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COMPARATIVE EFFECT OF DRY NEEDLING ASSISTED GLUTEUS MAXIMUS ACTIVATION ON PAIN, DISABILITY AND MUSCLE STRENGTH IN LOW BACK PAIN DUE TO GLUTEAL AMNESIA: AN EXPERIMENTAL STUDY

[1]Krishna Kumar Solanki, [2]Dr. Vaishnavi Jayakant Kania, [3]Dr. Jafar Khan, [4]Dr, Renuka Pal, [5]Dr. Abhishek Arora, [6]Dr. Hasnen Sheikh, [7]Dr. Abid R Quershi, [8]Dr. Suhani Bhatanagar, [9]Dr. Divya Tiwari, [10]Dr. Suhani Bhatnagar

[*1]M.P.Th. scholar, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[2] Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[3]Dean & HOD, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[4]Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[5]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[6]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[7]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[8]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[9]Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
[10]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan
Corresponding Author: Krishna Kumar Solanki
Email: Krishnaku111997@gmail.com

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KEYWORDS

Dry Needling, Gluteus Maximus, Gluteal Amnesia, Low Back Pain, Oswestry Disability Index, Visual Analogue Scale, Muscle Activation.

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Abstract

Background
Low back pain is commonly associated with altered lumbopelvic mechanics, poor hip control and compensatory overactivity of lumbar extensor muscles. Gluteal amnesia, characterized by reduced or delayed activation of the gluteus maximus, may increase lumbar loading during daily activities such as standing, walking, bending, lifting and stair climbing. Dry needling may reduce myofascial irritability and assist neuromuscular activation when combined with a structured gluteus maximus exercise protocol.

Objective
To compare the effect of a home exercise program with dry needling assisted gluteus maximus activation combined with a specific exercise protocol on pain intensity, functional disability and gluteus maximus strength in individuals with low back pain due to gluteal amnesia.

Methods
An experimental comparative study was conducted among 60 participants with low back pain associated with gluteal amnesia. Participants were divided into two groups of 30 each. Group A received a structured home exercise program, while Group B received dry needling activation of the gluteus maximus along with a progressive specific exercise protocol. Outcome measures included Visual Analogue Scale (VAS), Oswestry Disability Index (ODI) and gluteus maximus strength measured by manual muscle testing. Pre-intervention and post-intervention scores were recorded and analyzed using paired t-test and independent t-test with significance set at $p < 0.05$.

Results
Both groups showed statistically significant improvements after intervention. Group A showed reduction in VAS from 7.04 +/- 1.06 to 4.93 +/- 1.20, while Group B improved from 6.72 +/- 1.02 to 3.02 +/- 1.17. ODI reduced from 46.35 +/- 7.98% to 32.43 +/- 9.07% in Group A and from 46.94 +/- 6.87% to 22.68 +/- 9.31% in Group B. Gluteus maximus strength improved from 3.24 +/- 0.35 to 3.94 +/- 0.46 in Group A and from 3.12 +/- 0.40 to 4.36 +/- 0.42 in Group B. Between-group comparison showed significantly greater improvement in Group B for VAS, ODI and strength gain.

Conclusion
Dry needling assisted gluteus maximus activation combined with a specific progressive exercise protocol produced greater improvement in pain, disability and gluteus maximus strength than the home exercise program alone. The findings support the use of targeted gluteal activation strategies in selected patients with low back pain due to gluteal amnesia.

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INTRODUCTION

Low back pain is one of the most common musculoskeletal conditions encountered in physiotherapy practice. It can limit sitting, standing, walking, lifting, work participation and overall quality of life. Although low back pain is often treated as a local lumbar spine problem, many patients present with dysfunction beyond the lumbar region. The hip and pelvis are important contributors to spinal loading, and impaired gluteal muscle activation may influence the development and persistence of symptoms.

The gluteus maximus is the largest and one of the strongest muscles of the human body. It contributes to hip extension, pelvic control, trunk stability, upright posture and force transfer between the lower limb and spine. During functional activities such as rising from sitting, climbing stairs, bending and lifting, adequate gluteus maximus activation helps distribute mechanical load away from the lumbar spine. When this muscle is inhibited or poorly recruited, lumbar extensor muscles and hamstrings may compensate, resulting in inefficient movement and increased lumbar stress.

Gluteal amnesia, also known as dead butt syndrome, refers to reduced, delayed or poorly coordinated activation of the gluteal muscles. It is commonly associated with prolonged sitting, sedentary work, reduced physical activity, tight hip flexors and altered pelvic mechanics. In individuals with low back pain, gluteal amnesia may be seen as weak hip extension, poor bridge performance, hamstring dominance, anterior pelvic tilt or increased lumbar extension during functional tasks.

Exercise therapy remains a central component in low back pain rehabilitation. Home exercise programs can improve mobility, strength and posture, but in patients with gluteal amnesia, general exercises may not fully restore the neuromuscular timing of the gluteus maximus. A specific intervention is often required to improve isolated activation first and then integrate the muscle into functional movement patterns.

Dry needling is a physiotherapy technique used for myofascial pain, trigger point sensitivity and neuromuscular dysfunction. In gluteal amnesia, dry needling may prepare the gluteus maximus for improved activation by reducing local irritability and enhancing neuromuscular responsiveness. When followed by progressive gluteal exercises, it may provide a more complete intervention for patients whose low back pain is influenced by gluteus maximus inhibition.

The present study was therefore conducted to compare a structured home exercise program with dry needling assisted gluteus maximus activation combined with specific progressive exercise training in individuals with low back pain due to gluteal amnesia.

NEED FOR THE STUDY

Low back pain remains a leading cause of physical limitation and disability. In many individuals, symptoms persist because treatment focuses mainly on pain relief and spinal mobility while underlying lumbopelvic movement dysfunction remains uncorrected. Gluteal amnesia is clinically important because inhibited gluteus maximus activation can increase compensatory loading of the lumbar spine and reduce movement efficiency.

There is a need to evaluate treatment approaches that address the target muscle involved in gluteal amnesia. Home exercise programs are useful, but they may be insufficient when the patient continues to use hamstring or lumbar extensor dominance during exercise. Dry needling activation of the gluteus maximus, when combined with specific retraining exercises, may improve the muscle readiness and recruitment needed for better functional recovery.

The present study is needed because it compares general home exercise management with a targeted intervention that combines dry needling and progressive gluteus maximus activation. This comparison may help clinicians decide whether dry needling assisted activation provides additional benefit in reducing pain, improving disability and increasing gluteus maximus strength in low back pain patients with gluteal amnesia.

RESEARCH QUESTION

Does dry needling assisted activation of the gluteus maximus combined with a specific exercise protocol

produce greater improvement in pain, disability and gluteus maximus strength than a home exercise program in individuals with low back pain due to gluteal amnesia?

HYPOTHESIS

Null Hypothesis (H0): There is no significant difference between a home exercise program and dry needling assisted gluteus maximus activation with specific exercise protocol in improving pain, disability and gluteus maximus strength in individuals with low back pain due to gluteal amnesia.

Alternative Hypothesis (H1): Dry needling assisted gluteus maximus activation with specific exercise protocol produces significantly greater improvement in pain, disability and gluteus maximus strength than a home exercise program in individuals with low back pain due to gluteal amnesia.

OBJECTIVES OF THE STUDY

To compare the effect of home exercise program and dry needling assisted gluteus maximus activation with specific exercise protocol on pain intensity using VAS.

To compare functional disability changes between groups using ODI.

To compare gluteus maximus strength improvement between groups.

To determine whether dry needling assisted activation provides additional clinical benefit over home exercise alone.

MATERIALS AND METHOD

Study Design: Experimental comparative study.

Study Setting: Pacific Medical College and Hospital, Bedla, Udaipur, Rajasthan.

Sample Size: 60 participants, divided into two groups with 30 participants in each group.

Sampling Technique: Purposive sampling method.

Study Population: Male and female participants aged 20 to 70 years with low back pain due to gluteal amnesia.

Inclusion Criteria: Participants with low back pain associated with gluteal amnesia, willingness to participate and age between 20 and 70 years.

Exclusion Criteria: Cancer, spinal trauma, amputation, systemic inflammatory disorders, progressive neurological conditions, pregnancy, open wound, use of medications such as anticoagulants or steroids, and high degree burns.

OUTCOME MEASURES

Visual Analogue Scale (VAS): VAS was used to measure pain intensity. Participants rated pain on a 0 to 10 scale, where 0 indicated no pain and 10 indicated worst imaginable pain. A reduction in VAS score after intervention indicated improvement in pain.

Oswestry Disability Index (ODI): ODI was used to measure low back pain-related disability. It assesses the influence of pain on activities such as personal care, lifting, walking, sitting, standing, sleeping and social activities. Higher percentage indicates greater disability.

Gluteus Maximus Strength: Gluteus maximus strength was assessed clinically using manual muscle testing during prone hip extension. Improvement in strength score indicated better activation and functional capacity of the target muscle.

INTERVENTION PROTOCOL

Group A received a structured home exercise program consisting of warm-up, cat-cow movements, pelvic tilts, knee-to-chest stretch, child pose, piriformis stretch, glute bridge, bird-dog, plank, side plank and cooldown breathing exercises. The program aimed to reduce pain and improve general mobility and trunk support.

Group B received dry needling activation of the gluteus maximus along with a progressive specific exercise protocol. Dry needling was applied before exercise sessions to assist gluteal reactivation. The exercise program progressed from isometric gluteal sets and basic bridges to clamshells, quadruped hip extension, single-leg bridges, monster walks, step-ups, hip thrusts, lunges, single-leg deadlifts and functional strengthening drills. The exercises were progressed according to tolerance and pain response.

STATISTICAL ANALYSIS

Data were analyzed using descriptive and inferential statistics. Mean and standard deviation were

calculated for VAS, ODI and gluteus maximus strength. Paired t-test was used for within-group comparison of pre- and post-intervention values. Independent t-test was used for between-group comparison of improvement scores. A p value less than 0.05 was considered statistically significant.

RESULTS

A total of 60 participants completed the study, with 30 participants in Group A and 30 in Group B. Baseline comparison showed that the groups were comparable for age, VAS, ODI and gluteus maximus strength before intervention.

Table 1. Baseline comparability between groups

Variable	Group A Mean +/- SD	Group B Mean +/- SD	p value	Interpretation
Age	39.47 +/- 12.07	44.47 +/- 12.37	0.119	Non-significant
VAS pre	7.04 +/- 1.06	6.72 +/- 1.02	0.243	Non-significant
ODI pre	46.35 +/- 7.98	46.94 +/- 6.87	0.761	Non-significant
GM strength pre	3.24 +/- 0.35	3.12 +/- 0.40	0.222	Non-significant

The baseline values were statistically comparable between the groups, indicating that post-treatment differences could be interpreted in relation to the intervention rather than baseline imbalance.

Table 2. Comparison of VAS scores

Variable	Group A Mean +/- SD	Group B Mean +/- SD
VAS Pre-test	7.04 +/- 1.06	6.72 +/- 1.02
VAS Post-test	4.93 +/- 1.20	3.02 +/- 1.17
Mean improvement	2.11 +/- 0.53	3.71 +/- 0.63

Both groups showed pain reduction, but Group B demonstrated greater reduction in VAS scores. Between-group comparison of VAS improvement was statistically significant ($t = -10.66$, $p < 0.001$).

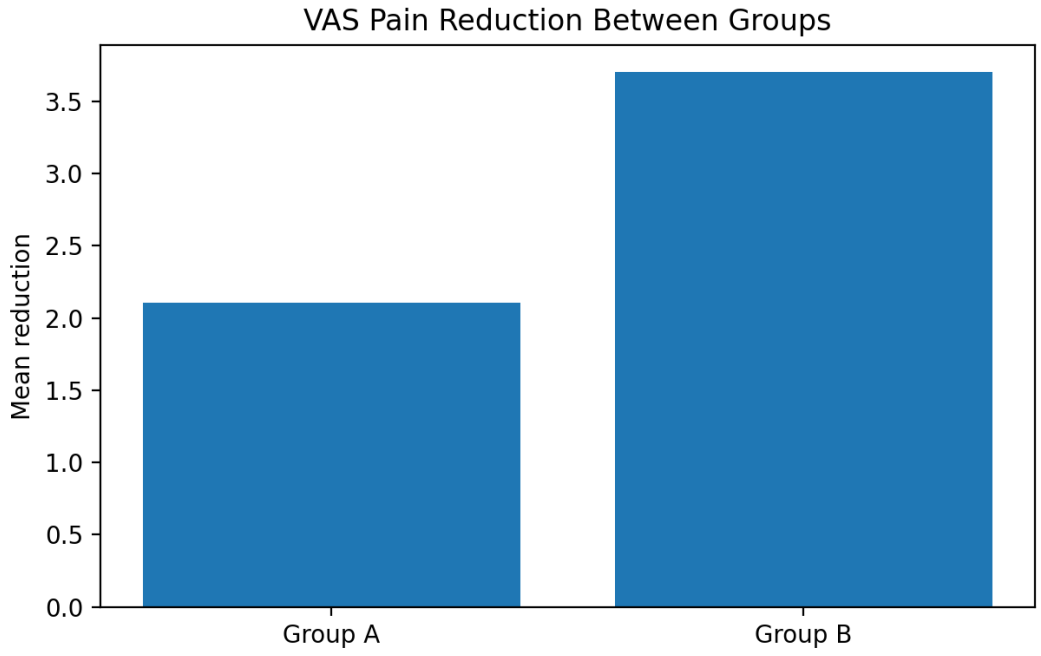

Figure 1: Comparison of VAS pain reduction between groups

Table 3. Comparison of ODI scores

Variable	Group A Mean +/- SD	Group B Mean +/- SD
ODI Pre-test	46.35 +/- 7.98	46.94 +/- 6.87
ODI Post-test	32.43 +/- 9.07	22.68 +/- 9.31
Mean improvement	13.92 +/- 3.31	24.26 +/- 5.30

Both groups showed functional improvement, but Group B showed a greater reduction in ODI. The between-group difference in ODI improvement was statistically significant ($t = -9.064$, $p < 0.001$).

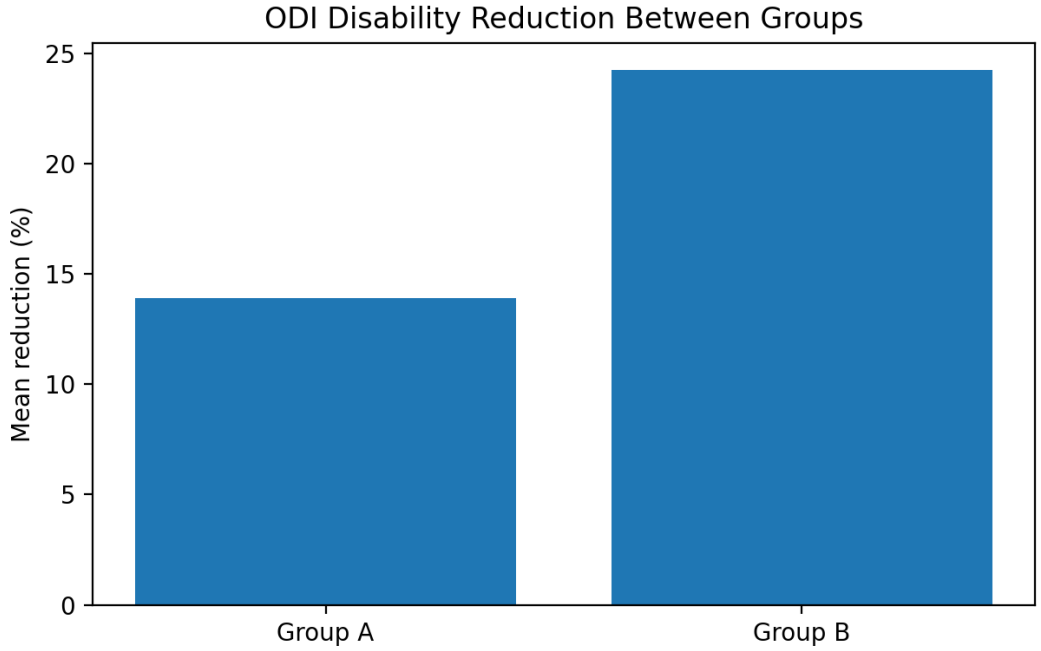

Figure 2: Comparison of ODI disability reduction between groups

Table 4. Comparison of gluteus maximus strength

Variable	Group A Mean +/- SD	Group B Mean +/- SD
GM strength Pre-test	3.24 +/- 0.35	3.12 +/- 0.40
GM strength Post-test	3.94 +/- 0.46	4.36 +/- 0.42
Mean strength gain	0.70 +/- 0.24	1.24 +/- 0.24

Both groups improved gluteus maximus strength, but the improvement was greater in Group B. The between-group comparison of strength gain was statistically significant ($t = -8.583$, $p < 0.001$).

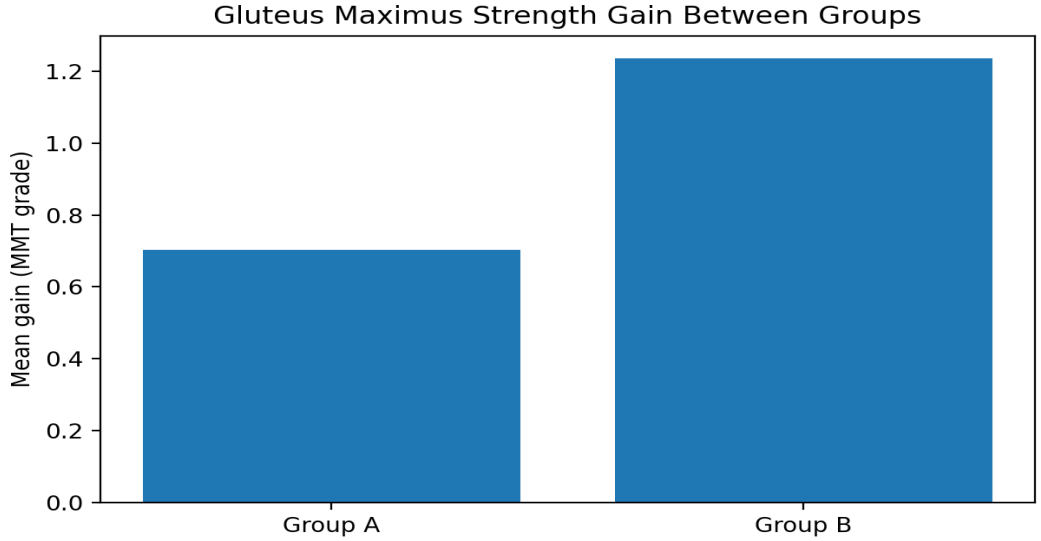

Figure 3: Comparison of gluteus maximus strength gain between groups

Table 5. Paired t-test summary

Outcome	Group A t value	Group A p value	Group B t value	Group B p value
VAS	21.83	<0.001	32.24	<0.001
ODI	23.02	<0.001	25.09	<0.001
GM strength	15.96	<0.001	28.23	<0.001

The paired t-test results showed significant within-group improvements in all outcomes. However, higher improvement values in Group B indicate that dry needling assisted activation with specific exercise produced stronger clinical effects than home exercise alone.

DISCUSSION

The present study compared the effect of a home exercise program with dry needling assisted gluteus maximus activation combined with a specific exercise protocol in patients with low back pain due to gluteal amnesia. The major finding was that both groups improved, but the dry needling assisted activation group showed greater improvement in pain, functional disability and gluteus maximus strength.

Pain intensity reduced significantly in both groups. The improvement in Group A suggests that a structured home exercise program can reduce pain by improving spinal mobility, flexibility, trunk control and general muscle conditioning. However, the greater pain reduction in Group B suggests that dry needling may have provided additional pain-modulating effects by reducing myofascial trigger point irritability and improving the readiness of the gluteus maximus to participate in movement.

Functional disability also improved in both groups as measured by ODI. The larger reduction in ODI in Group B indicates that participants receiving dry needling assisted activation were better able to translate symptom improvement into daily functional activities. This may be because improved gluteus maximus activation supports pelvic stability and reduces compensatory lumbar loading during activities such as walking, standing, lifting and bending.

Gluteus maximus strength showed statistically significant improvement in both groups, but the gain was greater in Group B. This finding is clinically important because the study focused on low back pain associated with gluteal amnesia. Better gluteus maximus strength suggests improved neuromuscular recruitment of the target muscle. Dry needling may have reduced local inhibition, while progressive exercise reinforced the desired activation pattern.

The results support the idea that low back pain management should not be limited to the lumbar spine alone. In patients with gluteal amnesia, treatment should address hip extension control, pelvic stability and gluteus maximus activation. The combined intervention used in Group B provided both a neuromodulatory stimulus through dry needling and a motor learning stimulus through progressive exercise, which may explain its superior effect.

From a clinical perspective, dry needling should not be considered a replacement for exercise. Rather, it may be used as an adjunct to improve the effectiveness of specific gluteal activation training. The findings suggest that physiotherapists should assess gluteus maximus function in patients with recurrent or persistent low back pain, especially when movement analysis reveals hamstring dominance, anterior pelvic tilt or lumbar extensor overactivity.

CONCLUSION

The study concluded that both home exercise program and dry needling assisted gluteus maximus activation with specific exercise protocol were effective in reducing pain, improving disability and increasing gluteus maximus strength in individuals with low back pain due to gluteal amnesia.

However, participants who received dry needling activation of the gluteus maximus along with a progressive specific exercise protocol demonstrated greater improvement than those who performed the home exercise program alone. The results support the use of dry needling as an adjunct to targeted gluteal activation exercises in selected low back pain patients with gluteal amnesia.

The findings highlight the clinical importance of assessing and treating gluteus maximus dysfunction in low back pain rehabilitation. Restoring gluteal activation may reduce compensatory lumbar loading and improve functional movement.

LIMITATIONS

The sample size was limited to 60 participants, which may restrict generalization to a wider low back pain population.

The study was conducted in a single clinical setting, which may limit applicability to other regions or healthcare settings.

Gluteus maximus strength was assessed clinically using manual muscle testing, which is less objective than dynamometry or electromyography.

Long-term follow-up was not included, so maintenance of improvement over time could not be confirmed.

Participant occupation, daily sitting duration and physical activity level were not controlled in detail, although these factors may influence gluteal amnesia and low back pain.

RECOMMENDATIONS

Future studies should include a larger sample size to improve generalizability.

Long-term follow-up should be included to determine whether improvements in pain, disability and gluteal strength are maintained.

Objective tools such as electromyography, hand-held dynamometry or motion analysis may be used to measure gluteus maximus activation more precisely.

Future research may compare dry needling with sham needling to determine the specific effect of needling beyond exercise and placebo response.

Clinicians should consider gluteus maximus assessment and targeted activation training in low back pain patients who demonstrate signs of gluteal amnesia.

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