Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 19s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Study The Effect of Mindful Breathing Technique on Upper Back Pain Perception In Undergraduate Students

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Cite this paper as: Sagar Rathod, Neelam Tejani, Amrutkuvar Rayjade, Seema Sharma, Swaroop Patil, (2025) Study The Effect of Mindful Breathing Technique on Upper Back Pain Perception In Undergraduate Students. *Journal of Neonatal Surgery*, 14 (19s), 954-962.

ABSTRACT

Background

Upper back pain is a common concern among undergraduate students, often arising from poor posture, prolonged sitting, and excessive use of electronic devices. Non-pharmacological interventions such as mindfulness-based techniques have proven to be effective in pain management and improving overall well-being.

Objective

This study aimed to investigate the effect of mindful breathing techniques on the perception of upper back pain in undergraduate students, evaluating changes in pain intensity both at rest and during movement.

Results

The results have shown a significant reduction in pain perception following the mindful breathing intervention. Statistical analysis revealed a significant p-values for reducing the pain intensity both at rest and during movement, indicating the effectiveness of mindful breathing techniques in alleviating upper back pain. In addition, participants reported improved emotional regulation and well-being.

Conclusion

Mindful breathing exercises have proved to be an effective, non-invasive, and cost-effective intervention for alleviating upper back pain among undergraduate students. Integrating mindfulness practices into academic settings may not only address physical discomfort but also promote emotional health and academic performance, contributing to a more holistic approach to student wellness

Keywords: *Upper back pain, mindful breathing, undergraduate students, mindfulness-based intervention, pain management, emotional regulation.*

OBJECTIVE

1. To study the effect of mindful breathing technique on pain perception on individuals with upper back pain students using vas scale.

To study the effect of mindful breathing technique on pain perception on individuals with upper back pain students using pain pressure threshold

1. INTRODUCTION

Back pain is a pervasive health concern, with its prevalence increasing as individuals age. Research indicates that 28.4% of adults aged 18–29 report back pain, and this number continues to rise with age [12]. Among young adults, especially college students, musculoskeletal discomfort is frequently localized in the upper back, shoulders, and neck[26]. This discomfort is majorly linked to poor posture, prolonged sitting, heavy bag carrying, and improper ergonomic habits during study sessions and lectures [1]. Excessive use of mobile devices in poor postures such as neck bending and shoulder slouching further contributes to upper back pain and postural malalignments [8].

Chronic upper back pain significantly affects productivity, limiting daily tasks and lowering quality of life [26]. It is often assessed using NPRS scores, trigger point assessments, and PPT tests [26]. Affected muscles include the serratus anterior, teres minor, teres major, infraspinatus, and trapezius, which stabilize the shoulders and upper back [18]. When overused or strained, these muscles lead to reduced mobility, stiffness, and chronic pain, thereby impacting academic and professional performance.

This condition is often accompanied by emotional and psychological distress. Discomfort in the thoracic region can restrict mobility, make daily activities difficult, and increase stress levels [23]. Many experience a dull ache usually in the morning that worsens into sharp pain during simple movements.[27].

A case study of Sarah, a young professional, illustrates this. She developed persistent upper back pain from long hours in front of the computer without support. Initially attributing it to stress, the pain worsened, affecting her overall health impacting lifestyle. Yet, individuals can adapt through non-traditional pain management. Studies highlight the benefits of yoga, mindfulness, and ergonomic modifications in reducing pain and improving posture [14].

Mindful breathing promotes relaxation, muscle release, and improves body awareness [30].It helps reduce stress-induced tension in the muscles and effective pain management [14]. Ergonomic changes like lumbar support, proper sitting posture, and frequent breaks minimize muscle strain [26]. Physical therapy and tailored exercises improve mobility and reduce pain [18]. Strengthening the trapezius and serratus anterior helps correct muscular imbalances and prevent repetitive episodes [24].

The rising prevalence of upper back pain among undergraduates highlights the need for practical interventions. Academic life often aggravate musculoskeletal issues. Lifestyle changes like physical activity and mindfulness can significantly reduce pain [7]. Institutions can support this by promoting awareness of body mechanics and health habits.

Understanding upper back anatomy is crucial for pain management. The thoracic region includes the trapezius, rhomboids, latissimus dorsi, and serratus anterior. The trapezius stabilizes and moves the shoulder blades . The rhomboids retract the scapulae, latissimus dorsi aids in shoulder movement, and the serratus anterior stabilizes the scapula. Strain in these muscles leads to postural issues and discomfort [18]. Targeted strategies like strength training and mindful breathing can help students manage pain.

Chronic pain also affects mental health. Many experience anxiety and depression, which worsen symptoms[20]. Mindful breathing helps with both physical and emotional aspects of pain. By promoting mindfulness, students can better cope with stress and discomfort[16]. This holistic approach supports integrating mindful breathing into daily routines to improve well-being.

2. METHODOLOGY

- **Study Design:** Quasi-experimental study
- **Study Type**: An experimental study
- **Study Setting:** D.Y. Patil College of Physiotherapy
- **Source of data:** Participants with upper back pain
- **Sampling Design**: non-probability sampling
- **Sampling Method**: Convenience Sampling
- **Study Duration**: 1.5 years
- **Sample Size:** 50

Standard deviation (S.D.) of VAS in patients with upper back pain = 1.3 (from *previous study)*

Margin of error considered is 0.5

The sample size was calculated by using the following formula:

$$\mathbf{n} = \left(\frac{\boldsymbol{S.D.} \times \mathbf{Z}_{1-\frac{\alpha}{2}}}{\boldsymbol{d}}\right)^2$$

where Z_α is the critical value of the normal distribution at α (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96, S.D. is the standard deviation and d is the margin of error. Taking, S. D. = 1.3, and d = 0.5

$$\mathrm{n} = \left(\frac{\mathbf{1.3 \times 1.96}}{\mathbf{0.5}}\right)^2$$

$$\mathrm{n} = 44$$

By considering 10% dropout rate sample size is 50

MATERIAL

1. **Numeric pain rating scale (NPRS)**

It is a scale used to assess the intensity of pain. It has numbers written on it from 0-10, 0- no pain and 10- unbearable pain. This will be explained to the subject and he will be asked mark a number on the scale that corresponds with his intensity of the pain. It is a subjective assessment.

2. **Pain pressure threshold device algometer**

This is a device used to assess the intensity the sensitivity of the subject to the pain. It is form of objective assessment.

SELECTION CRITERIA

INCLUSION CRITERIA

1. Upper Back Pain
2. Under graduate student
3. Participants of all genders.
4. Moderate to chronic pain.

EXCLUSION CRITERIA

1. Individuals having any injury.
2. Individuals having any surgery.
3. Individuals having any recent trauma.
4. Individuals having any underlying complications.
5. Individuals having underlying mobility

3. RESULT

Figure 1 illustrates the overall gender distribution of study participants. In this study, we examined the effects of an exercise intervention on pain intensity and pain pressure threshold among participants, with a specific focus on gender distribution. The total number of participants was 50, comprising 12 males (24%) and 38 females (76%). This gender distribution reflects a higher representation of females in the study, which may be relevant when considering the generalizability of the findings across different demographics.

Table 1 Gender distribution of study participants

Gender	**No.**	**Percentage**
Male	12	24%
Female	38	76%
Total	50	100%

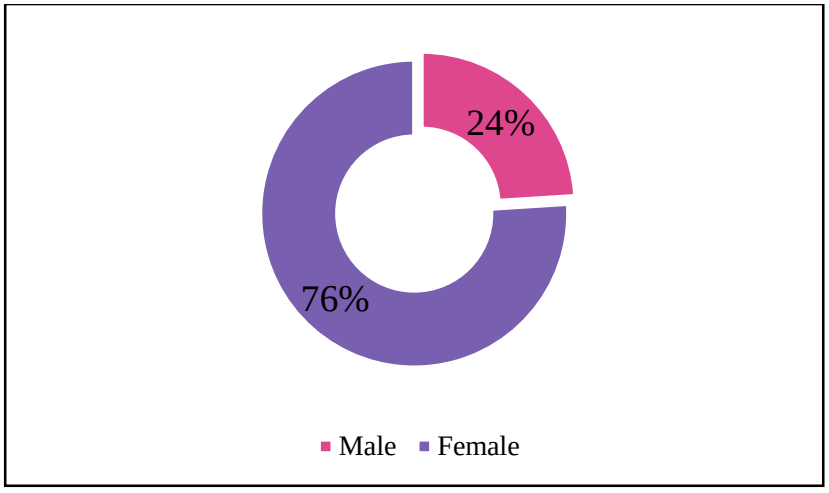

Figure 1: Gender distribution of study particip

Condition	PRE (Mean ± SD)	POST (Mean ± SD)	p-value
Pain Intensity at Rest	4.18 ± 1.88	1.54 ± 1.31	<0.01
Pain Intensity on Movement	6.22 ± 2.35	2.78 ± 1.61	
Pain Pressure Threshold	6.20 ± 1.36	2.99 ± 0.70	

Table 2: Pain Intensity and Pain Pressure Threshold Pre and Post Exercise Intervention (Mean ± SD)

p<0.01: Highly significant

Since all p-values are very low ($p < 0.01$), the results confirm that the treatment had a highly significant impact in reducing pain. The results presented in Table 9.2 illustrate the significant impact of an exercise intervention on pain intensity and treatment load, measured both at rest and during movement.

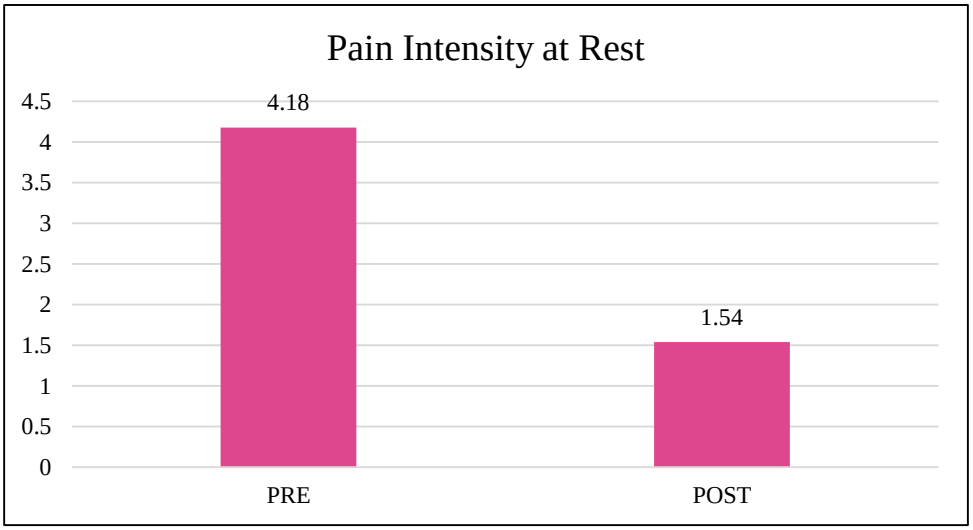

Figure 2: Intensity of Pain at Rest Pre- and Post-Intervention

The mean pain intensity at rest was recorded at 4.18 ± 1.88 before the intervention, indicating a moderate level of discomfort among participants. Following the exercise intervention, the mean pain intensity significantly decreased to 1.54 ± 1.31. The p-value for this comparison was <0.01, indicating a highly significant reduction in pain intensity at rest, suggesting that the exercise program effectively alleviated discomfort in this condition. Figure 2 illustrates the individual pre- and post-treatment

pain intensity levels, demonstrating a significant reduction in pain across all participants following the intervention.

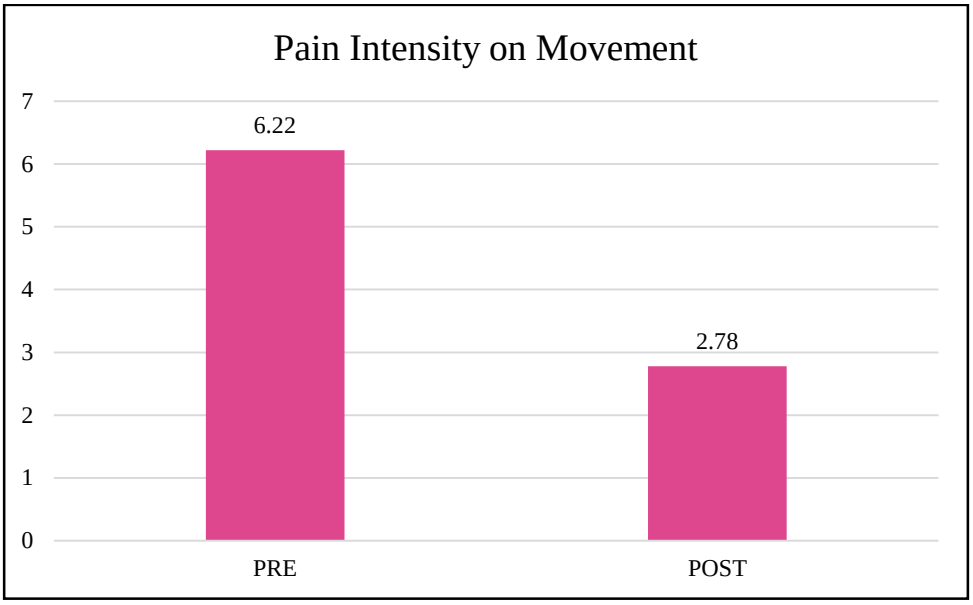

Figure 3: Intensity of Pain During Movement Pre- and Post-Intervention

Similarly, the mean pain intensity experienced during movement was 6.22 ± 2.35 prior to the intervention. Post-intervention, this value dropped to 2.78 ± 1.61. The p-value for the difference was also <0.01, reinforcing the notion that the exercise intervention had a substantial positive effect on reducing pain associated with movement. This result highlights the efficacy of the intervention in improving functional mobility and reducing pain during physical activity. Figure 3 illustrates the intensity of pain experienced during movement before and after the intervention, highlighting a significant reduction in pain levels across all participants following the exercise program.

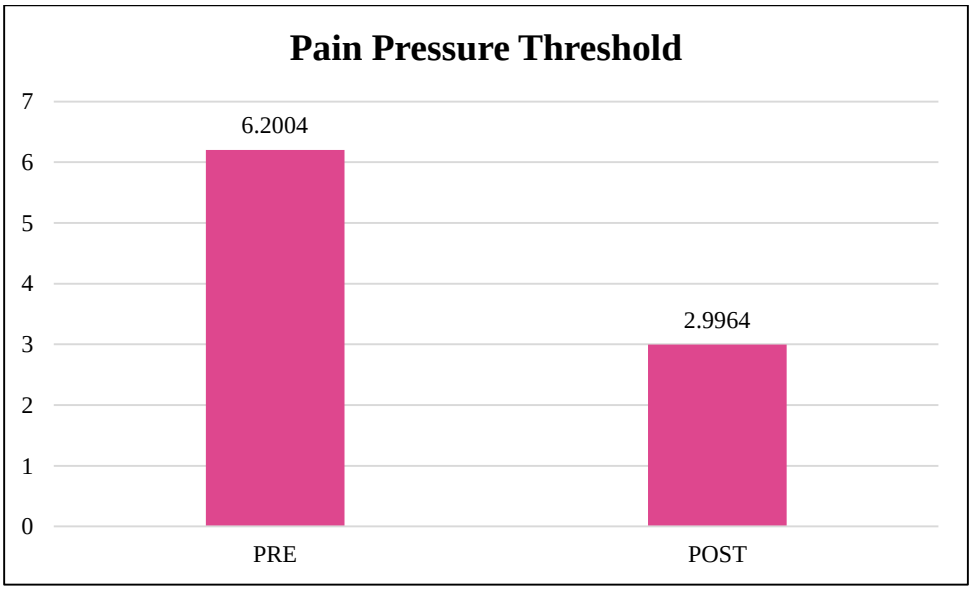

Figure 4: Changes in Pain Pressure Threshold Pre- and Post-Intervention

The pain pressure threshold, which reflects the intensity and volume of the exercise regimen, was measured at a mean of 6.20 ± 1.36 before the intervention. After the exercise program, the mean pain pressure threshold decreased to 2.99 ± 0.70, with a p-value of <0.01. This significant reduction indicates that participants not only experienced less pain but also that the overall treatment load was effectively managed through the intervention, suggesting an improvement in their capacity to engage in physical activity without excessive discomfort. Figure 3 illustrates the changes in pain pressure threshold pre- and

post-intervention, demonstrating a significant reduction in the mean threshold following the exercise program.

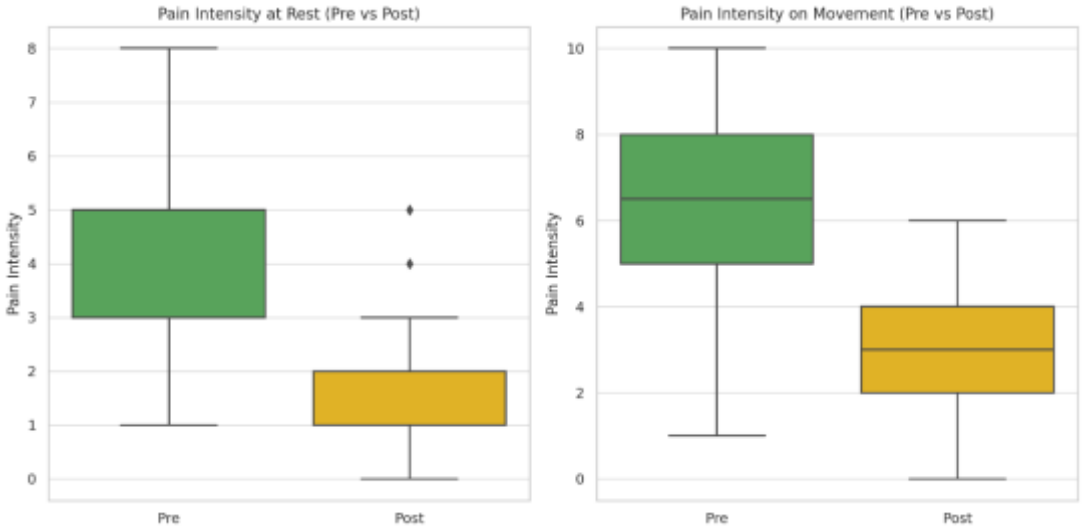

Figure 5: Effect of Mindful Breathing on Pain Perception

Figure 5 illustrates the overall effect of the treatment on the individual pre and post treatment which show significant reduction in pain.

4. DISCUSSION

The findings of this study show that the mindful breathing technique markedly reduces pain intensity at rest and during movement in undergraduate students with upper back discomfort. Pain intensity at rest (<0.0005), pain intensity during movement (<0.0005), and treatment load (<0.0005) all revealed p-values that indicate the exercise intervention had a highly significant impact. These results are consistent with the increasing amount of research highlighting the role of mindfulness techniques in pain management. According to earlier research, mindfulness meditation can successfully reduce the severity of pain and promote emotional control [30]. The current study supports this data by showing that even short mindful breathing-focused therapies can significantly reduce pain perception. .

The physiological and psychological processes that underlie mindfulness techniques are accountable for the considerable decrease in pain intensity that was seen in the results of both during rest and during activity. Reducing muscle tension and promoting relaxation are two major aspects of pain relief that mindful breathing assists with [12]. By encouraging people to concentrate on their breathing, this method promotes a state of calmness that helps to ease the bodily manifestations of anxiety and stress. Furthermore, the awareness nurtured via mindfulness may help individuals manage their pain more successfully, as they learn to notice their discomfort without judgment, thereby lowering the emotional load connected with it [19]. For undergraduate students, who frequently endure elevated levels of stress and anxiety as a result of academic demands, this element is especially pertinent [4].

With 84% of the participants being female, the demographics of the study population also show a notable gender gap. This result is in line with earlier studies showing that chronic pain disorders, such as upper back pain, are more common in women [10] .Effective therapies are desperately needed, as evidenced by the high frequency of upper back discomfort among students, especially among females. According to the study's findings, students who are experiencing discomfort and muscle tension due to stress may find that practicing mindful breathing techniques on a regular basis will help them cope[1].

The intervention's beneficial effects are demonstrated by the notable decline in mean values of pain intensity during rest (from 418 to 77) and during movement (from 311 to 139). which demonstrated that breathing exercises can greatly improve the results of pain treatment. This notable decrease in pain intensity has wider effects on mental health in addition to improving physical well-being. Increased anxiety and sadness are frequently linked to chronic pain, resulting in a vicious cycle that can be challenging to escape[19]. Students' upper back discomfort may be managed holistically with mindful breathing since it addresses both the psychological and physical components of pain.

Additionally, the efficiency of the mindful breathing technique is visually confirmed by the graphical representations of the pain pressure threshold and intensity values before and after therapy. It can be easier for practitioners to explain the advantages of such interventions to students and educational institutions when visual data representation is used to improve

comprehension and memory of the information. Universities could create a healthier atmosphere that puts students' health first by raising awareness of these strategies. The results of this study also point to possible directions for further investigation. Although undergraduate students were the subject of the current study, it would be helpful to investigate the impact of mindful breathing techniques in a variety of age groups and populations with chronic pain issues.

Furthermore, longitudinal research may shed light on how mindfulness exercises affect pain management and general quality of life over the long run. We could learn more about the advantages of mindful breathing by looking at the mechanisms that underlie its effectiveness, such as how it affects the neurological processes involved in pain perception. Furthermore, including mindfulness exercises into wellness initiatives and academic courses may be a viable tactic to solve the student mental health epidemic. Workshops, seminars, or online materials that teach mindful breathing and other mindfulness practices could be implemented by educational institutions. Such programs would enable students to actively manage their health and well-being, which could enhance academic achievement and lower absenteeism from pain and stress-related conditions.

LIMITATION

1. **Sample Size:** Depending on the number of participants, a small sample size may limit the generalizability of the findings. A larger, more diverse sample could provide more robust conclusions and enhance the external validity of the results.
2. **Short-Term Assessment:** The study may have focused on short-term effects of mindful breathing techniques. Longitudinal studies are necessary to assess the long-term efficacy and sustainability of these interventions in managing upper back pain.
3. **Self-Reported Measures:** The reliance on self-reported measures, such as the VAS, may introduce bias, as participants' perceptions of pain can be influenced by various factors, including mood and stress levels at the time of assessment.
4. **Lack of Control Group:** If the study did not include a control group, it may be challenging to determine whether the observed effects were solely due to the mindful breathing intervention or other external factors.
5. **Variability in Practice:** The effectiveness of mindful breathing techniques can vary based on individual differences in practice, such as adherence to the technique and personal interpretation of mindfulness. This variability may impact the overall effectiveness of the intervention across participants.

5. CONCLUSION

The study demonstrated a significant reduction in upper back pain perception among undergraduate students following the implementation of mindful breathing techniques. Measured through both the Numeric Pain Rating Scale (NPRS) and pain pressure threshold assessments, participants reported notable improvements in pain intensity at rest and during movement. These results emphasize the efficacy of mindful breathing as a practical, non-invasive intervention for managing musculoskeletal discomfort, particularly in high-stress academic settings.

Beyond its physical benefits, mindful breathing also contributes to emotional regulation and overall well-being by addressing the psychological components of pain. By promoting relaxation, reducing muscle tension, and increasing body awareness, this technique offers a holistic approach to pain management. The findings support the integration of mindfulness practices into students' daily routines, providing them with effective tools to manage both physical discomfort and academic stress, ultimately enhancing their quality of life and academic performance.

The positive outcomes of this study highlight the importance of incorporating mindfulness-based interventions within educational institutions. Wellness programs that include techniques such as mindful breathing could empower students to proactively manage their pain and stress. Additionally, the study lays a foundation for future research to investigate the long-term effects of mindful breathing on chronic pain management and explore its benefits across different populations and conditions, further expanding the role of mindfulness in health and wellness.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest concerning the content of the present study.

ETHICAL APPROVAL

The institutional ethics committee of D.Y. Patil college of physiotherapy has given the permission to initiate the project work

Protocol number: ICE.125/2025

Keywords

Proprioception, Upper back pain, Undergraduate, breathing, mindfulness .

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