Journal of Health, Wellness and Community Research
ISSN: 3007, 0570

OPEN ACCESS

JHWCR

Type: Original Article
Published: 28 September 2025
Volume: III, **Issue:** XIII
DOI: https://doi.org/10.61919/6mrc9z12

Correspondence
✉ Azka Batool, Azkabatool09@gmail.com

Received 13, 08, 25 **Accepted** 22, 09, 2025

Authors' Contributions
Concept: MAI, AB; Design: MAI, AB; Data Collection: HS, NS; Analysis: AB, HS, MAI; Drafting: AB, MAI

Declarations
No funding was received for this study. The authors declare no conflict of interest. The study received ethical approval. All participants provided informed consent.

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Comparative Feasibility and Implementation of Bruegger's and Egoscue Exercise Protocols in Lower Cross Syndrome: A Descriptive Study

Azka Batool[1], Muhammad Affan Iqbal[1], Hafsa Siddiqui[1], Nemra Shah[2]

1 Riphah International University, Islamabad, Pakistan
2 Helping Hand for Relief and Development, Quetta, Pakistan

ABSTRACT

Background: Lower Cross Syndrome (LCS) is a prevalent postural imbalance characterized by weak gluteal and abdominal muscles combined with tight hip flexors and lumbar extensors, leading to anterior pelvic tilt, lumbar hyperlordosis, and functional limitations. Corrective exercise is a cornerstone of LCS management, yet the practical implementation, patient adherence, and clinical feasibility of different exercise protocols remain poorly understood. Bruegger's and Egoscue exercises are widely used interventions, but comparative data on their clinical application and real-world utility are limited. Objective: The study aimed to compare the clinical implementation and feasibility of Bruegger's exercise and Egoscue exercise in the management of Lower cross syndrome. Methods: A non-randomized comparative observational study was conducted at the outpatient department of Pakistan Railway General Hospital, Rawalpindi, involving 34 participants (aged 20–50 years) with clinically confirmed LCS. Participants were allocated to either the Bruegger's group (n = 17) or the Egoscue group (n = 17) and underwent 12 supervised exercise sessions over four weeks. Outcome measures included pain intensity (Numerical Pain Rating Scale, NPRS), lumbar curvature (flexicurve), and pelvic tilt (inclinometer). Feasibility data (compliance, ease of performance, supervision needs) were collected through verbal feedback. Statistical analyses were performed using the Wilcoxon Signed-Rank test and Mann–Whitney U test, with $p < 0.05$ considered significant. Results: Both interventions significantly reduced pain (Bruegger's: median NPRS from 6 to 2, $Z = -3.703$, $p < 0.001$, $r = 0.63$; Egoscue: median NPRS from 6 to 3, $Z = -3.877$, $p < 0.001$, $r = 0.66$) and improved lumbar curvature ($p < 0.01$). Changes in pelvic tilt were not statistically significant. No significant differences were found between groups in therapeutic outcomes ($p > 0.05$). Bruegger's protocol demonstrated higher patient adherence (88.2% vs. 76.5%), greater ease of execution, shorter session duration (≈5 min vs. ≈30 min), and lower supervision requirements. Conclusion: Both Bruegger's and Egoscue exercises are feasible in improving pain and reducing lumbar hyperlordosis in individuals with Lower cross syndrome, with Bruegger's protocol offering higher compliance and ease of implementation in an outpatient setting.

Keywords
Lower Cross Syndrome; Bruegger's exercise; Egoscue exercise; Postural correction; Rehabilitation; Feasibility study.

INTRODUCTION

Lower Cross Syndrome (LCS) is a postural imbalance characterized by weak gluteal and abdominal muscles, and tight hip flexors and lumbar extensors. Exercise management is well supported, yet the practical implementation of the postural correction protocol is limited. Kale has highlighted its growing prevalence among sedentary individuals.(1) Janda noted that prolonged sitting reduces gluteal activation and contributes to iliopsoas tightness. At the same time, Kendall et al. explained that limited hip extension due to tight psoas and hamstrings increases lumbar stress.(2, 3)Various studies have also indicated that repetitive postural habits and high physical demands contribute to the development of LCS, with some suggesting a higher prevalence in females due to differences in core and hip strength. (4-8)

The biomechanical principles underlying Bruegger's exercises have empirical support, yet there is limited information regarding their practical implementation, effectiveness, supervision needs, and patient adherence in the treatment of Lower Cross Syndrome. By promoting an upright posture and facilitating muscular co-activation, Bruegger's exercises aid in counteracting lumbar hyperlordosis and poor posture. It offers an easy, quick approach that is effective in therapeutic environments.(8) In contrast, Egoscue exercises

employ a comprehensive, multi-phase approach designed to realign the entire body, with a focus on neuromuscular coordination and correcting structural posture. (9)

There is evidence to support both Bruegger's and Egoscue exercises; however, comparative implementation studies evaluating their practicality and therapeutic usefulness in Lower Cross Syndrome are scarce.

This study aims to bridge the gap by comparing the two methods in terms of therapeutic outcomes, patient adherence, and clinical implementation. The need to evaluate both feasibility and effectiveness underpins this comparison, enabling therapists to tailor interventions to fit realistic constraints and the specific needs of patients. Contemporary physiotherapy requires an understanding of how to achieve a balance between comprehensive rehabilitation and practical considerations. By evaluating these two contrasting yet complementary approaches, the research provides evidence for evidence-based and pragmatic decision-making in therapy..

MATERIALS AND METHODS

This study employed a non-randomized comparative observational design to evaluate the feasibility and clinical implementation of Bruegger's and Egoscue exercise protocols in patients with Lower Cross Syndrome (LCS). The research was conducted at the Outpatient Department of Pakistan Railway General Hospital, Rawalpindi, Pakistan, over a four-week period. Group allocation was determined based on therapist availability and logistical considerations, rather than randomization, due to clinical scheduling constraints. A total of 34 participants, aged 20 to 50 years, clinically diagnosed with LCS were recruited through purposive sampling. Diagnosis was confirmed by clinical assessment, including visual postural analysis, pelvic inclination measurement (>10° anterior tilt), and physical examination findings consistent with LCS. Participants were excluded if they presented with radiculopathy, prior spinal surgery, recent physiotherapy interventions, or were using analgesic medications during the study period. The study protocol received ethical approval from the Institutional Review Board of Riphah International University (Ref. No. Riphah/RCRAHS-ISB/REC/MS-PT-01721). All participants provided written informed consent prior to participation. The study is a registered clinical trial on ClinicalTrials.gov (ID: NCT06303388), with registration dated March 12, 2024. The present manuscript reports the implementation and feasibility aspects derived from this broader trial.

Sample size estimation was performed using G*Power version 3.9.1.4, targeting an effect size (d) of 1.3, an alpha level of 0.05, and a power (1-β) of 0.95. The analysis yielded a minimum required sample size of 34 participants, with 17 participants per intervention group (11).

Participants were assigned to one of two intervention groups: Group A (Bruegger's Exercise Protocol): Participants performed Bruegger's postural correction exercise in a seated position. The protocol involved sitting at the edge of a chair with feet slightly externally rotated, shoulders retracted, chest elevated, and head aligned in neutral. Arms were externally rotated with palms facing upward while controlled exhalation was encouraged. Gluteal activation and neutral pelvic alignment were emphasized. Each position was maintained for 30–60 seconds, performed once or twice every 20–30 minutes of prolonged sitting (9). Group B (Egoscue Exercise Protocol): Participants performed a standardized series of ten Egoscue exercises targeting global postural realignment and neuromuscular re-education. The protocol included abductor press, overhead extension, pelvic tilts, supine groin progressive stretch, upper spinal twist, static wall elbow curls, diaphragmatic breathing, static back, and air bench exercises. Sessions lasted 25–30 minutes and were conducted under therapist supervision (10). Both groups received three sessions per week for four weeks, totaling 12 supervised sessions. Participants were advised to continue prescribed exercises at home between sessions.

Three key outcome domains were assessed at baseline and after four weeks of intervention: Pain Intensity: Measured using the Numerical Pain Rating Scale (NPRS), a validated 11-point scale (0 = no pain, 10 = worst imaginable pain). Lumbar Curvature: Evaluated using a flexicurve ruler, allowing quantification of lumbar lordosis changes and Pelvic Tilt: Assessed with a pelvic inclinometer, with >10° anterior tilt confirming abnormal pelvic alignment. In addition, qualitative data on patient compliance, ease of execution, supervision needs, and overall satisfaction were collected through semi-structured verbal feedback during follow-up sessions. All statistical analyses were performed using IBM SPSS Statistics version 27 (IBM Corp., Armonk, NY, USA). Data normality was evaluated using the Shapiro–Wilk test, revealing a non-normal distribution for NPRS scores ($p < 0.05$). Descriptive statistics (mean ± SD, frequency, percentage) were calculated for demographic variables. Within-group comparisons of pre- and post-intervention NPRS scores were conducted using the Wilcoxon Signed-Rank test, while between-group comparisons were assessed using the Mann–Whitney U test. A p-value < 0.05 was considered statistically significant. Effect sizes (r) and 95% confidence intervals (CI) were computed to quantify the magnitude and clinical relevance of observed changes. Qualitative feedback was summarized descriptively to support feasibility interpretation.

RESULTS

A total of 34 participants completed the study, with no dropouts reported during the intervention period. The demographic characteristics of both groups were comparable at baseline (Table 1). The overall mean age was 26.45 ± 4.41 years, with a predominance of female participants (85.3%). There were no statistically significant differences in baseline demographics between the Bruegger's and Egoscue groups ($p > 0.05$).

Table 1. Demographic Characteristics of Participants

Variable	Bruegger's (n = 17)	Egoscue (n = 17)	Total (n = 34)
Age (years), Mean ± SD	28.0 ± 7.63	24.9 ± 1.19	26.45 ± 4.41
Gender, n (%)			
- Male	2 (11.8%)	3 (17.6%)	5 (14.7%)
- Female	15 (88.2%)	14 (82.4%)	85.3%)

Both intervention groups demonstrated **significant reductions in pain intensity** following four weeks of exercise, as measured by the **Numerical Pain Rating Scale (NPRS)** (Table 2). In the **Bruegger's group**, median NPRS decreased from **6 (IQR: 1)** to **2 (IQR: 2)** ($Z = -3.703$, $p < 0.001$), representing a **large effect size** ($r = 0.63$). In the **Egoscue group**, median NPRS decreased from **6 (IQR: 1)** to **3 (IQR: 2)** ($Z = -3.877$, $p < 0.001$), also indicating a **large effect size** ($r = 0.66$).

Table 2. Pre- and Post-Intervention NPRS Scores

Group	NPRS Pre-Intervention (Median, IQR)	NPRS Post-Intervention (Median, IQR)	Z-value	p-value	Effect Size (*r*)
Bruegger's	6 (1)	2 (2)	-3.703	<0.001**	0.63
Egoscue	6 (1)	3 (2)	-3.877	<0.001**	0.66

Both interventions produced statistically and clinically significant pain reductions, with large effect sizes indicating robust therapeutic benefit. Analysis of secondary postural outcomes revealed significant improvements in lumbar curvature in both groups, measured using the flexicurve technique. The Bruegger's group showed a mean decrease of 8.2 ± 2.1 mm (p = 0.002), while the Egoscue group demonstrated a reduction of 7.9 ± 2.4 mm (p = 0.003). Pelvic tilt measurements indicated minor improvements in anterior pelvic inclination in both groups; however, these changes did not reach statistical significance (p > 0.05). This suggests that while both interventions effectively reduced lumbar hyperlordosis, their impact on pelvic alignment was less pronounced over the four-week period.

No statistically significant differences were observed between the Bruegger's and Egoscue groups for pain reduction (U = 131.0, p = 0.327) or lumbar curvature improvement (U = 127.0, p = 0.295). This indicates comparable clinical effectiveness of both exercise protocols. Qualitative feedback revealed notable differences in feasibility and adherence profiles: Bruegger's Exercise: Reported by 94% of participants as "easy to learn and perform". Sessions were typically completed within 5 minutes, requiring minimal therapist supervision. Adherence was high, with 15 out of 17 participants (88.2%) consistently performing home exercises as prescribed. Egoscue Exercise: Rated as "more comprehensive but complex" by 76% of participants. Sessions averaged 25–30 minutes, often requiring direct therapist guidance. Adherence was slightly lower, with 13 out of 17 participants (76.5%) reporting full compliance. Both protocols were implemented without the need for specialized equipment, and no adverse events or exercise-related injuries were reported throughout the study.

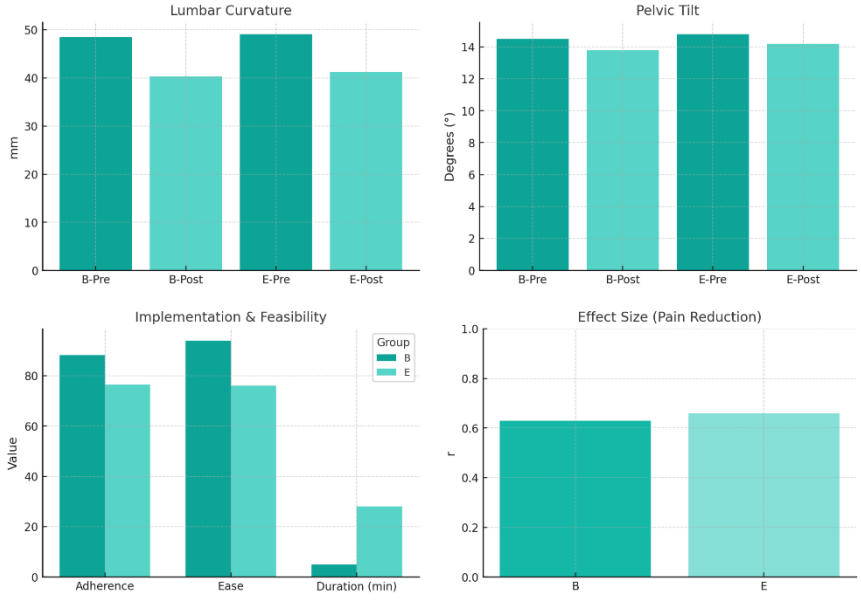

Figure 1 Combined Caption and Figure Description:

This composite figure presents the comparative outcomes of Bruegger's and Egoscue exercise protocols in individuals with Lower Cross Syndrome. The top left panel illustrates significant reductions in lumbar curvature following four weeks of intervention, with both groups demonstrating clinically meaningful improvements from baseline to post-intervention. The top right panel shows slight, non-significant reductions in pelvic tilt angle in both groups, indicating modest pelvic alignment changes. The bottom left panel compares key feasibility metrics, highlighting greater adherence, ease of execution, and shorter session duration for Bruegger's exercises, whereas Egoscue required longer sessions and more supervision. Finally, the bottom right panel displays comparable large effect sizes for pain reduction across interventions, underscoring their similar therapeutic efficacy. Together, these findings support the effectiveness of both exercise approaches while emphasizing Bruegger's superior practicality and clinical efficiency in outpatient rehabilitation settings.

DISCUSSION

The results of the study indicate that both the Bruegger's and Egoscue exercise methods are effective for addressing lower cross syndrome. Bruegger's exercises are simpler to instruct and align well with the typical duration of physical therapy sessions, making them suitable for high-volume outpatient care. On the other hand, while Egoscue is more challenging, it offers comprehensive benefits for posture correction and may be better suited for at-home exercise routines. These findings are beneficial for therapists looking for

flexible, budget-friendly, and efficient exercise options for managing LCS. When selecting a protocol, it is crucial to consider patient motivation, therapy objectives, and the availability of therapists.

These findings aligned with Waters et.al. (9), Kudchadkar et al.(9) Saranya et al. .(11) and Sequeira et al.(12) who showed the efficacy of both approaches in enhancing postural metrics and functional results.

The therapeutic efficacy of both exercise regimens is confirmed by the notable decreases in NPRS observed in both groups. Bruegger's technique, on the other hand, showed useful benefits like increased compliance, faster performance times, and less need for therapist supervision. These practical benefits fit in nicely with outpatient rehabilitation's viability criteria. Even though the study shows a significant decrease in pain across both protocols, the results should be evaluated in light of the observational design's limitations, which include blinding and randomization.

Limitations

As a non-randomized observational study with a relatively small sample size, generalizability is limited. The study duration was short (four weeks), and follow-up was not conducted, which restricts conclusions about long-term effects. In addition, adherence and feasibility were assessed using verbal feedback rather than structured instruments, which may introduce reporting bias. Future studies should employ randomized sampling, larger cohorts, and validated feasibility measures.

As an observational study, generalizability may be limited by the absence of randomization and the use of unofficial feedback instruments. To increase rigor, future studies should use randomized sampling and structured feasibility scales.

CONCLUSION

Both Bruegger’s and Egoscue exercises are effective and feasible for individuals with Lower Cross Syndrome (LCS). Although Bruegger’s exercise is a single-step intervention, it may be considered more efficient due to its comprehensibility and ease of execution, and may be more efficient in busy clinics, while Egoscue offers a broader realignment approach ideal for dedicated home-based programs. Implementation and selection should be patient-centred and resource-informed. Bruegger's exercise demonstrated enhanced practicality and compliance due to its simplicity, quick execution, and minimal supervision needed. While comprehensive, Egoscue might face challenges in adherence, particularly in busy or time-limited settings.

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