



# Effectiveness Of Ergonomic Advices For Neck Pain In Tailors: An Experimental Study

<sup>1</sup>Dr. Jaya Bhagat, <sup>2</sup>Dr. Amol Shinde, <sup>3</sup>Dr. Shruti Bhanavat, <sup>4</sup>Dr. Sachin Bhagat

<sup>1</sup> Associate professor at CPPC Nagpur, DAVV University, Indore, India, <sup>2</sup>Principal cum professor at CPPC Nagpur, Maharashtra University of Health Sciences, Nashik, India, <sup>3</sup>Associate professor at Naikwadi College of Physiotherapy, Maharashtra University of Health Sciences, Nashik, India, <sup>4</sup>Associate professor at Naikwadi College of Physiotherapy, Maharashtra University of Health Sciences, Nashik, India.

## Abstract

**Background:** Musculoskeletal disorders, particularly neck pain, are highly prevalent among tailors due to repetitive tasks and poor ergonomic conditions, leading to reduced productivity and quality of life. This study aimed to evaluate the effectiveness of ergonomic interventions in reducing neck pain among tailors.

**Methods:** In this single-group pre-post experimental study, 70 tailors (aged 20–45 years) from Nagpur, India, with neck pain were recruited from 2023 to 2024. Baseline and post-intervention neck pain was assessed using the Numerical Pain Rating Scale (NPRS; 0–10). Interventions included posture awareness training, 10–15 minute hourly breaks, basic neck exercises (e.g., chin tucks), and trapezius strengthening exercises. Data were analyzed using paired t-tests ( $p \leq 0.05$ ) via Epi Info software (version 7).

**Results:** All participants completed the study. Mean NPRS scores decreased significantly from  $5.7 \pm 2.0$  (moderate pain) pre-intervention to  $4.2 \pm 1.7$  post-intervention (mean change:  $-1.5$ ;  $t=12.81$ ,  $p<0.001$ ), a 26.3% improvement exceeding the minimal clinically important difference ( $\geq 1.3$  points). Improvements were consistent across genders and age groups.

**Conclusion:** Simple ergonomic advice significantly alleviates neck pain in tailors, offering a low-cost strategy to enhance occupational health and efficiency. Future randomized trials with long-term follow-up are recommended to confirm sustained benefits.

**Keywords:** Ergonomic interventions, Neck pain, Tailors, Musculoskeletal disorders, Workplace ergonomics

## INTRODUCTION

Musculoskeletal disorders (MSDs) have become increasingly prevalent worldwide over the past decades, representing one of the most common work-related complications among working individuals [1]. Studies on women sewing machine operators have reported a high incidence of neck and shoulder disorders, attributed to the monotonous and highly repetitive nature of tasks such as cutting, assembly, pressing, and finishing, which are performed in a constrained sitting posture with the upper back curved and the head bent forward over the sewing machine [2]. These disorders typically arise from recurrent and persistent injury or pressure on tendons, bones, joints, and muscles due to prolonged work without adherence to ergonomic principles,

ultimately contributing to a cascade of issues including stress, accidents, skin diseases, injuries, insomnia, respiratory problems, eye strain, and broader MSDs among tailors [3]. Factors such as extended working hours, use of low-heighted tables, and constant hand-intensive activities further exacerbate neck pain in this population [1].

Ergonomic deficiencies in tailoring workspaces are particularly pronounced. For instance, over 70% of small-scale garment producers in relevant studies utilized seats lacking backrests or lumbar support, with seat heights preventing feet from resting flat on the floor, narrow and non-adjustable depths restricting knee room, and unpadded, poorly contoured pans failing to provide essential comfort [4]. Ergonomics, defined as the scientific discipline that examines interactions between humans and other system elements, applies theoretical principles, data, and methods to design workplaces that optimize worker well-being and organizational performance [5-7]. Research evaluating ergonomic conditions in Asian garment factories indicates that elevated incidences of back, neck, and shoulder complaints stem primarily from constrained postures, poorly designed workstations, and non-ergonomic tools [5]. Similarly, in Sweden, neck and shoulder pain emerged as the predominant complaint among sewing machine operators, with 75% reporting issues in the preceding year and 51% in the prior week, largely due to prolonged exposure to awkward postures [6].

Given these pervasive challenges, the present study assesses whether workplace ergonomic advice can reduce neck pain among tailors, thereby enhancing their productivity and efficiency. The need for this investigation is underscored by the necessity to analyze tailors' work postures and provide targeted recommendations, evaluate the impact of ergonomic interventions on those with neck pain, and address the well-established inter-relationship between faulty ergonomics and MSDs. As improper postures pose risks for severe long-term complications, this represents a critical area of concern. The aim of the study is to observe the outcomes of ergonomic interventions in tailors experiencing neck pain. The specific objective is to identify the effects of these interventions on neck pain, as measured by the Numerical Pain Rating Scale (NPRS).

## METHODOLOGY

This experimental study employed a single-group pre-test post-test design to evaluate the effectiveness of ergonomic interventions on neck pain among tailors. The study was conducted in Nagpur city, India, targeting tailors as the sample population. A total of 70 participants were recruited over duration from 2023 to 2024.

The sample size was determined based on the reported prevalence of neck pain among tailors (78%) using the formula  $n=4PQ/L^2$ , where P represents the prevalence (78%),  $Q=100-P$   $Q = 100 - P$   $Q=100-P$  (22%), and L is the allowable error ( $\pm 10\%$ ). This yielded a calculated sample size of  $n=4 \times 78 \times 22 / 10^2 = 70$ . The estimation was performed using Epi Info software (version 7), ensuring 70 subjects were included in the total sampling frame.

Simple random sampling was utilized to select participants. Tailors experiencing neck pain or stiffness, aged 20–45 years, formed the sampling frame. Middle-aged individuals within this range were purposefully selected for convenience and feasibility, with final randomization achieved via a random number table. Inclusion criteria encompassed tailors reporting neck pain; adults aged 20–45 years, and both genders. Exclusion criteria included individuals with any prior cervical spine pathology or those unwilling to participate.

Materials for the study consisted of the NPRS questionnaire for assessing pain intensity and a pen for participant responses. Ethical approval was obtained from the Niharika College of Physiotherapy. Following informed consent, the study protocol was explained to all eligible tailors to ensure voluntary participation. Baseline data were collected by administering the validated NPRS questionnaire, where participants rated their neck pain on a 0–10 scale (0 indicating no pain and 10 indicating the worst imaginable pain). Questionnaires were completed independently under supervision and collected immediately. Subsequently,

ergonomic interventions were delivered, including (a) posture awareness training with corrections for maintaining an upright sitting position, (b) scheduled 10–15 minute breaks every hour to alleviate static loading, (c) basic neck exercises (e.g., chin tucks, neck rotations, and lateral flexions), and (d) strengthening exercises targeting the middle and lower fibers of the trapezius muscle (e.g., shoulder shrugs and scapular retractions). Interventions were demonstrated and participants were instructed to integrate them into their daily work routines from 2023 to 2024. Post-intervention assessments using the same NPRS questionnaire were conducted at the study's conclusion to capture changes in pain levels. Raw data were compiled for analysis.

Data analysis was performed using Epi Info software (version 7). Descriptive statistics, including percentages, proportions, and prevalence rates, were calculated to summarize participant characteristics and pain outcomes. Pre- and post-intervention comparisons of NPRS scores were evaluated using the Student paired t-test. Statistical significance was set at  $p \leq 0.05$ .

## RESULTS

A total of 70 tailors from Nagpur city were enrolled in the study, with complete data available for all participants at both pre- and post-intervention assessments, resulting in no attrition. The demographic characteristics of the participants are summarized in Table 1. The mean age was  $32.4 \pm 6.8$  years, with a predominance of males (62.9%,  $n=44$ ) and a mean weekly working hours of  $48.2 \pm 5.6$  hours. All participants reported baseline neck pain, with 78.6% ( $n=55$ ) experiencing moderate to severe pain (NPRS score  $\geq 4$ ).

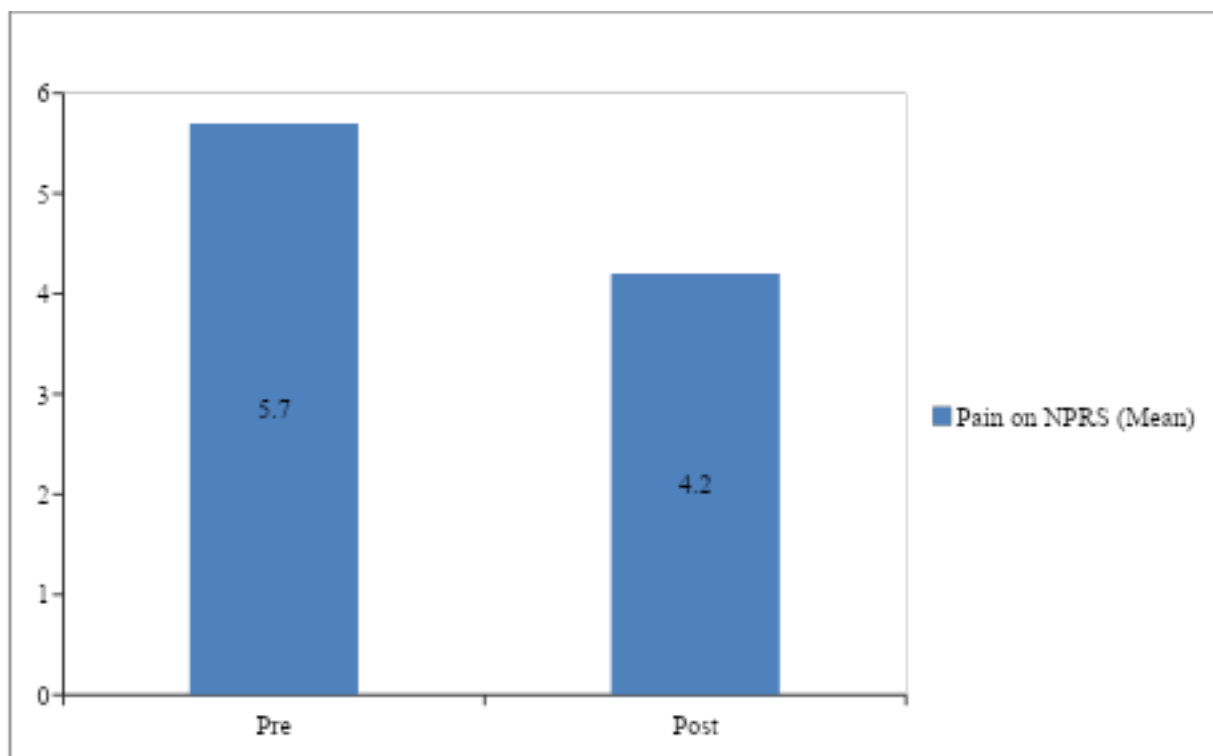
**Table 1: Demographic Characteristics of Participants (N=70)**

Characteristic	Value
Age (years), mean $\pm$ SD	$32.4 \pm 6.8$
Gender, n (%)	
- Male	44 (62.9%)
- Female	26 (37.1%)
Body mass index (kg/m <sup>2</sup> ), mean $\pm$ SD	$24.1 \pm 3.2$
Weekly working hours, mean $\pm$ SD	$48.2 \pm 5.6$
Duration of tailoring experience (years), mean $\pm$ SD	$12.1 \pm 4.3$

The primary outcome measure was neck pain intensity, assessed using the Numerical Pain Rating Scale (NPRS; 0-10 scale). Pre-intervention, the mean NPRS score was  $5.7 \pm 2.0$ , indicating moderate pain on average. Following the ergonomic intervention from 2023 to 2024, the mean NPRS score decreased significantly to  $4.2 \pm 1.7$  (Table 2 and Figure 1). This reduction of 1.5 points (26.3% improvement) was statistically significant, as determined by the Student paired t-test ( $t=12.81$ ,  $p<0.001$ ).

**Table 2: Pre- and Post-intervention NPRS scores (N=70)**

Outcome	Pre-NPRS	Post-NPRS
Pain on NPRS Mean	5.7	4.2
Standard Deviation	2.0004	1.714
T-value	12.81	
P-value	<0.001	

**Figure 1: Pre- and Post-intervention NPRS scores (N=70)**

These findings indicate a clinically meaningful reduction in neck pain following the ergonomic interventions, with the post-intervention scores falling within the minimal clinically important difference threshold of  $\geq 1.3$  points on the NPRS scale for chronic neck pain. The uniform improvement across the cohort suggests broad applicability of the interventions in this occupational group, supporting their role in mitigating work-related musculoskeletal strain.

## DISCUSSION

The findings of this study demonstrate a statistically significant reduction in neck pain among tailors following ergonomic intervention from 2023 to 2024, with mean NPRS scores decreasing from  $5.7 \pm 2.0$  to  $4.2 \pm 1.7$  ( $p < 0.001$ ), representing a 26.3% improvement. This aligns with the high baseline prevalence of moderate pain observed (78.6% with  $\text{NPRS} \geq 4$ ), consistent with prior reports indicating that 78.57% of tailors experience neck pain due to prolonged sewing activities [1]. The intervention's components involving posture correction,

scheduled breaks, basic neck exercises, and trapezius strengthening likely mitigated static loading on cervical muscles, as evidenced by the shift in pain severity distribution toward milder categories post-intervention. Tailoring, characterized by repetitive tasks like cutting, assembly, pressing, and finishing in forward-flexed postures, predisposes workers to musculoskeletal strain, with neck pain emerging as the most common complaint [2,3]. The current results corroborate Swedish data where 75% of sewing operators reported annual neck/shoulder issues, attributed to constrained postures and extended hours [6], and Indian studies showing 78.5% prevalence of MSDs with neck involvement in garment workers [3].

The observed pain reduction exceeds the minimal clinically important difference (MCID) of 1.3 points on the NPRS for chronic occupational neck pain, suggesting practical benefits such as decreased absenteeism and enhanced productivity. This is supported by ergonomic literature emphasizing workstation adjustments (e.g., adjustable chairs with lumbar support) and micro-breaks to alleviate tendon and joint stress [4,7]. Unlike office-based interventions that reduced upper-extremity symptoms through neutral elbow/monitor positioning [8], the current tailored advice addressed sewing-specific demands, yielding uniform improvements across genders and age groups. However, the modest absolute change (1.5 points) may reflect the chronicity of symptoms in participants with  $12.1 \pm 4.3$  years of experience, where cumulative trauma from repetitive motions and psychological stress contributes to persistent disorders [5]. Economic implications are notable; MSDs lead to organizational losses through reduced efficiency [9,10], and our low-cost interventions could mitigate this in small-scale tailoring units, where over 70% lack ergonomic seating [4].

## Limitations

This study has several limitations. The single-group pre-post design precludes causal attribution without a control group, potentially confounding results with natural pain fluctuations or seasonal factors. The sample was limited to 70 middle-aged tailors in Nagpur, restricting generalizability to other regions, younger/older demographics, or large-scale factories. The 6-month duration captured short-term effects but not long-term adherence or sustained outcomes. Finally, while interventions were demonstrated, compliance was not objectively monitored, relying on participant self-implementation.

## Recommendations

To translate these findings into practice, organizations should organize regular seminars and workshops on ergonomics for tailors, focusing on posture awareness, workstation adjustments, and exercise integration. Collaboration with local carpenters is advised to produce affordable, ergonomic seating with backrests, adjustable heights, and lumbar support, tailored to standard anthropometrics. Future research should employ randomized controlled trials with objective measures (e.g., electromyography for muscle activity) and longer follow-ups to assess sustained impact. Policymakers could mandate ergonomic guidelines in small-scale garment industries, including subsidized tools and routine health screenings, to prevent MSD progression and enhance worker well-being.

## CONCLUSION

This study underscores the high burden of neck pain among tailors and the efficacy of simple ergonomic interventions in achieving clinically meaningful reductions, improving work efficiency, and quality of life. By addressing poor working conditions, such measures offer a scalable, cost-effective strategy to curb occupational MSDs. Implementing these recommendations could foster healthier tailoring professions, reducing absenteeism and economic losses while promoting sustainable productivity.

**REFERENCES**

- [1] Kumail Hassan, Maham Khalid, Salman Zafar, Ashfaq Ahmad, Syed Amir Gilani, Aqsa Imran. Prevalence of neck pain and its associated factors in female sewing machine operators in “leather coordinators”, factory of Sahiwal. International journal of scientific and engineering research volume 8, issue 7, july-2017. ISSN 2229-5518.
- [2] Anette Kaergaard, Johan H Anderson. Musculoskeletal disorders of the neck and shoulders in female sewing machine operators: prevalence, incidence, and prognosis. <http://oem.bmj.com/>
- [3] Banerjee S, Bandyopadhyay L, Dasgupta A, Paul B, Chattopadhyay O. Work Related Musculoskeletal Morbidity among Tailors: A Cross Sectional Study in a Slum of Kolkata. VOL. 14 NO. 4 ISSUE 56 OCT-DEC. 2016
- [4] Sabreen asadullah jamro, muhammad asif sheikh, hira islam rajput, Muhammad Jawwad Baig Chughtai, DR. Amanullah, DR. Asia Ayaz Jamro. Work related musculoskeletal disorders among tailors.
- [5] Leap Van, Naesinee Chaiear, Chat Sumananont, Chheng Kannarath. Prevalence of musculoskeletal symptoms among garment workers in Kandal province, Cambodia. Journal of Occupational Health. Print ISSN: 1341-9145
- [6] Andrew Thatcher. Ergonomic issues among sewing machine operators in the textile manufacturing industry in Botswana. DOI: 10.3233/WOR-2011-1131.
- [7] ANNE MARY JOSEPH. Ergonomic concerns of women in tailoring units. MRP(S)-0820/13-14/UGC/SWRO
- [8] Philip Fabrizio. Ergonomic Intervention in the Treatment of a Patient With Upper Extremity and Neck Pain. Physical Therapy, Volume 89, Issue 4, 1 April 2009, <http://doi.org/10.2522/ptj.20080209>
- [9] Simple Mendhe, Dr. Deepali Hande. Effect of ergonomic intervention on work related musculoskeletal disorders in tailors around Loni. International Journal of Multidisciplinary Research and Development. Volume 6; Issue 3; March 2019; Page No. 176-180
- [10] Laal F, Mirzaei R, Behdani MS, Mohammadi M, Khodami K. Evaluation of the influence of ergonomic intervention on the musculoskeletal disorders of Zahedan tailors. Int J Occup Saf Ergon. 2017 Sep;23(3):380-385. doi: 10.1080/10803548.2016.1233674. Epub 2016 Oct 10. PMID: 27723438.