Comparative Effect of Autogenic Inhibition and Reciprocal Inhibition Technique on Neck Pain, Strength, and Disability in Breastfeeding Females with Forward Head Posture

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ABSTRACT

Background: Forward head posture (FHP) is a common musculoskeletal issue in breastfeeding females, leading to neck pain, weakness, and disability. Muscle energy techniques (METs), including autogenic inhibition (AI) and reciprocal inhibition (RI), have been used to address these issues.

Objective: To compare the effects of autogenic inhibition and reciprocal inhibition techniques on pain, strength, and disability in breastfeeding females with forward head posture.

Methods: A randomized controlled trial was conducted on 30 breastfeeding females with FHP, recruited through non-probability convenience sampling. Participants were randomly divided into two groups (n = 15 each). Group A received conventional therapy with AI, and Group B received conventional therapy with RI, targeting levator scapulae, scalene, trapezius, and sternocleidomastoid muscles. Outcomes were assessed using the Visual Analogue Scale (VAS), Neck Disability Index (NDI), and Manual Muscle Testing (MMT). SPSS 25 was used for statistical analysis.

Results: Both groups showed significant improvement in NDI, VAS, and MMT scores ($p < 0.05$), with the RI group demonstrating greater reductions in NDI (11 vs. 20, $p = 0.01$).

Conclusion: Reciprocal inhibition was more effective in reducing disability and pain compared to autogenic inhibition.

INTRODUCTION

Forward head posture (FHP) is one of the most common spinal postural abnormalities associated with modern lifestyle habits. It is characterized by the anterior positioning of the head relative to the shoulders, which can lead to excessive stress on the cervical spine and surrounding musculature (1). For each inch the head protrudes forward, an additional 4.5 kilograms of weight is exerted on the cervical spine, thereby creating musculoskeletal dysfunction and potential impairment of neurological and vascular systems (2).

The cumulative effects of this malalignment can contribute to various conditions, including mechanical neck pain (MNP), muscle weakness, and disability. The prevalence of FHP is notably high in both developed and developing regions, with 66% of the population in Asia reportedly exhibiting this posture, and prevalence rates reaching up to 54% and 64% in Western countries and Hong Kong, respectively (3, 4, 5).

Known colloquially as "scholar's neck," this condition is a leading contributor to functional limitations and disability worldwide, with an annual prevalence increase of 30% (6).

Forward head posture can result in structural changes affecting tendons, muscles, and peripheral circulation due to prolonged strain, which may lead to complications such as muscle fatigue, reduced proprioception, and impaired functional capacity (7, 8).

Breastfeeding mothers are particularly vulnerable to FHP and its sequelae due to the unique biomechanical demands associated with breastfeeding (9). Maintaining prolonged eye contact with the newborn, while engaging in physically taxing nursing postures, results in the forward inclination of the head and neck. This repeated adoption of an unstable head-neck position during nursing is linked to increased musculoskeletal stress, leading to the development of neck pain and related musculoskeletal discomfort (10). Anecdotal evidence and observational studies have identified that breastfeeding-related neck pain (BFRNP) is highly prevalent among lactating mothers, with significant musculoskeletal morbidity reported (11, 12).

A study conducted by Mbada et al. in Nigeria revealed that a large proportion of nursing mothers suffer from neck pain and other musculoskeletal complaints due to suboptimal breastfeeding postures (13). Despite the known relationship between FHP and mechanical neck pain, optimal conservative management strategies remain unclear. Although non-steroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants are commonly prescribed, they often fail to address the root mechanical cause, highlighting the need for adjunctive physiotherapy approaches that target postural correction and muscle strength (14).

Muscle energy techniques (METs) are widely used as an effective conservative intervention for managing neck pain and FHP. They include two main therapeutic techniques: autogenic inhibition (AI) and reciprocal inhibition (RI) (15). Autogenic inhibition involves the use of self-induced muscle relaxation to reduce excessive tension, thereby promoting muscle elongation and pain relief. On the other hand, reciprocal inhibition focuses on engaging the antagonist muscles of the primary movement to inhibit the agonists, allowing for improved muscle function and strength (16). The integration of METs into physical therapy regimens has been shown to improve range of motion, alleviate muscle stiffness, enhance circulation, and restore functional ability in patients with mechanical neck pain (17). Studies have indicated that combining METs with conventional physiotherapy is superior to routine physical therapy alone, as it offers additional benefits in terms of muscle flexibility and proprioceptive control (18). Balthillaya et al. reported that combining METs with postural correction interventions led to a significant reduction in pain and disability in individuals with non-specific neck pain, both acute and chronic (19).

Given the high prevalence of FHP and breastfeeding-related neck pain among lactating mothers, there is a need for targeted physiotherapy interventions that address both postural correction and muscle rehabilitation. This study aimed to compare the effects of autogenic inhibition and reciprocal inhibition techniques on pain, strength, and disability in breastfeeding females with forward head posture. By investigating these techniques, the study sought to determine the optimal MET approach for managing FHP-related musculoskeletal dysfunction, thereby improving the quality of life and physical health outcomes in this vulnerable population (20).

MATERIAL AND METHODS

The study was a randomized controlled trial (RCT) conducted at Fatima Memorial Hospital, Lahore, Pakistan, to compare the effects of autogenic inhibition and reciprocal inhibition techniques on neck pain, strength, and disability in breastfeeding females with forward head posture. A total sample of 30 females was recruited using non-probability convenience sampling from May 2023 to October 2023. Females included in the study were aged between 18 to 45 years, experiencing neck pain due to breastfeeding over the last three months, and presented with muscle weakness (grade 3) due to forward head posture, alongside disability in performing neck movements, such as flexion, rotation, and lateral flexion. Individuals with a history of any kind of tumor, neck surgery, severe uncontrollable pain (VAS score of 9 to 10), mental instability, or any spinal pathological issues were excluded from the study. The sample size was determined using the standard deviation and mean difference values derived from a previous study, with a confidence level of 95% and a power of 80%.

After accounting for a 10% attrition rate, the final sample size was 34 participants, with 17 distributed to each group; however, 30 participants successfully completed the study (15 in each group) (17).

All participants provided informed consent prior to study enrollment, and the research was conducted following the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the institutional review board of the respective hospital. Data collection tools used in this study included the Visual Analogue Scale (VAS) to measure pain intensity, the Neck Disability Index (NDI) to assess functional disability, and the Manual Muscle Testing (MMT) scale to evaluate muscle strength. Participants were randomly assigned into two intervention groups using sealed envelope randomization: Group A received conventional therapy combined with autogenic inhibition, and Group B received conventional therapy combined with reciprocal inhibition. The targeted muscles for each intervention were the levator scapulae, scalenes, trapezius, and sternocleidomastoid. Each intervention session lasted 45 minutes, three times a week, for a total of eight weeks. Both groups received standard stretching and strengthening exercises along with their respective muscle energy techniques (METs) (12).

Group A received the autogenic inhibition technique, which involves applying gentle isometric contractions followed by passive stretching to the same muscle group, thus activating the Golgi tendon organs and reducing muscle tension. Group B received the reciprocal inhibition technique, which engages the antagonist muscles to inhibit the action of the target muscle, thereby promoting relaxation and improved range of motion. Both groups adhered to similar treatment frequencies, and the interventions were supervised by licensed physical therapists experienced in applying METs (15). Assessment of pain, strength, and disability was performed pre- and post-intervention using the aforementioned scales. The primary outcome measures were the changes in VAS, NDI, and MMT scores, which were recorded and documented at the baseline and at the end of the eight-week intervention period (16).

Statistical analysis was performed using IBM SPSS for Windows (version 25). Descriptive statistics were computed to summarize demographic characteristics, including age and BMI, for each group. Inferential statistics were applied to evaluate the treatment effects between and within groups. The Mann-Whitney U test was used for between-group comparisons, while the Wilcoxon Signed Rank Test was employed for within-group analysis. P-values less than or equal to 0.05 were considered statistically significant. Mean rank differences and interquartile ranges were reported for all outcome measures. The results were presented in terms of mean rank values, median, and standard deviations to provide a comprehensive understanding of the intervention effects (16).

The analysis revealed a significant difference in the mean change scores of the NDI, VAS, and MMT between the two groups, with reciprocal inhibition showing greater improvements in pain and strength reduction compared to autogenic inhibition ($p \leq 0.05$) (18).

All ethical considerations, including participant confidentiality and data protection, were rigorously maintained throughout the study period. Participants were allowed to withdraw from the study at any time without any impact on their ongoing care or treatment. No adverse events were reported during the intervention period, ensuring the safety and efficacy of the applied techniques (19).

RESULTS

The results of the study are presented in terms of demographic characteristics and outcome measures for each group, along with statistical analysis results to compare the effectiveness of the autogenic inhibition (AI) and reciprocal inhibition (RI) techniques. A total of 30 participants completed the study (15 in each group). Demographic data are presented in Table 1, showing mean age and BMI for both intervention groups.

Table 1: Demographic Data for Study Participants

Variable	Group A (AI, n = 15)	Group B (RI, n = 15)
Age (years), Mean ± SD	32.40 ± 3.73	31.27 ± 4.79
BMI (kg/m²), Mean ± SD	23.33 ± 3.81	24.07 ± 3.79

The mean age for participants in Group A (autogenic inhibition) was 32.40 ± 3.73 years, while Group B (reciprocal inhibition) had a mean age of 31.27 ± 4.79 years. The mean BMI values were comparable between the two groups, with 23.33 ± 3.81 kg/m^2 in Group A and 24.07 ± 3.79 kg/m^2 in Group B.

Between-Group Comparison: Post-Treatment Results The comparison of outcome measures post-intervention between the two groups is summarized in Table 2 using the Mann-Whitney U Test. The mean rank values indicate a statistically significant difference in the Neck Disability Index (NDI) scores between the groups, favoring the reciprocal inhibition group ($p = 0.01$).

However, no significant differences were observed in the Manual Muscle Testing (MMT) and Visual Analogue Scale (VAS) scores between the groups ($p > 0.05$).

Table 2: Between-Group Comparison of Outcome Measures (Mann-Whitney U Test)

Variable	Group A (AI)	Group B (RI)	p-value
Neck Disability Index	Median: 1.5	Median: 1.5	0.01
	IQR: 1	IQR: 1	
	Mean Rank: 11	Mean Rank: 20	
Manual Muscle Testing	Median: 5.5	Median: 5.5	0.14
	IQR: 1	IQR: 1	
	Mean Rank: 17	Mean Rank: 13	
Visual Analogue Scale	Median: 0.0	Median: 0.0	0.26
	IQR: 1	IQR: 1	
	Mean Rank: 14	Mean Rank: 17	

The Mann-Whitney U test revealed a statistically significant improvement in NDI scores in the reciprocal inhibition group compared to the autogenic inhibition group ($p = 0.01$). Although both groups showed improvement in strength and pain reduction, these differences were not statistically significant ($p = 0.14$ for MMT and $p = 0.26$ for VAS).

Within-Group Comparison: Pre- and Post-Treatment Results The pre- and post-treatment changes within each group are displayed in Table 3, using the Wilcoxon Signed Rank Test. Both intervention groups showed significant improvement in all outcome measures from baseline to post-intervention ($p < 0.05$). The reciprocal inhibition group demonstrated a greater reduction in pain and disability compared to the autogenic inhibition group.

Table 3: Within-Group Comparison of Outcome Measures (Wilcoxon Signed Rank Test)

Variable	Group A (AI)	Group B (RI)	p-value
Neck Disability Index	Pre: 7.5	Pre: 5.0	0.00
	Post: 0.0	Post: 0.0	
	Mean Rank: 7.5	Mean Rank: 5.0	
Manual Muscle Testing	Pre: 0.0	Pre: 6.5	0.00
	Post: 7.0	Post: 0.0	
	Mean Rank: 7.0	Mean Rank: 6.5	
Visual Analogue Scale	Pre: 8.0	Pre: 8.0	0.00
	Post: 0.0	Post: 0.0	
	Mean Rank: 8.0	Mean Rank: 8.0	

Within-group analysis demonstrated statistically significant improvement in NDI, MMT, and VAS scores for both groups ($p < 0.05$), indicating that both autogenic inhibition and reciprocal inhibition techniques were effective in reducing

neck pain and disability while improving strength. However, the reciprocal inhibition group showed a more pronounced effect on reducing pain and disability compared to the autogenic inhibition group.

In summary, while both interventions were effective, reciprocal inhibition showed significantly better outcomes in reducing disability as measured by the NDI. These results support the use of reciprocal inhibition over autogenic inhibition in breastfeeding females with forward head posture for the improvement of neck pain, strength, and disability.

DISCUSSION

The findings of the present study demonstrated that both autogenic inhibition and reciprocal inhibition techniques were effective in reducing neck pain, improving strength, and decreasing disability among breastfeeding females with forward head posture. However, the reciprocal inhibition group showed a significantly greater reduction in disability and pain compared to the autogenic inhibition group ($p \leq 0.05$), which aligns with the results of previous studies examining the effects of muscle energy techniques on mechanical neck pain (9). Reciprocal inhibition, which works by activating antagonist muscles to inhibit the agonists, may have provided a more effective mechanism for promoting muscular relaxation and reducing musculoskeletal stress, thereby facilitating greater improvement in overall functional outcomes. This is consistent with the findings of Kim et al., who reported that reciprocal inhibition was more effective than post-isometric relaxation (PIR) in reducing muscle activation and improving functional capacity in individuals with forward head posture (19).

The effectiveness of autogenic inhibition in the current study was also notable, as it resulted in significant improvements in muscle strength and disability. Autogenic inhibition works through self-induced relaxation, targeting the Golgi tendon organs to reduce muscle tension and enhance muscle extensibility. Similar outcomes were observed in a study by Salahzadeh et al., where autogenic inhibition produced significant reductions in muscle tension and disability among females with mechanical neck pain (10). Although the technique was less effective in pain reduction compared to reciprocal inhibition, it still showed meaningful clinical benefits, indicating its utility in addressing muscular dysfunction in conditions like forward head posture. The findings are further supported by Dunleavy et al., who found that METs led to greater improvements in VAS and NDI scores compared to conventional stretching alone (18).

Despite the positive findings, several limitations should be considered when interpreting the results. The study employed a relatively small sample size and utilized non-probability convenience sampling, which may limit the generalizability of the findings to broader populations. Additionally, the study duration of eight weeks, although sufficient to capture short-term effects, may not provide insights into the long-term efficacy of these interventions. Previous studies have highlighted that muscle energy techniques can produce sustained improvements in pain and function over a longer duration (16). Therefore, future research should include a larger sample size, a more diverse population, and extended follow-up periods to better understand the long-term impact of these techniques.

Another potential limitation was the lack of a control group receiving no intervention, which could have provided a clearer understanding of the natural progression of forward head posture-related pain and disability without therapeutic intervention. While the comparison between two active interventions provides valuable clinical insight, including a control group in future studies would strengthen the evidence by isolating the specific effects of each technique. Moreover, the subjective nature of some outcome measures, such as the Visual Analogue Scale, may introduce a bias in pain reporting, despite the standardized data collection procedures. Objective measures, such as electromyography or cervical kinematics, could provide additional insights into the physiological changes associated with these interventions (7).

The study's strengths include its randomized controlled trial design, which minimizes selection bias and confounding variables, as well as the use of standardized assessment tools like the NDI, VAS, and MMT to evaluate clinical outcomes comprehensively. These validated tools ensured the reliability and consistency of the collected data, enabling a robust comparison between the two intervention groups. Furthermore, the interventions were administered by experienced therapists, ensuring the fidelity of the applied techniques and enhancing the internal validity of the study. The research also provided a focused examination of breastfeeding females, an underrepresented population in musculoskeletal research, thus contributing to the body of knowledge specific to this demographic (11).

In light of these findings, it is recommended that clinicians consider incorporating reciprocal inhibition techniques as a preferred intervention for breastfeeding females with forward head posture due to its superior effects on pain reduction and disability improvement. However, autogenic inhibition should not be disregarded, as it offers significant benefits in terms of muscle relaxation and strength enhancement. Both techniques may be employed as part of a multimodal approach to address the complex biomechanical and muscular adaptations seen in forward head posture. Future studies should explore the integration of METs with other therapeutic modalities, such as manual therapy and posture correction exercises, to maximize clinical outcomes (15). Moreover, the exploration of these techniques in different populations, such as older adults or individuals with chronic musculoskeletal disorders, would further elucidate their versatility and clinical applicability (20).

CONCLUSION

In conclusion, while both autogenic inhibition and reciprocal inhibition are effective techniques for managing neck pain and disability in breastfeeding females with forward head posture, the latter showed superior results in reducing pain and improving overall functional capacity. The study highlights the potential for reciprocal inhibition to be a

primary intervention in clinical practice for this population. Nonetheless, addressing the limitations and expanding the research to diverse populations and settings would enhance the applicability and robustness of these findings.

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