the mother and the fetus. This procedure carries its own risks for the mother and the baby [4]. The incidence of LSCS is increasing day by day in India and globally. A cross-sectional study found rates of about 20% in public hospitals, 38% in charitable medical institutions and 47% in private hospitals [5]. The period after delivery is known as the postnatal period, also called the fourth trimester, typically ending after 6-8 weeks, not the recovery period [6]. LSCS is one of the most commonly performed major abdominal operations in women in both affluent and low-income countries. Rates vary considerably between countries and health services [7].

There was a great rise in LSCS globally. It was also linked with morbidity; it was one of the most commonly done surgical procedures in pregnancy [8-10].

In 2021, the US reported an increase in LSCS from 20.7% to over 60% [11-13]. The UK report reported an increase from 14-40% [14] and globally, it was reported that there was a high incidence of 62.5% of emergency LSCS and 37.5% elective LSCS [15]. Based on the psychometric properties, the outcome measures were selected for the study. The Trunk Flexor Endurance Test has its own reliability and validity; clinically, it's a widely used tool for assessing the trunk flexors [16]. Evans et al. stated that it is very useful in evaluating the performance of core musculature. The Postpartum Functional Assessment Scale [17] was used to assess women's functional status across the domains of mobility, self-care and child care. The literature shows that the PPFS has strong reliability and validity, which will help in utilising clinical research. Both instruments have demonstrated acceptable psychometric properties in previous studies of postpartum women and populations with abdominal and functional impairments. According to previous studies, the 6-inch Double Leg Raise hold exercise helps in improving core strength and stability [18], with an intention to provide good strength to abdominal muscles with less utilisation of time for LSCS women 6-inch Double Leg Raise hold exercise was selected.

This study aimed to compare the effectiveness of traditional postnatal exercises and the 6-inch Double Leg Raise hold exercise to determine whether these exercises improve trunk flexor endurance and postpartum physical function in women after LSCS. We hypothesised that both groups may show improvement, but the Double Leg Raise hold intervention would provide superior functional recovery compared with traditional postnatal exercises.

METHODS

A Prospective, two-arm, assessor-blinded quasi-randomised controlled clinical trial was conducted and participants were allocated using an odd-even sequence. Hence, the allocation was quasi-random rather than truly random. The outcome assessor was blinded, but the participants and treating therapists were not, given the nature of the exercise interventions (Figure 1).

The study was clearly explained to the subjects and informed consent was obtained from them. Confidentiality was maintained throughout the study. Women aged 20 to 40 years, primiparous mothers who underwent elective or emergency LSCS and had no complications during early mobilisation were included in the study. Postnatal women with complications, sedentary women and women who underwent NVD were excluded from the study. The outcomes used in the study were the Trunk Flexor Endurance Test (TFET) and the Postpartum Physical Function Scale (PPFS). After baseline assessment and confirmation of eligibility, participants were randomly allocated to either the Traditional Postnatal exercises (TP) group or the Double Leg Raise (DL) exercise group by an odd-even sequential allocation method. Participants were randomly allocated into groups based on the recruitment order, with odd-numbered participants assigned to the TP group and even-numbered participants allocated to the DLR group. Allocation concealment procedures were not formal (e.g. sealed opaque envelopes or centralised randomisation) as allocation was done in a predetermined sequence. So the study was considered a quasi-randomised controlled trial. All exercise sessions were delivered by the same physiotherapist who had clinical experience in women's health physiotherapy, to ensure consistency of intervention delivery.

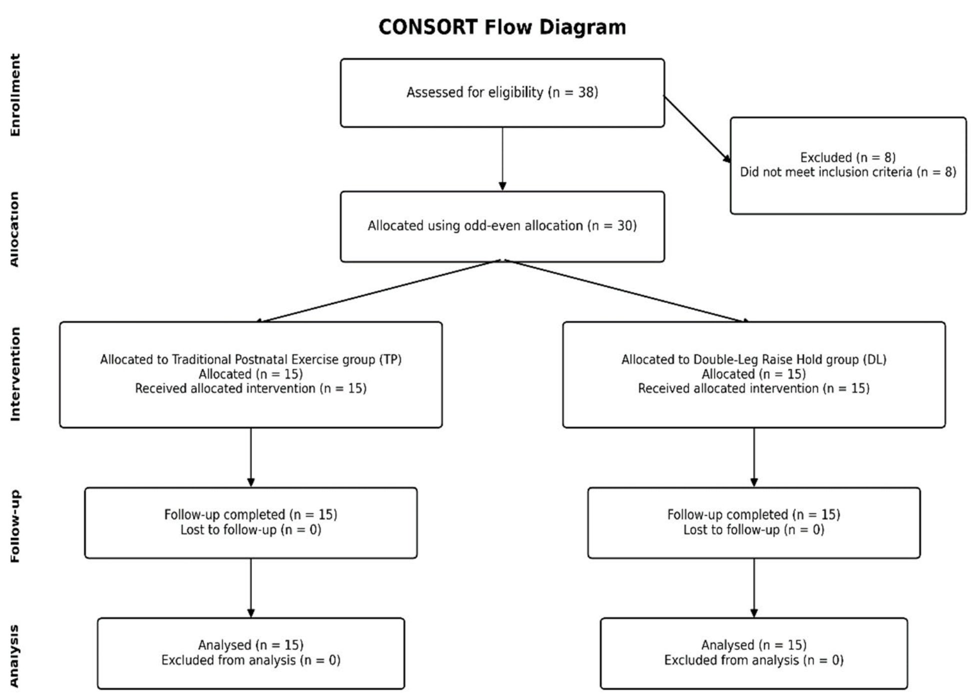

Figure 1: Consort Flow Diagram of Data Presentation

All subjects were divided into 2 groups using the odd-even sampling method. Subjects were divided into 2 groups: Traditional Postnatal exercises (Group TP), the control group and Double Leg Raise Hold (Group DL), the experimental group, with 15 subjects in each group. Group TP was treated with traditional postnatal exercises and Group DL was treated with 6-Inch Double Leg Raise Hold exercises.

Group TP

After 8 weeks of the postpartum period, the subjects were instructed to perform upper- and lower-limb active range-of-motion exercises, followed by transverse abdominis activation and Kegel exercises with a 5-10 second hold, repeated 10 times, gradually increasing the count to 100 times. After 10 weeks, the subjects were allowed to perform the single-leg and double-leg abdominal presses.

Group-DL

After 8 weeks of the postpartum period, the subjects were instructed to perform upper- and lower-limb active range-of-motion exercises, followed by transverse abdominis activation and Kegel exercises with a 5- to 10-second hold, repeated 10 times and the count was gradually increased to 100 times. After 10 weeks, the subjects were allowed to perform the 6-Inch Double-Leg Raise Hold.

A standardised intervention protocol was developed prior to participant recruitment, detailing exercise techniques, criteria for progression, duration, frequency and instructions for participants, which were the same till the end of the 8th week of the study. The only difference between the two intervention groups was the change during the 10th week baseline education and the follow-up schedule was identical in both groups. Attendance records and exercise compliance logs assessed participant adherence during the intervention period. Adherence to the exercise programme was monitored throughout the study and participants were encouraged to complete all prescribed exercise sessions. There were no major protocol deviations during the study. All participants were treated according to the pre-defined study protocol and included in the final statistical analysis. No adverse event requiring modification or cessation of the intervention was reported.

RESULTS

In Table 1 baseline comparison between experimental and control groups. There were no statistically significant differences between groups for scores on the Trunk Flexor Endurance Assessment (TFEA) (Experimental: 28.27±5.07; Control: 27.80±5.09; p = 0.80) or the Postpartum Physical Function Scale (PPFS) (Experimental: 54.60±3.33; Control: 54.33±3.56; p = 0.83). These results show that the groups were similar prior to the intervention.

Table 2 indicates that both intervention groups had statistically significant improvements from baseline to post-intervention. The experimental group in TFEA improved by 41.07±10.04 points (t(14) = 15.843, 95% CI: 35.51-46.63, p <0.001), with a very large within-group effect size (Cohen's dz = 4.09). The control group also demonstrated improvement (36.53±3.80 points; t(14) = 37.274, 95% CI: 34.43-38.64, p<0.001) with an extremely large effect size (dz = 9.62). The experimental group showed a mean improvement of 40.73±4.01 in PPFS (t(14) = 39.358, 95% CI: 38.51–42.95, p<0.001) and a Cohen's dz of 10.16. The control group showed a significant improvement with a mean change of 35.20±2.24 points (t(14) = 60.795, 95% CI: 33.96–36.44, p<0.001) and an effect size of 15.70. Generally, both interventions resulted in highly significant within-group improvements in trunk flexor endurance and physical function postpartum.

The between-group comparison of change scores is shown in Table 3 Levene’s test for TFEA indicated unequal variances (F = 5.432, p = 0.027) and thus Welch’s independent t-test was used. The experimental group did better than the control group, but the difference was not statistically significant (t(17.923) = 1.636, 95% CI: -1.29 to 10.36, p = 0.119). The effect size between groups was moderate (Cohen’s d = 0.60, Hedges’ g = 0.58).

Table 1: Baseline Characteristics

Outcome	Experimental Mean±SD	Control Mean±SD	p-value
TFEA (pre-intervention)	28.27±5.07	27.80±5.09	0.80
PPFS (pre-intervention)	54.60±3.33	54.33±3.56	0.83

Note. TFEA = Trunk Flexor Endurance Assessment, PPFS = Postpartum Physical Function Scale, SD = Standard Deviation. P-values are reported to three decimal places

Table 2: Within-Group Comparisons

Group and Outcome	Mean Change±SD	t(df)	95% CI	Cohen's dz	p-value
Experimental group-TFEA	41.07±10.04	15.843 (14)	35.51,46.63	4.09	<0.001
Control group-TFEA	36.53±3.80	37.274 (14)	34.43,38.64	9.62	<0.001
Experimental group-PPFS	40.73±4.01	39.358 (14)	38.51,42.95	10.16	<0.001
Control group-PPFS	35.20±2.24	60.795 (14)	33.96,36.44	15.70	<0.001

Note. TFEA = Trunk Flexor Endurance Assessment, PPFS = Postpartum Physical Function Scale, SD = Standard Deviation, CI = Confidence Interval, df = degrees of freedom; dz = paired-samples standardised mean difference. Values reported by the statistical software as 0.000 are presented as p<0.001

Table 3: Between-Group Change (Welch)

Outcome	Levene’s F (p-value)	Welch’s t (df)	95% CI	Cohen’s d	Hedges’ g	p-value
TFEA	5.432 (0.027)	1.636 (17.923)	-1.29,10.36	0.60	0.58	0.119
PPFS	2.684 (0.113)	4.666 (21.982)	3.07,7.99	1.70	1.66	<0.001

Note. TFEA = Trunk Flexor Endurance Assessment, PPFS = Postpartum Physical Function Scale, CI = Confidence Interval, df = degrees of freedom. The PPFS p-value is reported to four decimal places because it is below 0.001

Table 4: Summary of Effect Size

Outcome	Within-group dz: experimental	Within-group dz: control	Between-group d	Hedges' g
TFEA	4.09	9.62	0.60	0.58
PPFS	10.16	15.70	1.70	1.66

Homogeneity of variance for PPFS was met, as shown by Levene's test (F = 2.684, p = 0.113). The experimental group showed significantly greater improvement than the control group (t(21.982) = 4.666, 95% CI: 3.07-7.99, p<0.001). Effect size was large, with Cohen's d being 1.70 and Hedges' g being 1.66.

Table 4 presents the effect sizes for the two outcomes. Both groups had extremely large within-group effect sizes for TFEA and PPFS, demonstrating substantial improvements following interventions. The between-group analysis revealed a moderate effect for TFEA (d = 0.60; Hedges' g = 0.58), which was not statistically significant and a large between-group effect for PPFS (d = 1.70; Hedges' g = 1.66), indicating a greater improvement in postpartum physical function in the experimental group compared to the control group.

Baseline TFEA and PPFS scores did not differ significantly between the experimental and control groups (ps>0.05), indicating comparable groups before intervention. Paired-samples t-tests demonstrated significant improvements in both groups for TFEA and PPFS (all ps<0.001). Between-group analyses were performed on change scores. Because Levene's test indicated unequal variances for TFEA change scores, Welch's independent-samples t-test was used. The experimental group showed a greater mean improvement than the control group; however, the difference was not statistically significant, t(17.923) = 1.636, p = 0.119, 95% CI [-1.29,10.36], g = 0.58. For PPFS, Welch's t-test demonstrated significantly greater improvement in the experimental group than the control group, t(21.982) = 4.666, p<0.001, 95% CI [3.07,7.99], g = 1.66, indicating a large between-group effect.

DISCUSSION

Important muscles affected after LSCS. The transversus abdominis is an important deep core muscle that acts as a stabiliser. The power was lost and the Rectus abdominis became weak due to incision pain and tissue separation. Internal and external obliques are affected due to maternal changes. The pelvic floor muscles, primarily the levator ani group, were also indirectly affected. The multifidus, also known as the lumbar stabiliser, can weaken due to core disconnection. All the muscles lose power during the LSCS procedure. Surgical incision cuts were made through the abdominal fascia and skin layers, reflex inhibition of abdominal activation, reduction of its use in pregnancy, inactivity during the postpartum period due to Diastasis recti, altered breathing pattern and improper postural habits. Among all the muscles, the transversus abdominis, the primary stabiliser of the core musculature, is very important to restore strength first. If the muscles are not strengthened properly, there is a risk of developing back pain or increased lumbar lordosis and of losing stability during walking and bending, which can also reduce balance and coordination. Weak abdominal muscles can also cause urinary incontinence, pelvic organ prolapse and other issues, so it is very important to strengthen them.

This study evaluated the effectiveness of Double Leg Raise Hold exercises versus traditional postnatal exercises on trunk flexor endurance and postpartum physical function. The results indicated a significant improvement in the DL group compared with the TP group, suggesting that abdominal strengthening exercises play a major role in enhancing abdominal muscle strength, thereby improving endurance and physical function in the postpartum period. There was greater improvement in the DL group, enhancing activation of deep core muscles, including the transversus abdominis, rectus abdominis and the pelvic floor, which often lose power during LSCS [19]. The 6-inch double-leg raise hold provides an isometric contraction of the muscles, making it a safer exercise after any surgery. This kind of exercise provides muscle endurance and neuromuscular control more effectively than traditional exercises. The literature suggests that structured postnatal exercises, primarily targeting the core muscles, support postpartum recovery and improve abdominal muscle strength compared with generalised exercises. Dhupkar and Pandit [3] also reported improved functional recovery [20] among post-LSCS women through structured group-based exercises. Moreover, Yadav *et al.* [21] stated that physiotherapy interventions involving relaxation and strengthening exercises primarily improve functional activity and quality of life in postpartum women with LSCS.

The current study also shows a marked improvement in the DL group, evidenced by strengthening of all abdominal muscles, as measured by the trunk flexor endurance test and the postpartum functional scale. In the PPFS, there was an improvement in scores, suggesting an enhanced ability to perform activities such as mobility, self-care and infant handling, which are very helpful in the daily life of a postpartum mother.6-inch double-leg raise exercises were explained clearly, with the benefits of progressive overload [22] and the role of sustained muscle action in helping re-establish abdominal strength following a surgical procedure. The findings of this study are consistent with prior studies documenting the benefits of structured postpartum core strengthening for abdominal endurance and functional recovery following LSCS. The current results are consistent with earlier randomised studies demonstrating improvements in trunk endurance and physical function following progressive stabilisation exercises.

The improved results in the Double Leg Raise (DLR) group were attributed to the prolonged isometric contraction of the transversus abdominis, rectus abdominis and internal and external oblique muscles, which enhanced neuromuscular control and trunk stability [23,24]. Isometric activation of the muscles improves motor-unit recruitment, muscular endurance and feed-forward activation of the core musculature, thereby improving lumbopelvic stability by minimising excessive movement across healing abdominal tissues after LSCS [25,26,27]. Increased activation of the deep abdominal musculature facilitates optimal load transfer through the trunk, thereby improving postural control and functional performance during postpartum recovery [26,28,29]. The present study results were consistent with previous studies reporting significant improvements in abdominal endurance, trunk stability and functional recovery after cesarean delivery with structured postpartum core-strengthening programs [29,30]. Similarly, prior randomised controlled trials investigating progressive core stabilisation and abdominal strengthening exercises have shown significant improvements in trunk endurance, pain reduction and physical function among postpartum women, supporting the effectiveness of targeted rehabilitation interventions following LSCS [30-32]. In the current study, statistically significant improvement in trunk flexion endurance and postpartum physical function was seen after the intervention. However, statistical significance does not necessarily mean clinical relevance. The observed improvements in TFET and PPFS scores suggest meaningful functional benefits for postpartum women, as enhanced trunk endurance and physical function may facilitate better performance of daily activities, improve mobility and support recovery following lower segment cesarean section. Thus, the interpretation of the results should take into account both the statistical significance and the clinical relevance of the observed functional improvements. The significant between-group difference in PPFS scores indicates a greater improvement in postpartum physical function in the intervention group. These findings may indicate that the specific exercise approach contributed not only to improved muscle endurance but also to enhanced functional performance and recovery-related activities during the postpartum period.

CONCLUSION

The findings of this study indicated that both interventions of exercise improved the endurance of trunk flexors and postpartum physical function after lower segment cesarean section. Both groups improved trunk flexor endurance; however, the intervention group was more effective in improving postpartum physical function outcomes. The results suggest that the intervention may have clinical utility as part of postpartum rehabilitation.

External validity and generalisability may be limited due to single-centre recruitment. To confirm the present results across different populations, further multi-centre studies with larger sample sizes are suggested.

Acknowledgement

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Author Contributions

Dasarapu Indrani: Conceptualization, study design, manuscript drafting; Shenbaga Sundaram Subramanian: Definition of intellectual content, Supervision, guarantor; Prathap Suganthirababu and Jagatheesan Alagesan: Clinical studies, data acquisition, manuscript preparation; K.Himabindu and MD.Varoof Basha: literature search; Chalavadi Nagendra Babu and Kavitha Ramanathan: Data Analysis; Dubba Nagaraju: Manuscript review.

Conflicts of Interest

The authors report no conflicts of interest.

Data Availability Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Clinical Trial Registration

The study was retrospectively registered at ClinicalTrials.gov (Identifier: NCT07367334).

Declaration of Generative AI in Scientific Writing

No generative artificial intelligence or AI-assisted technologies were used in the preparation, writing, analysis or editing of this manuscript.

Ethical Statement

The study was approved by the SMCH Institutional Ethical Committee (Approval No: 006/12/2021/IEC/SMCH).

REFERENCES

[1] Patel, P. *et al.* "Effect of physiotherapy treatment in the early postpartum period after Lower Segment Caesarean Section (LSCS)." *International Journal of Current Research and Review*, vol. 13, no. 12, 2021, pp. 155.

[2] Bhoite, S.S. *et al.* "Physiotherapy management for primary peritoneal serous carcinoma with lower segment caesarean section: A case report." *Cureus*, vol. 16, no. 2, 2024.

[3] Dhupkar, A. and Pandit, A. "Group therapy Vs individual therapy post lower segment caesarean section: Preferred mode of exercising." *Indian Journal of Physiotherapy and Occupational Therapy*, vol. 10, no. 2, 2016, pp. 1-4.

[4] Yadav, N.K. *et al.* "Effectiveness of Benson's relaxation and Mitchell's relaxation along with conventional physiotherapy exercise on pain, urinary incontinence, sleep quality and activities of daily living in lower segmental caesarean section: A comparative study." *Trials*, 2026.

[5] Gupta, A. *et al.* "Assessment of indications, risk factors and materno-fetal outcomes of LSCS (emergency and planned) in a tertiary care rural hospital of Wardha District, India." *Journal of Pharmaceutical Research International*, vol. 33, no. 38B, 2021, pp. 253–258.

[6] Ludington-Hoe, S.M. "Postpartum: Development of maternicity." *AJN: The American Journal of Nursing*, vol. 77, no. 7, 1977, pp. 1171–1172.

[7] Hofmeyr, G.J. *et al.* "Techniques for caesarean section." *The Cochrane Database of Systematic Reviews*, no. 1, 2008, Article CD004662.

[8] Betran, A.P. *et al.* "Trends and projections of caesarean section rates: Global and regional estimates." *BMJ Global Health*, vol. 6, 2021.

[9] Belizán, J.M. *et al.* "Health consequences of the increasing caesarean section rates." *Epidemiology*, vol. 18, no. 4, 2007, pp. 485-486.

[10] Villar, J. *et al.* "Cesarean delivery rates and pregnancy outcomes: The 2005 WHO global survey on maternal and perinatal health in Latin America." *The Lancet*, vol. 367, no. 9525, 2006, pp. 1819–1829.

[11] Hamilton, B.E. *et al.* "Births: Final data for 2014." *National Vital Statistics Reports*, vol. 64, no. 12, 2015, pp. 1–64.

[12] Ifeyinwa, N.V. *et al.* "Analysis of the effects of double straight leg raise and abdominal crunch exercises on core stability." *International Journal of Clinical Medicine and Surgery Research*, vol. 4, no. 4, 2021, pp. 36-44.

[13] Stephenson, J. "Rate of first-time cesarean deliveries on the rise in the US." *JAMA Health Forum*, vol. 3, no. 7, 2022, Article e222824.

[14] Yu, C. *UK C-Section Rates 2023: Stats, Perspectives and Guidance.* 2023.

[15] Ali, M. *et al.* "Maternal and fetal outcome: Comparison between emergency caesarean section versus elective caesarean section." *Professional Medical Journal*, vol. 12, no. 1, 2005, pp. 32-39.

[16] Evans, K. *et al.* "Trunk muscle endurance tests: Reliability and gender differences in athletes." *Journal of Science and Medicine in Sport*, vol. 10, no. 6, 2007, pp. 447-455.

[17] Filipec, M. *et al.* "New assessment tool-Postpartum functional assessment questionnaire." *Medicina*, vol. 59, no. 7, 2023, pp. 1219.

[18] Lynch, B.J. *A Multi-Study Investigation: Biomechanical Analysis of Single-Leg Drop Vertical Jumps (Kinematics and Kinetics) and a Systematic Review of Core Strengthening Effect on Outcomes Following Anterior Cruciate Ligament Reconstruction.* Doctoral dissertation, University of Jamestown.

[19] Indrani, D. *et al.* "Effect of different plank positions on enhancing abdominal strength and stability in women undergoing lower-segment cesarean section." *Health Education and Health Promotion*, vol. 12, no. 3, 2025, pp. 547–552.

[20] Dhupkar, A. and Pandit, A. "Group Therapy Vs Individual Therapy Post Lower Segment Caesarean Section: Preferred Mode of Exercising." *Indian Journal of Physiotherapy and Occupational Therapy*, vol. 10, no. 2, 2016, pp. 1–4.

[21] Yadav, T. and Vyas, V. "Synergising Postural Support, Pain Assessment and Skin Health in Physiotherapy." *Physiotherapy Using Artificial Intelligence: Enhancing Biomechanics for Optimal Rehabilitation*, 2026, pp. 231-251.

[22] Kumar, M.S. and Vinayakan, K. "The science of strength: Understanding the principles of effective weight training." *Indo American Journal of Multidisciplinary Research and Review*, vol. 8, no. 2, 2024, pp. 149-159.

[23] Hodges, P.W. and Richardson, C.A. "Contraction of the abdominal muscles associated with movement of the lower limb." *Physical Therapy*, vol. 77, no. 2, 1997, pp. 132-142.

[24] Richardson, C., Hodges, P.W. and Hides, J. *Therapeutic Exercise for Lumbopelvic Stabilization.* Churchill Livingstone, 2004.

[25] Hodges, P.W. and Richardson, C.A. "Inefficient muscular stabilization of the lumbar spine associated with low back pain: A motor control evaluation of transversus abdominis." *Spine*, vol. 21, no. 22, 1996, pp. 2640–2650.

[26] Kibler, W.B. *et al.* "The role of core stability in athletic function." *Sports Medicine*, vol. 36, no. 3, 2006, pp. 189-198.

[27] Granacher, U. *et al.* "Effects of core instability strength training on trunk muscle strength, spinal mobility, dynamic balance and functional mobility in older adults." *Gerontology*, vol. 59, no. 2, 2013, pp. 105-113.

[28] Lee, D.G. *The Pelvic Girdle: An Integration of Clinical Expertise and Research.* Elsevier Health Sciences, 2011.

[29] Ren, S. *et al.* "The effect of pelvic floor muscle training on pelvic floor dysfunction in pregnant and postpartum women." *Physical Activity and Health*, vol. 4, no. 1, 2020.

[30] Sperstad, J.B. *et al.* "Diastasis recti abdominis during pregnancy and 12 months postpartum: Prevalence and risk factors." *British Journal of Sports Medicine*, vol. 50, no. 17, 2016, pp. 1092-1096.

[31] Sperstad, J.B. *et al.* "Diastasis recti abdominis during pregnancy and 12 months postpartum: Prevalence and risk factors." *British Journal of Sports Medicine*, vol. 50, no. 17, 2016, pp. 1092-1096.

[32] Benjamin, D.R. *et al.* "Effects of exercise on diastasis of the rectus abdominis muscle in the antenatal and postnatal periods: A systematic review." *Physiotherapy*, vol. 100, no. 1, 2014, pp. 1-8. https://doi.org/10.1016/j.physio.2013.08.005

[33] Mota, P. *et al.* "Reliability of the inter-rectus distance measured by ultrasound imaging measurement." *Physical Therapy*, vol. 92, no. 2, 2012, pp. 236-245.