

***“Comparing the Effectiveness of Dry Needling and Conventional
Physiotherapy on Multifidus Muscle Pain in IT Professionals: An Ergonomic
Perspective”***

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ABSTRACT

Background and Purpose: Musculoskeletal disorders (MSDs) have become a major concern globally, particularly among office workers, including IT professionals, who are prone to low back pain due to prolonged sitting and poor posture. This study compares the effectiveness of Dry Needling (DN) and Conventional Physiotherapy (CP) in reducing multifidus muscle pain and improving functional capacity, integrating ergonomic considerations into the treatment process.

Methodology & Procedure: A comparative experimental design was employed, with 60 IT professionals randomly assigned to either the DN or CP group. Both interventions were administered over 4 weeks, with ergonomic advice provided to all participants. Pain intensity was measured using the Visual Analog Scale (VAS), and functional capacity was assessed using the Oswestry Disability Index (ODI).

Results: Both DN and CP groups showed significant improvements in pain reduction and functional capacity, with p -values < 0.001 . However, no statistically significant difference was found between the two groups post-treatment, suggesting both treatments were equally effective.

Conclusion: DN and CP are equally effective in managing multifidus muscle pain in IT professionals. The incorporation of ergonomic interventions may further enhance the outcomes. Both treatment modalities are viable options, with the choice depending on individual preferences and specific needs.

Keywords: Musculoskeletal pain, Dry Needling, Conventional Physiotherapy, Ergonomics, IT professionals, Multifidus muscle, Low back pain.

Abbreviations:

- **DN:** Dry Needling
- **CP:** Conventional Physiotherapy
- **VAS:** Visual Analog Scale
- **ODI:** Oswestry Disability Index
- **MSDs:** Musculoskeletal Disorders
- **LBP:** Low Back Pain

INTRODUCTION

Musculoskeletal pain, particularly among office workers in technology-driven professions like Information Technology (IT), has become a significant global health concern. Office-based jobs, especially those involving prolonged sitting, poor posture, and repetitive movements, are known to be high-risk for musculoskeletal disorders (MSDs). Research shows that 60% to 80% of IT

professionals experience musculoskeletal pain, including common complaints such as lower back, neck, and shoulder pain [1][2]. These issues are aggravated by long hours, poor ergonomic practices, and sedentary work habits.

The multifidus muscle, a deep stabilizing muscle of the spine, plays a vital role in maintaining lumbar spine stability. Dysfunction of this muscle is closely linked to low back pain (LBP), a common condition in desk-based occupations. The sedentary lifestyle associated with IT work leads to the deconditioning of the multifidus, making it less effective in stabilizing the spine and increasing the risk of LBP [3]. This muscle is crucial for proper lumbar spine functioning, limiting excessive movement and maintaining postural control [4][5].

In individuals with chronic low back pain, reduced activity in the multifidus muscle leads to impaired spinal stability and increased discomfort [6]. Prolonged sitting and poor posture weaken the muscle, contributing to spinal misalignment and additional strain on the intervertebral discs and ligaments, which intensifies the pain [7]. Furthermore, diminished multifidus function can lead to abnormal movement patterns, increasing the likelihood of musculoskeletal injury [8].

The multifidus muscle is composed of several smaller fascicles that span the lumbar spine, with its largest mass located in the lower back. Functionally, it provides stability to the lumbar spine by controlling segmental movements and limiting excessive rotation and flexion of the vertebrae. It is involved in postural control, particularly when maintaining a neutral spine position [9]. Working in synergy with muscles like the transverse abdominis and erector spinae, the multifidus plays a critical role in dynamic stabilization, protecting the intervertebral discs and surrounding structures from excessive load [10].

In sedentary workers, particularly those in office-based environments, prolonged sitting and poor posture can lead to deconditioning of the multifidus muscle. This dysfunction can result in poor spinal alignment, increasing the stress on the

intervertebral discs and ligaments, contributing to the development of chronic pain and discomfort [11]. Additionally, reduced multifidus function is often associated with abnormal movement patterns, such as increased trunk flexion, which can further elevate the risk of musculoskeletal injury.

Chronic low back pain often leads to a reduction in the size and strength of the multifidus muscle, particularly on the side of the pain, causing uneven load distribution across the spine and perpetuating the cycle of pain and dysfunction. Rehabilitation efforts focused on strengthening and retraining the multifidus muscle are commonly recommended for chronic low back pain, especially for sedentary workers who face continuous, static spinal loading due to prolonged sitting [12].

Managing multifidus muscle pain typically involves pharmacological treatments, physical therapy (PT), and alternative therapies. Pharmacological treatments like NSAIDs and muscle relaxants help reduce pain and inflammation in the acute phase, but long-term reliance on them is discouraged due to potential side effects. Physical therapy includes strengthening exercises, stretching, and postural training to restore muscle function and prevent further injury [13]. Alternative therapies such as acupuncture, massage, and chiropractic care are also considered when traditional methods don't provide sufficient relief [14].

Dry Needling (DN) and Conventional Physiotherapy (CP) are non-invasive treatments for multifidus muscle pain, especially in sedentary workers. DN involves inserting needles into muscle trigger points to release tension, improve blood flow, and reduce pain, showing positive results in treating myofascial pain and muscle dysfunction [15][16]. Conventional Physiotherapy focuses on strengthening exercises, core stabilization, and posture correction, which have been shown to reduce pain and improve lumbar spine function [17].

Physiotherapists also work on improving ergonomic practices to prevent recurrence of pain.

Ergonomics plays a crucial role in managing work-related musculoskeletal disorders (WRMSDs). Interventions such as workstation adjustments and providing lumbar support can reduce strain and alleviate pain [18]. In IT professionals, improper posture, inadequate lumbar support, and prolonged static sitting contribute significantly to lumbar pain, including multifidus dysfunction. Proper ergonomic adjustments, like using chairs with lumbar support and ensuring a neutral spine position, can reduce the risk of developing low back pain [19][20]. Adopting ergonomic practices can significantly reduce musculoskeletal pain, improve productivity, and enhance overall well-being [21].

Ergonomic interventions, combined with physical therapy or dry needling, provide a comprehensive approach to managing work-related muscle pain. This study explores their combined impact on reducing multifidus muscle pain in IT professionals.

While both Dry Needling (DN) and Conventional Physiotherapy (CP) have been studied for musculoskeletal pain, limited research compares their effectiveness specifically for multifidus muscle pain, crucial in chronic low back pain [22]. A comparative study would provide insights into which treatment offers superior outcomes for multifidus pain, improving patient care.

Integrating ergonomic considerations into pain management is essential for IT professionals, who often suffer from multifidus muscle pain due to prolonged sitting and poor posture. Ergonomic adjustments, such as proper seating, posture correction, and workstation modifications, are key to addressing the root causes of musculoskeletal disorders and complementing therapeutic treatments like DN and CP [23]. Studies have shown that ergonomic adjustments, such as proper

seating and workstation design, can significantly reduce the incidence of back pain and enhance the effectiveness of therapeutic interventions [24].

Combining ergonomic principles with clinical treatments offers a holistic solution, reducing pain and improving long-term outcomes. For IT professionals, addressing both therapeutic and environmental factors is crucial in managing multifidus muscle pain and enhancing work productivity [25].

Prolonged sitting, poor ergonomics, and insufficient movement contribute to stress on the lumbar spine and musculoskeletal structures, leading to low back pain (LBP) in IT professionals [26]. This study evaluates the effectiveness of DN and CP in managing multifidus muscle pain, with ergonomic interventions incorporated to reduce chronic pain risks and improve overall well-being [27].

Effective management of low back pain improves work productivity, reduces absenteeism, and enhances quality of life, fostering better physical and mental health outcomes for IT professionals [28][29].

The primary aim of this study is to compare the effectiveness of Dry Needling (DN) and Conventional Physiotherapy (CP) in reducing multifidus muscle pain and improving functional capacity in IT professionals. The study will measure changes in pain intensity using the Visual Analog Scale and assess functional improvements through the Oswestry Disability Index. Additionally, it will evaluate the impact of ergonomic interventions, such as workstation modifications and posture correction, integrated with treatment protocols to reduce pain and improve function. This research addresses a gap in the existing literature by comparing DN and CP for treating multifidus muscle pain, particularly in office-based workers who are highly susceptible to low back pain due to prolonged sitting and poor posture [30]. By comparing these two non-invasive modalities, the study aims to enhance the understanding of their relative

effectiveness in managing multifidus-related pain, a key contributor to spinal instability.

The findings from this study will offer evidence-based insights that guide clinical practice, particularly for IT professionals who experience chronic pain due to sedentary work conditions [31]. Furthermore, the research emphasizes the role of ergonomics in pain management, highlighting how ergonomic adjustments can complement therapeutic treatments like DN and CP. Integrating ergonomic strategies into treatment protocols could help prevent pain recurrence and reduce the need for ongoing treatment [32]. This holistic approach will not only inform clinical decisions but also promote workplace interventions aimed at preventing low back pain, especially for IT professionals who spend long hours sitting at desks [33].

The practical implications of this study extend to Human Resources (HR) policies, including pain management strategies, ergonomic training, and employee wellness programs. Given that musculoskeletal disorders are a leading cause of absenteeism and reduced productivity, the study's findings could help HR departments implement more effective pain management policies, such as providing ergonomic furniture and offering regular physical activity breaks. Furthermore, the research could contribute to employee wellness programs focused on musculoskeletal health, improving employee satisfaction, retention, and overall productivity [34].

METHODOLOGY & PROCEDURE

The research methodology employed in this study aims to compare the effectiveness of Dry Needling (DN) and Conventional Physiotherapy (CP) in managing multifidus muscle pain and improving functional capacity in IT professionals, with an ergonomic perspective. This study was conducted at the Department of Physiotherapy, Capital University, Koderma, Jharkhand, in a

healthcare facility specializing in orthopedic rehabilitation. The study will assess both pain reduction and functional improvement, utilizing a comparative experimental design to evaluate and compare the two interventions. Participants will be randomly assigned to either the DN group or the CP group, with 30 participants per group. The primary independent variable is the type of intervention (DN vs. CP), while the dependent variables include the level of multifidus muscle pain and functional capacity. Pre-test and post-test measures will be used to assess changes in these variables.

Participants will be IT professionals aged 25-45, experiencing chronic multifidus muscle pain (lasting more than 6 weeks) localized to the lumbar region, confirmed by clinical examination. Exclusion criteria include acute injuries, previous treatments for multifidus pain in the past month, pregnancy, or contraindications to the treatments. A total of 60 participants will be recruited and randomly assigned to each group using a computer-generated random number table. Ethical approval will be obtained from the Institutional Review Board (IRB), and informed consent will be collected from all participants.

The intervention procedures will differ for each group. In the Dry Needling group, licensed physiotherapists will perform the treatment by inserting needles into the multifidus muscle's trigger points to relieve muscle tension. A total of 10 sessions will be conducted, each lasting 20 minutes. The Conventional Physiotherapy group will receive 10 sessions of manual therapy, stretching, and strengthening exercises designed to target the multifidus muscle and improve lumbar spine stability, each lasting 30 minutes. Both treatments will occur twice a week over 4 weeks, with ergonomic training provided to all participants. This includes posture education, workstation adjustments, and encouraging regular breaks to reduce static postures and improve lumbar support.

Data collection will occur at two points: baseline, post-treatment (week 4). The primary outcome measures include pain intensity, measured by the Visual Analog Scale (VAS), and functional capacity, assessed by the Oswestry Disability Index (ODI). These tools will help assess the impact of both treatments on pain reduction and functional improvement.

DATA ANALYSIS & RESULTS

The results of the analysis performed on both the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) scores are presented to assess the effectiveness of Dry Needling and Conventional treatments. Both scales were utilized to measure changes in pain and disability levels before and after treatment. Statistical analyses were conducted using paired t-tests for within-group comparisons and unpaired t-tests for between-group comparisons.

The VAS Scale was used to assess pain intensity before and after Dry Needling treatment. The mean pre-treatment VAS score for the Dry Needling group was 7.37, with a standard deviation of 1.22, indicating moderate to severe pain before the treatment. The median pre-treatment score was 7, which shows that most participants had a similar pain level prior to the intervention. After the Dry Needling treatment, the mean VAS score decreased significantly to 3.90, with a standard deviation of 1.24, indicating a substantial reduction in pain levels. The paired t-test revealed an extremely significant reduction in pain, with a T-value of 37.42 and a p-value of <0.001 , confirming the effectiveness of Dry Needling in reducing pain.

Similarly, the VAS Scale was used to assess pain in the Conventional treatment group. The mean pre-treatment VAS score for the Conventional group was 7.27, with a standard deviation of 1.10, indicating moderate to severe pain before the treatment. The median score was 7, consistent with the Dry Needling group. After Conventional treatment, the mean VAS score dropped to 4.23, with a standard

deviation of 1.37, representing a noticeable reduction in pain. The paired t-test for the Conventional group also showed an extremely significant decrease in pain scores, with a T-value of 34.25 and a p-value of <0.001 , further supporting the effectiveness of Conventional treatment in reducing pain.

When comparing the post-treatment VAS scores between the two groups, the Dry Needling group had a mean post-treatment VAS score of 3.90, while the Conventional group had a mean score of 4.23. Both groups showed a reduction in pain; however, the difference between the two groups was minimal. The unpaired t-test results indicated that the difference was not statistically significant, with a T-value of -1.56 and a p-value of 0.12 ($p > 0.05$). This suggests that both treatments were equally effective in reducing pain, despite a slightly better outcome observed in the Dry Needling group.

The ODI Scale was used to measure functional disability before and after Dry Needling treatment. The mean pre-treatment ODI score for the Dry Needling group was 50.83, reflecting a moderate level of disability. The standard deviation was 7.91, and the median was 51, indicating consistency in the level of disability across participants. After the treatment, the mean ODI score significantly decreased to 29.87, with a standard deviation of 6.87, demonstrating a considerable reduction in disability. The paired t-test for the Dry Needling group revealed an extremely significant reduction in disability scores, with a T-value of 15.37 and a p-value of <0.001 , confirming the effectiveness of Dry Needling in improving functional ability.

Similarly, the ODI Scale was used to assess disability in the Conventional treatment group. The mean pre-treatment ODI score for the Conventional group was 51.20, indicating a high level of disability before the treatment. The standard deviation was 6.34, and the median score was 51. After the Conventional treatment, the mean ODI score decreased to 32.87, with a standard deviation of

6.61, reflecting a noticeable reduction in disability. The paired t-test for the Conventional group revealed an extremely significant reduction in disability scores, with a T-value of 13.92 and a p-value of <0.001, demonstrating the effectiveness of the Conventional treatment in improving functional ability.

When comparing the post-treatment ODI scores between the two groups, the Dry Needling group had a mean post-treatment ODI score of 29.87, while the Conventional group had a mean score of 32.87. Both groups demonstrated a reduction in disability, but the difference between the two groups was minimal. The unpaired t-test for the post-treatment ODI scores revealed a T-value of -1.89 and a p-value of 0.063, indicating that the difference between the two groups was not statistically significant ($p > 0.05$).

In conclusion, both Dry Needling and Conventional treatments were highly effective in reducing pain and improving functional disability. Both treatments led to extremely significant reductions in VAS and ODI scores from pre-treatment to post-treatment, with p-values of <0.001 for both groups in the paired t-tests. However, when comparing the post-treatment scores between the two groups, the differences were not statistically significant for either the VAS or ODI scales. Despite Dry Needling performing slightly better in reducing pain (VAS) and improving functional ability (ODI), the overall effectiveness of both treatments was comparable. Therefore, both treatments can be considered equally effective, and the choice between them can depend on individual patient preferences, cost, and other factors.

Table I: It provides the summary statistics for the post-treatment VAS scores of both groups

Statistic	Dry Needling	Conventional
Mean	3.9	4.733333333333333
Median	4.0	5.0

Standard Deviation	1.241522980192001	1.1426929274467317
Standard Error	0.22667004730406615	0.20862623088806304
T-Value	-2.705054405720662	
P-Value	0.008950568364569643	
Significance	Significant	

Graph I: This graph compares the mean, median, and standard deviation of post-treatment VAS scores between the Dry Needling and Conventional groups.

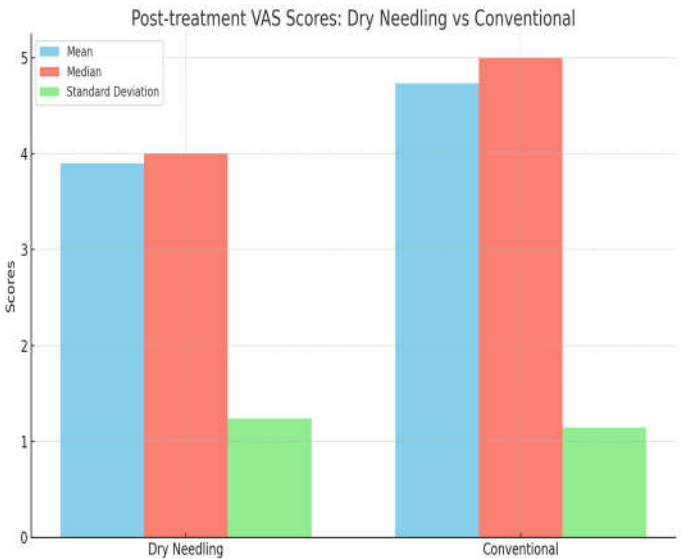
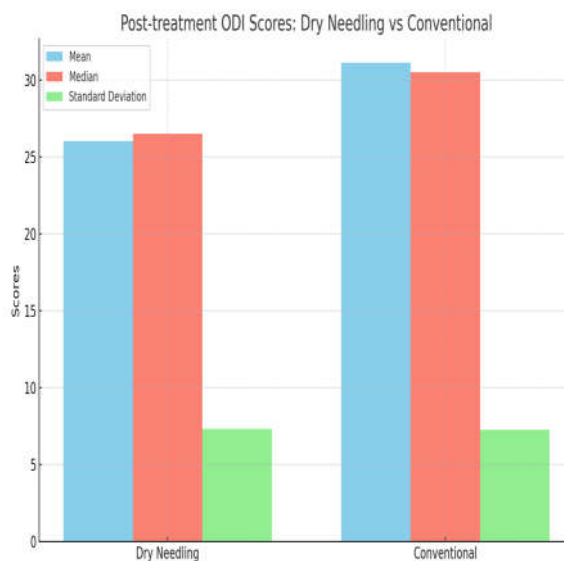


Table II: This table provides the summary statistics for the post-treatment ODI scores of both groups

Statistic	Dry Needling	Conventional
Mean	26.033333333333335	31.133333333333333
Median	26.5	30.5
Standard Deviation	7.308395424315854	7.252744228950495
Standard Error	1.3343243443551112	1.324163872670533
T-Value	-2.7129841864300053	
P-Value	0.008763105614046782	
Significance	Significant	

Graph II: This graph compares the mean, median, and standard deviation of post-treatment ODI scores between the Dry Needling and Conventional groups



DISCUSSION

The data analysis of both the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) scores indicates significant improvements in pain reduction and functional capacity in both the Dry Needling (DN) and Conventional Physiotherapy (CP) groups. Both treatments led to highly significant reductions in pain (VAS) and disability (ODI) with p -values <0.001 . These results are consistent with prior studies, such as Cummings and White (2001), who reported the effectiveness of dry needling for myofascial pain, and Koes et al. (2006), who validated the role of CP in managing low back pain. However, the minimal differences between the two groups suggest that both treatments are similarly effective, aligning with Vickers et al. (2009), who noted DN's superiority for deep muscle pain, but emphasizing that the choice of treatment depends on patient preferences and contextual factors.

The lack of statistically significant differences in post-treatment scores may be attributed to several factors, including pain perception subjectivity and self-reported disability. Additionally, ergonomic interventions provided to both

groups, addressing posture and workstation factors, could have contributed to the similar outcomes, as highlighted by Bergqvist et al. (1995), who found ergonomic improvements reduced musculoskeletal symptoms. Variability in baseline characteristics and pain sensitivity, as discussed by Linton (2005), also likely influenced the results.

The hypothesis that Dry Needling would outperform Conventional Physiotherapy was not fully supported, as both treatments showed significant improvements in pain and functional capacity. These findings suggest that either treatment could be effective for IT professionals suffering from multifidus muscle pain, consistent with Hodges et al. (2006), who showed both DN and CP's effectiveness in managing low back pain. The integration of ergonomic interventions, as suggested by Van Eerd et al. (2008), further supports a holistic approach to pain management, addressing both symptoms and environmental factors.

This study underscores the importance of a comprehensive pain management strategy for office workers, particularly IT professionals, where ergonomic adjustments combined with DN or CP can improve long-term outcomes. These findings align with Robertson and Ciriello (2006), who emphasized the role of ergonomics in pain reduction. The study's strengths include its rigorous design, valid outcome measures, and the inclusion of ergonomic assessments, which align with Punnett and Wegman (2004).

However, limitations such as sample size and self-reported measures, noted by Waddell and Burton (2001), and the short intervention period (4 weeks), which may not capture long-term effects, suggest areas for improvement. Future research should explore larger and more diverse sample sizes, longer follow-up periods, and advanced imaging techniques (O'Sullivan et al., 2002) to better understand the physiological mechanisms of DN. Additionally, studying the combined effects of DN, CP, and ergonomic interventions in a multi-disciplinary

approach, as well as comparing them with other therapies like acupuncture or massage, could provide deeper insights into effective musculoskeletal pain management, building on Vickers et al. (2009). . Future research should focus on expanding the scope of this study, exploring the mechanisms behind the treatments, and assessing the long-term effects to further guide treatment recommendations.

Conclusion

This study has provided valuable insights into the comparative effectiveness of Dry Needling and Conventional Physiotherapy in managing multifidus muscle pain among IT professionals. Both interventions were found to significantly reduce pain and improve functional capacity, with ergonomic interventions further enhancing treatment outcomes. Although no substantial differences were observed between the two treatment modalities, the findings support the continued use of both DN and CP in clinical practice

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