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**Integrating Yoga and Breathwork in Healthcare:
A Strategy to Reduce Musculoskeletal Disorders and Enhance
Nurses’ Well-being**

RESEARCH PAPER - LITERATURE REVIEW

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ABSTRACT

Introduction: The most prevalent occupational health issue affecting healthcare workers, particularly nurses, are musculoskeletal disorders mostly due to the physical and emotional demands of the profession. To address this problem, there has been growing global interest in non-pharmacological, holistic approaches. Yoga, rooted in ancient traditions, has emerged as a widely recognized Complementary and Alternative Medicine intervention promoting both physical resilience and mental wellbeing,

Aim: This literature review aims to investigate the potential role of yoga as an effective strategy in the prevention and management of musculoskeletal disorders (MSDs) among nurses. This study focuses on the prevalence and type of musculoskeletal disorders in nurses, the general benefits of yoga, the comparative effect of other interventions/standard care and the integration of yoga in health care as a preventive and management strategy. This review also seeks to identifying research gaps and highlighting the need for further studies,

Methodology: A review of the literature was performed using electronic databases such as PubMed, ScienceDirect, Elsevier, Google Scholar, ResearchGate and ClinicalKey. Scientific articles published in the last 20 years were considered as well as nurses from various clinical settings including home care, operating rooms, hospitals and long-term care facilities. The selected literature was analysed to identify common findings, therapeutic outcomes, and implementation of yoga into occupational health strategies.

Results: This literature review has consistently shown that musculoskeletal disorders are very common amongst the nurses especially the lower back, neck and shoulders. These findings are closely related to vast workloads, periods of long standing, monotonous movements and awkward/uncomfortable positions. The studies corroborate that yoga practices have important physical advantages. It relieves musculoskeletal pain, enhance posture and flexibility, and increase core stability. In addition, yoga can significantly reduce the levels of stress, enhance sleep quality, and promote emotion resilience. Yoga proved to be as effective or even more so when compared with traditional occupational health approaches. However, the study design heterogeneity making it hard to compare results directly or draw strong conclusions and a paucity of large-scale randomized controlled trials are still significant gaps.

Conclusions: Yoga is found as a viable and affordable solution to prevent and manage musculoskeletal disorders in the nursing fraternity. Considering its two effects on the physical and mental state makes it an effective supplement to current occupational health solutions. This

review emphasizes the value of the inclusion of yoga in medical facilities as a preventive measure for healthier, more resilient healthcare system. Additionally, the evidence is promising but inconsistent, so more research is needed for better and strong recommendations. The goal would be to establish standard protocols or guidelines for it to effectively integrated across different healthcare environments, maximizing its impact.

Keywords: Musculoskeletal disorders; Nurses; Breathwork; Yoga; Occupational Health, Workplace Well-being; Stress reduction

KOPSAVILKUMS

Ievads: Visizplatītākā aroda veselības problēma, kas skar veselības aprūpes darbiniekus, īpaši medmāsas, ir muskuļu un skeleta sistēmas slimības, galvenokārt profesijas fizisko un emocionālo prasību dēļ. Lai risinātu šo problēmu, pasaulē pieaug interese par nefarmakoloģisku, holistisku pieeju. Joga, kuras saknes meklējamas senās tradīcijās, ir kļuvusi par plaši atzītu papildinošās un alternatīvās medicīnas nozari, kas veicina gan fizisko veselību, gan garīgo labsajūtu.

Mērķis: Šīs literatūras apskata mērķis ir izpētīt jogas potenciālo lomu kā efektīvu stratēģiju muskuļu un skeleta sistēmas slimību (MSS) profilaksē un pārvaldībā medmāsu vidū. Šis pētījums koncentrējas uz muskuļu un skeleta sistēmas slimību izplatību un veidiem medmāsu vidū, jogas vispārējiem ieguvumiem, citu intervenču/standarta aprūpes salīdzinošo ietekmi un jogas integrāciju veselības aprūpē kā profilakses un pārvaldības stratēģiju. Šī apskata mērķis ir arī identificēt pētījumu nepilnības un uzsvērt nepieciešamību pēc turpmākiem pētījumiem.

Metodoloģija: Literatūras apskats tika veikts, izmantojot elektroniskās datubāzes, piemēram, PubMed, ScienceDirect, Elsevier, Google Scholar, ResearchGate un ClinicalKey. Tika ņemti vērā pēdējo 20 gadu laikā publicētie zinātniskie raksti, kā arī medmāsas no dažādām klīniskām vidēm, tostarp mājas aprūpes, operāciju zālēm, slimnīcām un ilgtermiņa aprūpes iestādēm. Atlasītā literatūra tika analizēta, lai noteiktu kopīgos atklājumus, terapeitiskos rezultātus un jogas ieviešanu arodslimību stratēģijās.

Rezultāti: Šajā literatūras apskatā ir konsekventi parādīts, ka balsta un kustību aparāta slimības ir ļoti izplatītas medmāsu vidū, īpaši muguras lejasdaļas, kakla un plecu rajonā. Šie atklājumi ir cieši saistīti ar lielu darba slodzi, ilgstošu stāvēšanu, monotonām kustībām un neērtām pozām. Pētījumi apstiprina, ka jogas praksei ir svarīgas fiziskas priekšrocības. Tā mazina balsta un

kustību aparāta sāpes, uzlabo stāju un lokanību, kā arī palielina korsetes stabilitāti. Turklāt joga var ievērojami samazināt stresa līmeni, uzlabot miega kvalitāti un veicināt emocionālo noturību. Joga izrādījās tikpat efektīva vai pat efektīvāka, salīdzinot ar tradicionālajām arodslimību ārstēšanas metodēm. Tomēr pētījumu dizaina neviendabīgums, kas apgrūtina rezultātu tiešu salīdzināšanu vai ticamu secinājumu izdarīšanu, un liela mēroga randomizētu kontrolētu pētījumu trūkums joprojām ir būtiskas nepilnības.

Secinājumi: Joga tiek uzskatīta par dzīvotspējīgu un pieejamu risinājumu balsta un kustību aparāta slimību profilaksei un pārvaldībai medmāsu aprindās. Ņemot vērā tās divējādo ietekmi uz fizisko un garīgo stāvokli, tā ir efektīvs papildinājums pašreizējiem arodslimību risinājumiem. Šajā pārskatā ir uzsvērtas jogas iekļaušanas medicīnas iestādēs vērtība kā preventīvs pasākums veselīgākai un noturīgākai veselības aprūpes sistēmai. Turklāt pierādījumi ir daudzsološi, bet pretrunīgi, tāpēc ir nepieciešami vairāk pētījumu, lai sniegtu labākus ieteikumus. Mērķis būtu izveidot standarta protokolus vai vadlīnijas, lai to efektīvi integrētu dažādās veselības aprūpes vidēs, maksimāli palielinot tās ietekmi.

Atslēgvārdi: Muskuloskeletālās sistēmas slimības; Medmāsas; Elpošanas vingrinājumi; Joga; Arodslimību veselība, Labklājība darba vietā; Stresa mazināšana

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INTRODUCTION

Musculoskeletal disorders (MSDs) are among the most frequent occupational health issues affecting nurses worldwide. It was established that the rate of work-related MSDs among nurses in the global population was 77.2 percent, annually, which is in line with the physically demanding nature of nursing work (Sun et al., 2023).

The most impacted areas are the lower back, shoulders, and neck (Sun et al., 2023), as they represent repetitive patient handling, awkward positions, long term care, long standing hours in hospital and home-care environments (Lee & Chiou, 1994; Davis & Kotowski, 2015; Ribeiro et al., 2017; Koyuncu et al., 2024). Overtime, these strains contribute not only to chronic pain, work related injuries and functional impairments but also emotional fatigue, absenteeism, and burnout, which will produce a secondary outcome on quality of life and, ultimately, patient care (Tüzün, 2007; Simon et al., 2008). Conventional/standard interventions such as ergonomic changes, physiotherapy, and pharmacological methods provide partial relief but are unsuccessful solving the combined biomechanical and psychosocial nature of these conditions (Sowah et al., 2018; Ziam et al., 2023; Demirel et al., 2019; Riley et al., 2016).

Due to my growing personal and academic interest in traditional healing practice/preventive health measures and the acute need to establish preventive and management strategies, this thesis examines one integrative approach, focusing on Yoga and breathwork practices.

With its roots on ancient traditions, yet supported and validated in modern scientific literature, yoga is defined by the National Institutes of Health as a Complementary and Alternative Systems of Medicine interventions. Yoga and breathwork are recognised as mind-body practices that can relieve pain, improve flexibility and postural control, improve functioning and enhance psychological resilience, combining physical and mental benefits in a single intervention (Raub, 2002; Holtzman & Beggs, 2013, Cramer et al., 2013, Saleem et al., 2025). Breathwork also reinforce these results by improving autonomic regulation, increasing vagal tone, and reducing stress and inflammatory markers (Cohen & Tyagi, 2016; Djalilova et al., 2018; Narayanan et al., 2021). These are holistic practices that do not only aim at minimizing the symptoms but also developing endurance resilience and wellness among the nurses.

This research aims to explore the potential implementation of these practices into healthcare settings as a preventative and curative measure to reduce MSD and enhance the well-

being of nursing professionals. The review focuses on the prevalence and type of musculoskeletal disorders in nurses, the general benefits of yoga, the comparative effect of other interventions/standard care and the integration of yoga in health care as a preventive and management strategy while identifying gaps in current research and highlighting the need for further studies. To achieve this, a comprehensive review of peer-reviewed scientific literature was conducted using databases such as PubMed, Elsevier, ScienceDirect, Google Scholar, ResearchGate and ClinicalKey. Studies published in the last 30 years were selected to reflect both the ancient foundation of the topic and ensuring the methodological rigor of the contemporary research. The study included nurses from various clinical settings, including home care, operating rooms, hospitals, and long-term care facilities.

1. MUSCULOSKELETAL DISORDERS AMONG NURSES

1.1. Epidemiology and Prevalence

1.1.1. Global Prevalence

Work-related musculoskeletal disorders (WRMSDs) among nurses are reported at alarming levels across the globe. A recent large scale meta-analysis, involving over 36,000 nurses, estimated an annual global prevalence of 77.2%, with the more impacted areas being the lower back (59.5%), neck (53.0%), and shoulders (46.8%) (Sun et al., 2023).

There is epidemiological evidence showing that nurses and other physically demanding occupations have comparable risk levels. Research done in Taiwan and North America demonstrated that back injury prevalence in nurses is similar to construction and warehouse workers (Lee & Chiou, 1994). One Taiwanese study indicates that about 70% of nurses had experienced low back pain in the past year (Lee & Chiou, 1994). Several other different regional analyses suggest prevalence rates ranging from 60% to 98%, confirming that MSDs constitute an almost universal occupational challenge for nurses (Sun et al., 2023, Simon et al., 2008, Ribeiro et al., 2017, Amin et al., 2020).

Considering the high rates of injuries in nurses compared to other demanding occupations adding onto the findings of both upper and lower body regions being affected, it highlights the extensive biomechanical stress within this profession. In addition, the coherent pattern throughout continents, confirming that WRMSDs are a widespread problem in the nursing field.

Additionally, international data demonstrate that WRMSDs rates vary according to the level of economic development of a particular country. The increased rates refer to low and middle-income countries where working conditions are more challenging. Nevertheless, inaccurate reporting, lack of surveillance systems, and limited access to occupational health services can contribute to an underestimation of the actual burden. In contrast, high-income countries tend to possess superior reporting systems and greater awareness regarding health hazards. This may partly explain the paradoxical observation of similarly high or even higher prevalence rates, reflecting greater detection rather than lower exposure (Sun et al., 2023, Curti et al., 2023).

The high global prevalence leads to significant long-term consequences for healthcare. Early retirement, career changes, or switching to non-clinical roles due to chronic pain are frequent incidences (Curti et al., 2023). This emphasizes an urgent need for preventive measures which are applicable in both high and low resource countries, in health care systems facing significant issues due to shortage of nurses

1.1.2. Variability across Clinical Settings

The prevalence of WRMSDs varies depending on the healthcare settings. A systematic review survey done in 2015 reported that nurses working in hospitals experience the highest prevalence of WRMSDs, succeeded by those in long-term care and home health settings (Davis & Kotowski, 2015). They argue that the patterns of prevalence may shift with emerging trends in health care including the growing complexity of patient needs, such as bariatric care and home-based recovery. These trends are likely to increase the exposure of nurses in long-term care and home health care to musculoskeletal stressors (Davis & Kotowski, 2015). One of the key voids in literature mention in this study is that MSD are mostly investigated in nurses and nursing aides in hospital and few research is done in home health care and long term care facilities. This should be taken in consideration as it can change the prevalence patterns (Davis & Kotowski, 2015).

A Turkish study found that 69.5% of operating room nurses reported low back pain and 68.6% neck pain, both associated with limitations in performing daily activities (Koyuncu et al., 2024). In contrast, Portuguese primary healthcare nurses reported prevalence as high as 89%, with the lower back and cervical regions most affected due to sustained trunk flexion and repetitive arm movements (Ribeiro et al., 2017). Even though there are some variabilities in numbers between the clinical settings, we can find a consistent pattern in prevalence rates, demonstrating the universal nature of WRMSDs.

1.1.3. Demographic and Institutional Patterns

Even though prevalence is high across all nurse populations, there are demographic and occupational factors that exacerbate the risk. Female nurses consistently show higher rates of musculoskeletal complaints (2.1 times more often than men), which may relate not only to physiological differences (muscle mass, joint structure, and hormones) but also to

disproportionate exposure to physically demanding tasks. Moreover, female nurses face the “double burden” of combining professional responsibilities with domestic and caregiving duties (Krishnan et al., 2021). Age and job tenure are additional risk factors, with older nurses reporting more frequent pain in the lower back and shoulders due to cumulative exposure (Amin et al., 2020). Conversely, studies done in Taiwan show that younger nurses also encounter acute episodes of musculoskeletal pain during their initial years, reflecting poor work knowledge, work and sitting habits and inadequate training in safe patient handling techniques (Lee & Chiou, 1994).

Institutional features are equally significant. Long working hours (>40 hours per week), night shifts, and inadequate staffing exacerbate physical strain. In Malaysia, long working shifts were significantly associated with higher MSD prevalence across multiple body regions (Amin et al., 2020). Research done in Portugal found that high workloads and standing work was strongly associated with absenteeism due to MSDs (Ribeiro et al., 2017). Nurses in high-intensity settings such as in intensive care and operating rooms, report heavy musculoskeletal strain, relating with both workload and emotional stress. The psychosocial factors such as time pressure, effort-reward imbalance, role conflicts, and emotional stress, further aggravate these conditions. (Soylar & Ozer, 2018).

1.2. Functional Anatomy and Biomechanics

1.2.1. Spinal Anatomy and Lumbar Biomechanics

The high prevalence of WRMSD affecting the lower back, reflect the anatomical and biomechanical vulnerability of this region to the physical demands of nursing tasks (Sun et al., 2023). The lumbar spine anatomy comprises of five vertebrae that support the weight of the upper body while providing mobility. It is stabilized by Intervertebral discs, ligaments, and surrounding musculature, particularly the erector spinae, multifidus, and psoas major muscle (Hansen et al., 2006). The lumbar spine is crucial for load-bearing movements as well as maintaining posture.

Among the surrounding musculature, the multifidus is important in stabilizing and maintaining segmental alignment particularly during dynamic postures and counteracting the anterior shear forces that may occur when the upper body moves forward. It is especially active when in upright posture and changes in position including lifting or bending (Mawston & G. Boocock, 2015). Its deep positioning and short fibres make it uniquely adapted to fine control

of intervertebral motion, as opposed to giving gross force. Extension and counteract flexion of the trunk are possible due to a large muscle group known as the erector spinae. These muscles are heavily engaged during patient handling tasks such as lifting, transferring, or bending (Hansen et al., 2006, Mawston & G. Boock, 2015).

Uncomfortable body positions and their sustained engagement, especially the forward flexion postures and rotations, increases the risk of injury. By diverting mechanical stress to passive structures including ligaments and intervertebral discs, (Hansen et al., 2006) over time, the repetitive microtraumas results in disc degeneration, facet joint irritation, or chronic low back pain. It plays a leading role in muscle fatigue and strain as well as increase in compressive and shear stress which may exceed safe physiological limits in a manner that causes tissue overloading and degeneration (Mawston & G. Boock, 2015).

Studies demonstrate that extended periods of bending during bed making or patient repositioning place excessive stress on paraspinal muscles and intervertebral discs (Ribeiro et al., 2017). Fatigue, consequently, reduces spinal stability predisposing to microtrauma (Mawston & G. Boock, 2015). Research indicates that lifting heavy weights without mechanical assistance, increases the lumbar load levels as in industrial labour (Lee & Chiou, 1994). There is an important mismatch between the nurses' patient handling strength (average 47 kg in optimal conditions) and the patients' actual weight which often exceeds these thresholds, leading to an increased risk of injury, especially in younger and inexperienced staff (Lee & Chiou, 1994). Its structural function as a load-bearing axis makes it particularly vulnerable during manual patient handling.

1.2.2. Cervical and Shoulder Complex

The cervical spine allows extensive head mobility but is vulnerable to static loading, especially during extended periods of neck flexion. Muscle fatigue and ligament strain may occur even at light but sustained postures (Blanpied et al., 2017). In case of reduced muscular support, the static tension accumulates in ligaments and facet joints, causing cervical discomfort, stiffness, and consequently myofascial pain or radicular symptoms (Blanpied et al., 2017).

Cervical musculature is under constant load during static postures throughout extended periods of time such as in patient observation and operating room chores (Koyuncu et al., 2024). The NEXT study demonstrated that neck pain was one of the most reported complains among

nurses in Europe (Simon et al., 2008) and Portuguese research reported a prevalence of 60% of cervical symptoms in primary care nurses (Ribeiro et al., 2017).

Reaching, lifting and overhead movements are possible due to the high involvement of the shoulder complex. It has four articulations and comprises of the glenohumeral joint, scapula, and clavicle, supported by the rotator cuff muscles (supraspinatus, infraspinatus, teres minor, subscapularis). The joint is anatomically designed to be mobile at the cost of stability, which makes it susceptible to biomechanical overload (Dickerson et al., 2020). Rotator cuff injuries and subacromial impingement are linked to repetitive tasks like overhead reaching, pushing, and pulling, and static positioning of the arms (Dickerson et al., 2020). Poor positions like forward head posture, increases the activation of cervical extensors and alters scapular biomechanics, predisposing to combined neck-shoulder syndromes, emphasizing the interplay in biomechanics (Dickerson et al., 2020).

1.2.3. Posture, Fatigue and Movement Patterns

Non-neutral postures, such as sustained trunk flexion during wound care or prolonged standing in operating rooms are often present in nurses' practice (Soylar & Ozer, 2018, Koyuncu et al., 2024). These static loads induce localized ischemia in muscles, impairing tissue recovery and leading to cumulative fatigue (Mawston & G. Boock, 2015).

Fatigue modifies movement patterns, often leading to compensatory strategies that further elevate risk. (Mawston & G. Boock, 2015). These maladaptive patterns perpetuate musculoskeletal dysfunction and chronic pain.

In a large cross-sectional study, the repetitive bending, turning, and arm movements performed by nurses, were significantly associated with upper limb conditions (Vora et al., 2010). The repetitive routine of these tasks is associated with short recovery time shifts, creates conditions for overuse injuries. The implementations of small breaks, alternating postures, and use of assistive devices have shown potential in the reduction of muscle fatigue and restoring functional biomechanics (Sowah et al., 2018, Soyilar & Ozer, 2018, Koyuncu et al., 2024).

1.3. Occupational Risk Factors

1.3.1. Patient Handling and Physical Load

Occurrence of WRMSDs is not the result of isolated incidents, but a cumulative effect of persistent exposure to modifiable occupational risk factors that are present in the everyday nursing activities.

Patient handling remains the single most important occupational risk factor for nurses' musculoskeletal health. Manual lifting and repositioning of patients produce extreme biomechanical stresses, especially when conducted without lifting aids (Lee & Chiou, 1994). A large-scale cross-sectional study in Malaysia confirmed that high physical demand was independently associated (even after adjusting for other risk factors) with musculoskeletal pain in the neck, shoulders, hips, knees, and feet (Amin et al., 2020).

In surgical and intensive care settings, patient handling is further complicated by time pressure and emergency situations, which often force nurses into non-ergonomic lifting postures (Soylar & Ozer, 2018, Adams, 2004). Intensive care and operating nurses report higher prevalence of shoulder and neck pain due to continuous patient monitoring, frequent repositioning, and operation of heavy equipment (Koyuncu et al., 2024, Adams, 2004). Unpredictable patient movements during lifting exposes nurses to sudden torsional loading of the spine (Soylar & Ozer, 2018).

1.3.2. Repetitive Tasks, Awkward Postures and Static Load

In addition to the handling of patients, nurses also experience repetitive upper limb tasks and immobile positions for a prolonged time, such as neck flexion or standing without movement. The information present in this section is built upon those presented in the previous subchapter 1.2.3.

In hospital wards, lifting and transferring patients are the main risk factors (Soylar & Ozer, 2018), whereas in operating rooms, static posture during prolonged surgeries is the leading contributor resulting in cumulative neck and shoulder strain (Koyuncu et al., 2024). In primary health care, repetitive trunk flexion and arm movements were strongly associated with pain in the cervical and shoulder regions (Ribeiro et al., 2017). Homecare is also facing the problem of static load, where prolonged standing and unnatural positioning are among the causes of long-term disability (Dellve et al., 2003).

Monotonous labor leads to further fatigue and accelerates musculoskeletal deterioration. The NEXT study revealed that repetitive tasks were highly related with increased risk of musculoskeletal pain in various body regions (Simon et al., 2008). These repetitive and static exposures highlight the necessity of better work organization and task diversity.

1.3.3. Organizational and Environmental Risk Factors

The way that Health Care Systems and workplaces are organized can either mitigate or amplify the physical demands placed on nurses.

The shortage of staffing, high patient turnover, long shifts, and rare break times lead to conditions in which nurses need to work in a state of multitasking and carry out physically challenging duties with no breaks or assistance (Dellve et al., 2003, Amin et al., 2020, Koyuncu et al., 2024). Home-care nurses identified insufficient time for rest as one of the strongest risk factors for disability (Dellve et al., 2003). Research done in Sweden demonstrated that insufficient organizational support and interpersonal problems at work were predictors of permanent disability pensions among home-care workers (Dellve et al., 2003). Similarly, Portuguese studies found strong associations between absenteeism and organizational factors, including high workloads and repetitive tasks (Ribeiro et al., 2017). This underlines the intimate link between psychosocial and biomechanical aspects in nursing labour.

Poorly designed workplaces such as rooms with limited working space, non-adjustable/inappropriate bed height, or lack of ergonomic tools such as lifting devices, force caregivers into awkward and unsafe positions, significantly increasing lumbar and shoulder strain (Ziam et al., 2023, Ribeiro et al., 2017). These deprived conditions are particularly frequent in homecare, where inadequate environmental control exposes nurses to unpredictable ergonomic risks (Ribeiro et al., 2017).

1.3.4. Psychosocial Contributors to Physical Strain

Psychosocial stressors play an equally critical role in musculoskeletal health. Nurses under high job strain, low autonomy, and poor organizational support exhibit significantly higher rates of musculoskeletal symptoms (Krishnan et al., 2021, Dellve et al., 2003). The interaction between psychological and physical stress produces a cumulative effect, where emotional exhaustion amplifies pain perception and impairs recovery.

Nurses in difficult ethical situations and emotionally challenging environments such as palliative care or emergency services can internalize the pain as being “part of the job” delaying recognition and reporting of early signs and symptoms (Krishnan et al., 2021). Qualitative studies highlight how lack of recognition, high emotional demand, and strained interpersonal relationships increase musculoskeletal vulnerability among nurses (Krishnan et al., 2021; Soylar & Ozer, 2018; Dellve et al., 2003).

1.4. Psychological and Occupational Consequences

1.4.1. Psychological Consequences

WMSDs are not only a physical health problem but also a source of significant psychological distress. It can impair job performance, increase emotional exhaustion, and reduce the overall quality of life in nurses (Tüzün, 2007).

The persistent pain associated with MSDs is also a source for other symptoms such as depression, anxiety, irritability, sleep disturbances, and burnout among nurses. This is a cyclic situation where these conditions tend to reinforce each other and increase their presentation. The physical distress impairs the quality of sleep affecting the ability to regulate emotions and enhances the experience of pain (Tüzün, 2007). Nurses with persistent pain report lower job satisfaction, perceived lack of support, and a diminished sense of professional accomplishment (Krishnan et al., 2021; Soylar & Ozer, 2018; Dellve et al., 2003).

Cognitive functioning is also impaired, as nurses with WMSDs report difficulties in concentration and decision-making (Curti et al., 2023). Such outcomes not only influences negatively the personal well-being but may also compromise patient safety since nurses are more susceptible to make clinical mistakes.

1.4.2. Occupational Impact

The occupational consequences of WMSDs extend far beyond absenteeism. In Portugal, 51% of primary healthcare nurses reporting WMSDs took sick leave in the previous year of the study (Ribeiro et al., 2017). Operating room nurses reported significant task limitations, particularly in performing manual precision work (Koyuncu et al., 2024). The NEXT study involving multiple European countries highlighted that nearly two-thirds of nurses reported musculoskeletal symptoms severe enough to interfere with work capacity (Simon et al., 2008).

WMSDs are also a leading cause of early retirement and job abandonment, with several studies reporting up to 18% of nurses leaving the profession due to chronic back pain (Lee & Chiou, 1994).

Healthcare institutions are severely affected by these occupational outcomes as they must resist the staffing shortages, reduced productivity, and increased turnover (Simon et al., 2008, Vora et al., 2010). Additionally, international studies underline the economic burden caused by absenteeism, loss of productivity, and disability pensions (Davis & Kotowski, 2015). For systems already struggling with such changes, musculoskeletal health is crucial for the sustainability of healthcare.

1.4.3. Quality of Life and Long-Term Outlook

WMSDs have long term impacts that exceeds occupational restrictions, affecting nurses' overall quality of life. Longitudinal research shows that untreated musculoskeletal disorders often escalate into lifelong disability, forcing nurses out of the workforce prematurely (Dellve et al., 2003). Chronic musculoskeletal pain interferes with sleep, physical activity, and social engagement (Tüzün, 2007).

Family life is also impacted by these disorders since nurses complain about difficulties performing household tasks and maintaining caregiving duties at home (Soylar & Ozer, 2018). The cumulative effect of physical limitation, psychological stress, and work disturbances reduce the overall life satisfaction and increases societal expenditures by using healthcare services and disability benefits (Davis & Kotowski, 2015).

Despite their impact, such conditions are frequently underreported in part due to a culture of resilience and the stigma surrounding mental health in clinical practice (Sowah et al., 2018, Davis & Kotowski, 2015). The solutions to these outcomes need to be holistic approaches that integrate ergonomic, psychosocial, and organizational strategies.

2. THERAPEUTICAL POTENTIAL OF YOGA AND BREATHWORK

2.1. Musculoskeletal Benefits of Yoga Practice

2.1.1. General Benefits

Yoga has gained recognition as a complementary method in musculoskeletal disorders with its multifactorial approach achieved through integration of physical postures, breath control and mindfulness. Systematic reviews affirm that yoga is effective in diverse populations creating consistent advantages in flexibility, balance, and musculoskeletal functioning experienced by both young and older adults (Denham-Jones et al., 2021, Chang et al., 2016, Raub, 2002)

The relevance of Yoga is particularly important in healthcare professions who are frequently exposed to demanding tasks and muscular strain due to the occupational demands of their career. For this specific group, it has been recognized as an intervention that improves both physical resilience and psychological coping strategies (Chang et al., 2016, Gura, 2002).

This modality enhanced the quality of overall posture, spinal alignment, and joint mobility, which lead to the avoidance of musculoskeletal disorders both in clinical and work situations (Raub, 2002, Rathore et al., 2024). It is suggested to improve neuromuscular balance and minimize maladaptive tension patterns inherent in chronic musculoskeletal conditions by combining stretching, strengthening postures with breath regulation (Denham-Jones et al., 2021). It can reduce stress-induced muscular contraction and thereby lower the occurrence of musculoskeletal problems and enhance occupational performance (Gura, 2002).

Yoga is more holistic than traditional exercise modalities that are based on single muscle groups or on high-intensity repetition. The promotion of mobility, balance, and postural alignment through the combination of movements across different planes, breath awareness and neuromuscular control makes yoga a unique alternative (Ross & Thomas, 2010). Combined, these results make yoga a preventive and therapeutic intervention with a generalized relevance in musculoskeletal health.

2.1.2. Pain Reduction and Functional Improvement

A variety of randomized controlled studies have proven that yoga interventions can significantly ease pain on people with chronic pain syndromes. A systematic review done in older adults with long-term musculoskeletal conditions reported that yoga practice led to a decrease in both pain intensity and disability score (including the Oswestry Disability Index and Roland-Morris Disability Questionnaire), especially when done on a regular basis over several weeks (Cramer et al., 2013). Even short therapy programs (2–4 weeks) were linked to the increase in spinal flexibility, decrease of functional disability, and improved movement control, particularly of lumbar and cervical spine (Rathore et al., 2024, Williams et al., 2003).

A randomized trial that used healthcare staff with chronic low back pain as the target population showed that a yoga program did not only produce a significant decrease in pain scores but also modulate key biomarkers (Saleem et al., 2025). It is believed that these effects are not only from increased flexibility and core stability, but also to the modulation of the perception of pain due to breathing techniques and meditative attention, which influence the way the central nervous system processes pain (Villemure & Bushnell, 2002).

These findings imply that yoga is not just a feasible form of non-pharmacological treatment but could also outperform traditional exercise or education-based interventions for targeting pain reduction (Denham-Jones et al., 2021, Chang et al., 2016).

2.1.3. Flexibility, Strength, and Postural Control

The effects of Yoga on muscle flexibility, range of motion of the joints, and balance/stability are of special use to musculoskeletal health and occupational resilience. Iyengar or Hatha practices are based on postural corrections through alignment and progressive stretching and strengthening as a result of which, the practice can be safely done by those individuals with limited mobility or pain (Raub, 2002, Williams et al., 2003). In Iyengar yoga, the use of straps, blocks, and bolsters enable the practitioners to safely attain biomechanical precision, which result in the correction of postural asymmetries and enhanced neuromuscular coordination (Williams et al., 2003).

The neck and back pain trials have provided evidence that the increase in the level of flexibility and posture correlate with the reduction in disability and improvement of functioning (Cramer et al., 2013, Rathore et al., 2024). Research on the healthcare workers show that these

adaptations result in greater resilience against repetitive strain and well as a decreased rate of incidence of musculoskeletal issues at the workplace (Gura, 2002).

These results indicate that yoga's musculoskeletal benefits are not just in terms of flexibility but also in terms of increased strength, endurance, and postural control accompanied by a direct decrease in injury risk.

2.1.4. Integration of Breath and Neuromuscular Awareness

One of the hallmarks of yoga is breathing alongside movement in which emphasis is the connection between the two. The Hatha Yoga presents *pranayama*-a system of controlled inhalation, exhalation, and holding the breath which is meant to control the flow of prana (vital energy). Breath is thought to be the main vehicle of prana, and its control influences physical, mental, and energetic states (Raub, 2002). Through consciously guiding respiration, one can control the energy flow, which will help in creating physiological and psychological stability. The breathing exercises during *asanas* (body postures) reduces muscle tension and facilitates parasympathetic activation, creating the conditions for better neuromuscular awareness (Raub, 2002). This process allows a higher level of proprioception and body awareness whereby individuals are capable of consciously modify movement tactics and avoid maladaptive patterns related to chronic pain and work-related injury (Denham-Jones et al., 2021).

Clinical trials prove that the combination of breathwork with physical practice amplifies the therapeutic outcomes. Workers in healthcare settings who underwent yoga programs with emphasis in *pranayama* alongside postures reported a reduction in musculoskeletal discomfort as well as a decrease in stress and fatigue, which can be interpreted as the synergistic effects of body-mind integration (Saleem et al., 2025, Gura, 2002). Working in both muscular and autonomic systems, yoga stands out among the purely physical rehabilitation methods, making it a distinctively appropriate option for complex occupational health challenges.

2.1.5. Relevance for Occupational Settings

WRMSDs represent a leading cause of absenteeism, disability, and turnover among healthcare professionals. Yoga has also proven helpful when applied in occupational health contexts.

Studies have demonstrated that yoga significantly reduces musculoskeletal pain, while at the same time improving concentration and job satisfaction (Gura, 2002, Currie et al., 2022, Chang et al., 2016). App-based or short-format yoga programs implemented within the workplace have also demonstrated feasibility and effectiveness, showing the possibility of adoption also for high-demand healthcare settings (Currie et al., 2022). Integrating yoga into occupational health programs makes it possible to reduce the financial and productivity problems associated with musculoskeletal conditions, making it an attractive strategy for employers as well (Barber et al., 2025).

There is a reduction in absenteeism, decrease reported pain, and ease on medication following the inclusion of yoga on workplace programs, referring its applications beyond the physical advantages. Participants also reported improved body awareness and greater sense of resilience (Hartfiel et al., 2012).

2.2. Breathwork and Autonomic Regulation

2.2.1. Autonomic Nervous System: Vagal Tone and Heart Rate Variability

Breathwork, especially as practiced in traditional forms of yoga, provides a unique and accessible way of regulating the activity of the autonomic nervous system (ANS). The only autonomic function that can be voluntarily controlled is the breathing. Therefore, respiration is an immediate way of regulating both sympathetic and parasympathetic branches of the ANS. This is why breathwork is a valuable therapeutic tool, particularly in stressful settings, where the skill to restore physiological balance and calmness is essential to protect both physical and emotional health (Cohen & Tyagi, 2016).

A key indicator of autonomic balance is heart rate variability (HRV). It is the variation in time between heartbeats. High HRV is a sign of strong vagal tone and higher levels of parasympathetic activity that correlates with better stress regulation and emotional resilience. Studies show that breathing techniques, including coherent breathing, Ujjay, alternate nostril breathing (Nadi Shodhana), and breath retention strategies, can improve HRV through increased vagus nerve activity. These methods enable what is referred to as the “vagal brake,” a mechanism that allows the rapid slowing of heart rate following stress via the myelinated vagus nerve, enabling the body to quickly recover and return to a calm state after sympathetic arousal returning into an emotional equilibrium. High vagal tone means a higher capacity to

deal with stress, change and challenges as well as higher capacity for rest, recharge, and recovery (Cohen & Tyagi, 2016).

Although HRV was not directly measured, mindfulness-based interventions involving breath awareness have been found to decrease heart rate, blood pressure and cortisol and this is an indication of better autonomic balance consistent with greater vagal modulation (Grossman et al., 2004). A randomized controlled study conducted throughout the COVID-19 pandemic was able to confirm that even brief, structured breathing interventions improved autonomic balance and minimized stress symptoms among frontline healthcare workers (Narayanan et al., 2021).

2.2.2. Mechanisms of Breath-Driven Regulation

Our breathing patterns do not only influence our lungs, but it has direct effects on the brain and nervous system. The mechanisms underlying breath-driven autonomic regulation are becoming increasingly well understood. The mechanism has been described in neurophysiological models, including the framework proposed by Brown and Gerbarg's, in which voluntary breathing patterns activate vagal afferents, which send signals through the brainstem and into areas of the brain that manage emotions, attention and bodily functions influencing limbic, cortical and autonomic centres (Currie et al., 2022, Naragatti, 2025, Cohen & Tyagi, 2016).

This direct respiratory-brain link described why all such practices as slow and steady breathing, approximately six breaths per minute (resonant breathing) are particularly effective, enhancing baroreflex sensitivity and respiratory sinus arrhythmia (RSA), which are signs of healthy autonomic flexibility and strength. Cardiovascular and respiratory systems become synchronized/ enter a resonant state at this breathing rhythm, which generates great oscillations in HRV and significant increase in RSA. Inspiration temporarily reduces vagal input, permitting the heart rate to increase whereas expiration restores vagal activity decelerating the heart rate once again. This shifts become more pronounced when vagal tone is stronger which results in an increase in the RSA amplitude reflecting increase autonomic adaptability (Cohen & Tyagi, 2016).

Different *pranayama* techniques elicit varying physiological effects. Practices such as alternate nostril breathing and *Ujjayi* breathing lead to a state of calmness and parasympathetic stimulation, whereas faster techniques like *Kapalabhati* function as stimulatory ones (Cohen &

Tyagi, 2016). There has been evidence showing that slow, deep *pranayama* practices are particularly effective for reducing stress and enhancing resilience, therefore especially suitable for occupational stress management (Raub, 2002).

2.2.3. Breathwork in different Yoga Styles

Distinct types of yoga use the breath in diverse ways, reflecting their different therapeutic intentions. As an illustration, the Kundalini Yoga (also called the yoga of awareness) is distinctive for its use of dynamic movements and emphasis on energetic alignment (Naragatti, 2025). During Kundalini Yoga, the breathing can be vigorous and accompanied by sound or mantras to activate the sympathetic nervous system initially followed by parasympathetic branches of the autonomic nervous system. Research in practitioners demonstrate that these practices can alter sensory and affective states and are linked to enhanced emotional regulation and autonomic balance (Naragatti, 2025, Cohen & Tyagi, 2016). Conversely, Hatha Yoga focuses more on slower, steady breathing through *pranayama* that induces parasympathetic dominance, relaxation, and less sympathetic overactivation (Raub, 2002).

The practice of Iyengar yoga combines breath with precise postural alignment, promoting parasympathetic dominance and relaxation (Williams et al., 2003). Restorative and mindfulness-based yoga styles are more focused on slow, diaphragmatic breathing, which leads to observable changes in sympathetic activation (Naragatti, 2025). Even more dynamic styles like Vinyasa and Ashtanga Yoga, though physically challenging, when practiced with breath awareness, can be used to assist in self-regulation and anxiety reduction (Raub, 2002, Cohen & Tyagi, 2016).

The more recent use in the COVID-19 pandemic demonstrates that breath-based yoga practices, even in digital format, are feasible for healthcare workers and help to lower stress and perceived burden levels (Narayanan et al., 2021). Combined, breathwork's flexibility, including the stimulating and mantra driven approach of Kundalini to the calming *pranayama* of Hatha, offers complementary practices to alleviate the autonomic stress responses to various work requirements, which may benefit from both energizing and calming techniques.

2.2.4. Clinical Implications for Healthcare Workers

Since the baseline level of sympathetic stimulation is high in healthcare environments due to elevated stress levels and short recovery time, breathwork provides an easy and efficient approach to enhance autonomic regulation.

Additionally, what is especially practical about breathwork is that it does not require much space, equipment, or time, which makes it more viable in demanding occupational environments. The ability to reduce stress and encourage a restorative condition is particularly topical in healthcare settings, where time limitations and excessive workloads limit opportunities to engage in longer interventions (Cohen & Tyagi, 2016, Narayanan et al., 2021).

The experience of workplace-based programs have revealed that yoga and breathing practices can be effectively used during work shifts, reducing musculoskeletal tension and psychological strain (Gura, 2002). Recent studies during the COVID-19 pandemic further confirms that digital and app-based breathing interventions are both acceptable and effective for healthcare professionals, (Narayanan et al., 2021, Currie et al., 2022). The use of digital delivery platforms maintains both adherence and effectiveness to yoga (Di Mario et al., 2023).

2.3. Anti-inflammatory, Stress-Modulating, and Neuroplastic Effects

2.3.1. Modulation of Stress Hormones, Immune Function, and Inflammatory Activity

The stress and inflammation are systems with a significant role in the development and persistence of MSKDs. The therapeutical effect of yoga in these domains is attributed mostly to the downregulation of the hypothalamic–pituitary–adrenal axis and sympathetic nervous system with a favourable effect on the immune and endocrine parameters (Raub, 2002; Cohen & Tyagi, 2016; Saleem et al., 2025).

Through a regular yoga practice, particularly when incorporates breath awareness and slow movements has been linked to quantifiable reductions in cortisol levels, the main glucocorticoid in the physiology of stress (Naveen et al., 2016). It has been demonstrated through randomized controlled trials that yoga lowers cortisol and substance P and elevates β -endorphins, so that anti-inflammatory and analgesic effects can be combined (Saleem et al., 2025). Yoga practices were also found to increase neuroplasticity through the rise of brain-derived neurotrophic factor (BDNF) levels and decrease stress hormones in clinical groups with depression (Naveen et al., 2016).

Yoga seems to influence on inflammatory pathways helping the body to lower the pro-inflammatory signals like IL-6, TNF- α , and CRP as they have been known to be high in individuals experiencing chronic musculoskeletal pain (Djalilova et al., 2018, Holtzman & Beggs, 2013). It also aids in increasing markers of immune defence like the increase in natural killer cells, enhanced lymphocyte proliferation, and modulation of key cytokines (Djalilova et al., 2018).

These biological changes can be used to explain this duality in effect of yoga, which minimizes the inflammatory load while simultaneously enhancing immune protection making people feel calmer and more physically comfortable after short periods of practice. This is critical because of the low-grade systemic inflammation typical of patients with chronic musculoskeletal pain (Djalilova et al., 2018).

2.3.2. Neuroplastic Changes and Neuroendocrine Regulation: Building Emotional Resilience

Neuroplastic changes were identified in an eight-week Mindfulness-Based Stress Reduction program. Using longitudinal MRI analysis, there was an increase in grey matter in the hippocampus and several other brain regions which are associated with emotion regulation, memory, and self-awareness (Hölzel et al., 2011). The amygdala is known for its function in detecting threats and triggering emotional responses. In chronic stress, the amygdala tends to be overactive and even enlarged. Mindfulness practice appears to reverse this pattern producing less emotional overactivity. Simultaneously, mindfulness enhance prefrontal regions involved in down regulation of emotions, reflecting a shift from limbic dominance to cortical control contributing to better psychological health and more balanced emotional state (Hölzel et al., 2011).

In a randomized trial involving healthcare workers with chronic low back pain, yoga practice significantly increased circulating β -endorphins, neurohormones that produce analgesia in addition to other positive effects like emotional bonding and sense of trust (Saleem et al., 2025). The high BDNF levels were linked to enhanced mood regulation and a decrease in susceptibility to depressive relapse, which reinforces the effect of yoga on long-term neuroendocrine stability (Naveen et al., 2016). Breath-centred practices, by promoting parasympathetic dominance, strengthen resilience to psychosocial stressors and enhance emotional regulation (Cohen & Tyagi, 2016).

In healthcare populations, where stress exposure is chronic and cumulative, yoga provides protective effects against burnout and emotional exhaustion. Stress biomarkers modulation is translated into an improvement in emotional resilience and cognitive functioning.

2.4. Mental Health Benefits: Reducing Burnout and Improving Well-being

Conditions of emotional exhaustion, depersonalization, and reduced sense of accomplishment are the main signs of burnout in health care professionals. It does not only impact the well-being of healthcare professionals but also compromises the quality of patient care. Yoga has gained recognition as a practical and accessible way to support mental health by helping to reduce stress levels, anxiety, tension and the symptoms associated with burnout as well as improved sleep and greater ability to cope with daily challenges (Riley et al., 2016).

App-based interventions like the Yoga of Immortals program have shown great improvements in the reductions in anxiety, depression, and insomnia among healthcare workers, with high adherence rate (Currie et al., 2022). Other research supports the statement that yoga and mindfulness programs are reliably effective in reducing stress and burnout across occupational groups (Di Mario et al., 2023).

Certain practices, like Yoga Nidra, have been especially useful in enhancing mindfulness, sleep quality patterns, alleviating signs and symptoms of stress and fatigue, enhancing cognitive clarity and improving mental health, and thus are highly applicable in healthcare environments (Barber et al., 2025, Nayak & Verma, 2023, Livingston & Collette-Merrill, 2018).

2.5. Yoga Styles and practices suitable for Healthcare Professionals

The diversity of yoga traditions allows for tailored interventions to meet healthcare professionals' unique needs. The biggest benefit for healthcare professionals would come from accessible, effective and adaptable interventions. Several styles of yoga meet these criteria with low-impact, time-efficient, and easily integrated into the work routine.

The 20-minute yoga module is one of the most validated and practical methods for healthcare workers. It includes a group of brief loosening exercises, *pranayama*, and dhyana techniques (mindfulness meditation with breath focusing and OM chanting). The strength of this module is in the short duration, the simplicity and adaptability making it optimal for

implementation in between shifts in hospital setting, enhancing parasympathetic activity significantly reducing burnout and improving psychological resilience (Upadhyay et al., 2025).

Another practice that is complementary is iRest Yoga Nidra, which is a guided deep relaxation in supine position with no physical movement. It has shown significant improvements in sleep quality and mindfulness dimensions such as “acting with awareness” and nonjudging (Livingston & Collette-Merrill, 2018). Yoga Nidra has emerged as a mental health booster, with evidence supporting its efficacy in treating stress, anxiety, PTSD, and sleep disorders (Nayak & Verma, 2023).

To the healthcare practitioners who encounter musculoskeletal problems, particularly chronic low back pain, Iyengar Yoga represents a structured form of therapy. The focus is on precision, postural alignment, and the use of supportive measures including belts or blocks allowing it to be safely applied to people with physical restrictions (Williams et al., 2003). Hatha yoga, one of the most common types, is a combination of postures, breath, and meditation in a balanced way both in favour of physical resilience and psychological stability (Raub, 2002).

Breath-centred interventions, which underwent numerous tests during the COVID-19 pandemic, proved their feasibility, high acceptability, and clinical value when delivered both in person and digitally (Narayanan et al., 2021).

3. INTEGRATING EVIDENCE- THE CASE FOR IMPLEMENTATION

3.1. Comparative Effectiveness of other Interventions

3.1.1. Comparative Advantages of Yoga

Occupational hazards such as WRMSDs and burnout have been subject of a range of interventions to help mitigate them. There are several valuable tools which can address this occupational health problem. Starting with regular physiotherapy and stabilization exercises (Demirel et al., 2019), ergonomic modifications (Ziam et al., 2023, Sowah et al., 2018), cognitive-behavioural therapy (Riley et al., 2016) and pharmacological interventions (Sowah et al., 2018), each of these options with its own effectiveness in the respective field.

Ergonomic training and physiotherapy are still considered standard preventive strategies, yet it has been demonstrated that residual pain and disability persist among healthcare workers despite the widespread use of these interventions (Sowah et al., 2018, Ziam et al., 2023), which is why other more integrative approaches should be applied. In comparison, Yoga provides a comprehensive solution which is systemic and incorporates physical, psychological, and emotional spheres. It is a method that strengthens muscles, improves posture, calms the nervous system, reduce stress-driven burnout and maintain emotional balance.

Yoga has preventive effects in the field of occupation. For workers exposed to prolonged standing, validated yoga-based modules incorporating joint loosening, strengthening, postures, breathing practices, and relaxation have been developed to reduce vascular and musculoskeletal strain (U. Yamuna et al., 2023). Healthcare professionals surveyed across India and the UK have shown a high willingness to recommend yoga, with many reporting personal benefits in stress reduction and resilience (Jaiswal et al., 2024, Smit & Cartwright, 2023). This holistic ability makes yoga an unique intervention that can fill the gaps left by conventional occupational health strategies.

3.1.2. Pharmacological and Conventional Care

Those in pain are usually given pharmacological treatment like nonsteroidal anti-inflammatory drugs (NSAIDs), analgesics, and sedatives. Although they are fast acting pain relief, reviews highlight that they fail to treat the underlying cause of the MSD and are

associated with side effects, risks of prolonged use and limited long-term success in preventing recurrent MSK pain (Sowah et al., 2018).

Yoga, on the other hand, has demonstrated similar or even greater pain reduction in intensity and frequency particularly in everyday functional contexts but without the risks associated with conventional treatment. Randomized studies suggest that yoga was more effective in reducing both resting and activity-related pain as compared to traditional stabilization or stretching interventions (Demirel et al., 2019).

In this way, while pharmacological care is still useful in the management of acute symptoms, the growing evidence suggests a transitions towards integrative models. Yoga can reduce the use of medication, improves patient autonomy, and address the underlying cause through physical, emotional, and cognitive self-regulation.

3.1.3. Physical Therapy and Occupational Health Programs

Conventional physical therapy is widely recommended as a first-line treatment of MSDs. It consists of stabilization exercises, strength training, and mobility enhancement measures. Interestingly, when researchers directly compared yoga with core stabilization exercises, the results were not as clear/ less straightforward evidence. (Demirel et al., 2019). However, yoga has been found to be better than stabilization exercises in the reduction of activity related pain and improving functional performance, whereas stabilization is better in terms of disability indices (Demirel et al., 2019).

Intensive yoga programs have significant positive effects in spinal flexibility and pain relief which in some cases suppress the exercise-based interventions (Tekur et al., 2008). Similarly, a study conducted on chronic neck pain patients showed that yoga produced more effective outcomes in terms of pain, disability, and quality of life than the conventional home exercise programs (Cramer et al., 2013). These results indicate that yoga can be used to complement physiotherapy instead of substituting it, to bridge physical and psychological rehabilitation.

3.1.4. Ergonomic and Environmental Interventions

Another form of intervention is the prevention of injuries through ergonomic changes. The use of equipment like ceiling lifts, transfer belts, slide sheets, and adjustable beds are

commonly used in hospitals to alleviate the pressure on the back when handling patients (Ziam et al., 2023). When applied consistently, these tools have been link to a reduced prevalence of musculoskeletal injuries and fewer compensation claims, which highlighting their relevance in occupational safety (Sowah et al., 2018).

Nevertheless, their effectiveness is affected by the successful implementation, the continuous staff training, and maintenance. Furthermore, the high financial cost of such equipment impedes their universal applicability in home care or resource limited contexts (Ziam et al., 2023). Organizational barriers, including time constraints, poorly designed spaces, and limited access to equipment frequently weakens the success of ergonomic measures (Ziam et al., 2023).

Yoga, by contrast, requires minimal space, no special and expensive equipment, or environmental modifications. It can be done anywhere such as in hospital break rooms or at home which makes it very versatile and adaptable. Healthcare workers and nurses who implemented yoga-based wellness programs mentioned improvements in resilience and self-care, which are rarely achieved outcomes with ergonomic changes alone (Livingston & Collette-Merrill, 2018). Furthermore, ergonomic interventions are usually focused on the mechanical risk factors, whereas yoga also target psychological stressors contributing to musculoskeletal pain.

3.1.5. Cognitive and Behavioural Interventions

Cognitive Behavioural Stress Management (CBSM) and mindfulness-based therapies have demonstrated strong effectiveness in occupational stress reduction. CBSM helps with the development of healthy coping mechanisms, reduces burnout, and enhances psychological outcomes among healthcare providers (Riley et al., 2016).

However, contrary to Yoga-Based Stress Management (YBSM) protocols, that often demonstrates a more comprehensive list of benefits addressing both somatic and psychological dimensions of stress. Clinical trials in medical staff demonstrate that YBSM brings much better physical and mental health outcomes when compared to CBSM, with greater reductions in stress and burnout (Riley et al., 2016). These results highlight the dual advantages of yoga. It does not only diminish psychological strain but also eases physical symptoms. In this way, yoga can be considered not only an alternative to cognitive-behavioural interventions but also a synergistic modality.

CONCLUSION

The research developed in this thesis supports the urgency of reconsidering the approach to occupational health in the healthcare sphere. In the everyday practice, nurses and other face very challenging conditions, which demand both physical endurance and psychological resilience. This dual burden leads to a high incidence of musculoskeletal problems, stress, and burnout. These problems transcend beyond the individual to ultimately compromise patient care and the effectiveness of healthcare systems.

The analysis of the literature revealed that yoga and breathing exercises hold a distinctive place among the available strategies. Uniquely different to other isolated ergonomic modifications or traditional physiotherapy programs, these practices incorporate mental regulation and physical strengthening. This integrated approach not only allows decreasing the pain and postural strain, but also enhancing the stress tolerance and emotional stability.

Yoga stands out because it deals with the challenge at multiple levels simultaneously. It was evidenced to have presumed beneficial effects in reducing musculoskeletal discomfort, improving posture and flexibility while promoting autonomic balance by regulating stress and anti-inflammatory action. This is supplemented by its accessibility: it is inexpensive, can be easily customized and does not require an intricate infrastructure to implement. These features make it particularly suitable for large-scale adoption in healthcare institutions.

However, after analysing the evidence, there are some limitations that must be taken in consideration and acknowledged. A number of existing studies are characterized by small sample sizes, heterogeneous methodologies, and interventions of short duration which might limit the generalizability of their results. Furthermore, despite the favourable results of most studies, there are also reports that suggest only modest improvements, which indicates that yoga and breathwork should be seen as complementary, rather than alternative to the existing methods. Cultural attitudes toward complementary and alternative medicine practices and institutional obstacles can also limit their widespread adoption, requiring strategies to counter this need giving more focus on education, staff engagement, and organizational support.

The future research must prioritize high quality randomized controlled trials in which nurses are put in the actual workplace settings and the results are followed up for long term to determine the sustainability of benefits. Comparative cost-effectiveness studies should also be made to inform policymakers, particularly in relation to standard physiotherapy or ergonomic programs. Moreover, the expanding possibility of online providing yoga and breathwork opens

a new field for investigation, particularly where the resources are scarce or during crisis situations such as pandemics.

In conclusion, the findings of this thesis underline the importance of moving from a reactive model, based mainly on treatment, to a preventive and holistic approach. Yoga and breathwork should not be a luxury but a necessity to introduce in occupational health. Such practices will help to make professionals healthier, more resilient teams, and in the long term, a safer and more sustainable healthcare environment.

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Declaration

I, Íris Alvarinho Arroja, certify that this Research Paper on the topic:

Yogas un elpošanas vingrojumu integrēšana veselības aprūpē: stratēģija muskuļu un skeleta sistēmas traucējumu mazināšanai un medmāsu labklājības uzlabošanai

(Title of the Research Paper in Latvian)

Integrating Yoga and Breathwork in Healthcare: A Strategy to Reduce Musculoskeletal Disorders and Enhance Nurses' Well-being

(Title of the Research Paper in English)

is my own independent research. All other sources of data, definitions and quotations in my Research Paper are referenced accordingly. The text of this Research Paper has never been submitted in any way to any other National Examination Commission for evaluation in its entirety or parts and has never been published in its entirety.

_____/ Íris Alvarinho Arroja

08th October 2025.