

Health Promotion through Smart Body Mechanics Training in Clinical Practice

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Abstract

Nursing profession is characterized by high physical demands, which raises the risk of Work-Related Musculoskeletal Disorders (WMSDs) among the nurses and nursing students. Patients' lifting, standing for too long, bending, and repetitive movements are common physical stressors that can lead to occupational injuries (Zaheer et al., 2022; Ali et al., 2024). In Pakistan and other nations, research has demonstrated that poor ergonomic knowledge and poor body mechanics play a significant role in musculoskeletal pain in health care workers (Firdous et al., 2026; Soliman et al., 2024).

Introduction:

Nursing profession is characterized by high physical demands, which raises the risk of Work-Related

Musculoskeletal Disorders (WMSDs) among the nurses and nursing students. Patients' lifting, standing for too long, bending, and repetitive movements are common physical stressors that can lead to occupational injuries (Zaheer et al., 2022; Ali et al., 2024). In Pakistan and other nations, research has demonstrated that poor ergonomic knowledge and poor body mechanics play a significant role in musculoskeletal pain in health care workers (Firdous et al., 2026; Soliman et al., 2024). Smart body mechanics training, such as posture correction, ergonomic education, and safe patient-handling techniques, is known to be an effective health- promotion approach to minimize occupational injuries and enhance clinical performance (Rahgoshay et al., 2025; Bashir et al., 2026).

This literature review, therefore, critically examines evidence from an international, regional and local perspective that demonstrates the effectiveness of smart body mechanics interventions in clinical practice.

Theme 1: International Perspectives on Ergonomic Interventions

In this theme, students will examine the viewpoints on ergonomic intervention around the world. International literature strongly supports ergonomic interventions for preventing WMSDs among healthcare workers. Salman et al. (2024) found that students had knowledge about the ergonomics but the incorrect postural behaviors still led to musculoskeletal pain. This suggests that without practice, knowing theory is not enough to ensure the actual change in behavior in the clinical setting. Likewise, Rahgoshay et al. (2025) showed that ergonomic interventions positively affected nurses' well-being and decreased musculoskeletal complaints. Ergonomic education is also highlighted by Enta and Masfuri (2024) as an important preventive measure to prevent injuries in the workplace. Moreover, Jahan et al. (2025) have implemented Plan-Do-Check-Act (PDCA) cycle for enhancing ergonomic compliance in clinical laboratories by monitoring and evaluating the process continuously. According to Zaheer et al. (2022), ergonomic risks can be divided into physical and structural risks; this underlines the multi-dimensional nature of WMSDs of healthcare workers. The results of these studies suggest that the most effective ergonomic intervention is the combination of ergonomic intervention, behavioral reinforcement, and workplace modifications.

Research Gap: There is good evidence from international research on ergonomic interventions, but the majority of the research has been conducted on healthcare professionals rather than nursing students. Although frameworks such as PDCA improve compliance, limited studies evaluate long-term retention of smart body mechanics during stressful clinical rotations. Furthermore, there is not sufficient focus on supervised clinical practice and feedback mechanisms for posture correction in real time.

Theme 2: Regional Evidence on Knowledge-Practice

The results of regional studies continue to show that there is a disconnect between knowledge and practice. In Saudi Arabia, Soliman et al. (2024) revealed that "incorrect body mechanics" was a significant factor influencing the occurrence of chronic musculoskeletal disorders among nurses. Similarly, Rasoul and Hussain (2024) found that the theoretical knowledge of the nurses in emergency hospitals was not matched by the correct application of body mechanics in practice. It is suggested by these studies that, in heavy workload and emergency environments, ergonomic compliance can often be difficult. Workplace Stretching Exercises (WSE) were, on the other hand, found to be effective in Indonesia. According to the research of Shari and Farma (2024) and WSE Study (2024), stretching activities during the clinical shifts significantly reduced nursing students' musculoskeletal complaints. Likewise, Singh et al (2023) showed structured educational interventions enhanced the knowledge and skills of body mechanics among healthcare staff in India.

Research Gap: The emphasis in regional literature is mainly on education interventions and stretching exercises. These are useful for short-term improvements, but fail to fulfill the requirements for ongoing supervision and behavior maintenance. In addition, the number of regional studies that incorporate technology and simulation into the learning process, along with patient transfer training, is limited. This shows a lack of context of implementing working ergonomic monitoring strategies in clinical practice.

Theme 3: Local context & prevalence in Pakistan

WMSDs are still very common among the nurses in Pakistan. The prevalence of musculoskeletal disorders was reported among nurses in Karachi (Ali et al., 2024) and Lahore (Jamil et al., 2024) tertiary care hospitals. Both studies found that nursing students and newly graduated nurses were high-risk groups as they had not yet acquired

the necessary clinical experience and/or poor ergonomic practices. Firdous et al. (2026) also confirmed that poor ergonomic knowledge is one of the main causes of physical diseases among healthcare professionals. Likewise, Bashir et al. (2026) pointed out that workplace posture correction is an efficient approach for enhancing work performance and quality of life. Also, Shafi et al. (2025) found psychosocial stress as another factor responsible for wrist and hand pain in Nurses in Karachi. This discovery expands the knowledge of WMSDs beyond physical strain and suggests that an all-round ergonomic intervention is required.

Research Gap The primary focus of literature for the local area is on prevalence factors and associated risk factors, and not on the effectiveness of interventions. Despite the consistent findings that high prevalence of WMSDs exists in the studies, limited experimental studies which involve structured smart body mechanics workshops among the nursing students in Pakistan have been reported. In addition, the importance of psychosocial stressors is still not incorporated into ergonomic intervention models, which suggests the need for a significant gap in local research.

Critical Synthesis of Literature The literature reviewed shows that the need for ergonomic interventions to prevent WMSDs among healthcare workers is a shared global concern. The importance of structured ergonomic frameworks and behavioral interventions is highlighted in international studies, while educational programs and stretching exercises are emphasized in regional studies. There are only a few local studies available that reported the prevalence and causes of musculoskeletal disorders among nurses. Despite these contributions, there are still some areas of weakness. First, most of the studies conducted are descriptive, and not experimental, so evidence of effectiveness of intervention is limited. Second, there is limited research that specifically focuses on nursing students when they are on a clinical rotation. Third, there are few studies that assess the long term effects on behavior after ergonomic training. Lastly, there is limited evidence on simulation versus supervised clinical practice for smart body mechanics (SBM) workshops in Pakistan.

Conclusion

Based on the literature, it is revealed that training on smart body mechanics is an important factor in occupational health and to prevent WMSD among nurses and nursing students. Ergonomic education, workplace stretching exercises and posture correction strategies have been shown to be effective in the region and across the globe. The transfer of knowledge to a consistent clinical practice, however, is challenging. In Pakistan, the thrust of research is on prevalence, not on effectiveness of interventions. Hence, further research is required to investigate the effect of simulation-based smart body mechanics structured workshops with continuous supervision and real-time feedback to enhance clinical outcomes among nursing students.

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