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Physical Ergonomics in Healthcare Workers: A Narrative Review

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ABSTRACT

Introduction: Ergonomics is the discipline that studies the adaptation of work to humans and machines, aiming to improve safety, well-being, efficiency, and task performance. Healthcare workers are exposed to risk factors in their work environment, leading to various musculoskeletal disorders. **Objective:** To analyze the importance of ergonomics in healthcare workers between 2008 and 2023. **Materials and Methods:** A literature review was conducted using databases such as PubMed, Scopus, ProQuest, Science Direct, Medline, and SciELO. The search terms included *ergonomics*, *working conditions*, and *worker*, applying Boolean operators AND and OR. Original articles in both Spanish and English were included. **Results:** Healthcare workers experience musculoskeletal disorders caused by repetitive movements, work overload, and stress. This highlights a lack of ergonomic practices in the institutions where they work, as most do not have the necessary policies in place or fail to comply with recommended guidelines to prevent these issues. **Conclusions:** Ergonomics is essential for healthcare workers as a preventive measure to safeguard their well-being and overall health. A safer, healthier work environment can be achieved by implementing specific ergonomic strategies in each work area, which benefits the healthcare professionals and enhances their patient care performance.

Keywords: ergonomics; musculoskeletal disorders; posture; working conditions; occupational diseases.

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Ergonomía física en trabajadores de la salud. Revisión narrativa

RESUMEN

Introducción: La ergonomía es la disciplina que estudia la adaptación del trabajo al hombre y la máquina, para mejorar su seguridad, bienestar, eficiencia y efectividad en la ejecución tareas. Debido a que los trabajadores del área de la salud están expuestos a factores de riesgo en su entorno laboral, presentan diferentes alteraciones musculoesqueléticas.

Objetivo: Analizar la importancia de la ergonomía en los trabajadores de la salud entre 2008 y 2023.

Materiales y métodos: Revisión de la literatura en las bases de datos Pubmed, Scopus, Proquest, Science Direct, Medline y SciELO, teniendo en cuenta criterios de búsqueda como: ergonomics, working conditions y worker, aplicando operadores boléanos AND y OR. Se incluyeron artículos originales tanto en idioma español como inglés.

Resultados: Se encontró que los trabajadores del área de la salud presentan alteraciones musculoesqueléticas derivadas de movimientos repetitivos, sobrecarga laboral y estrés. Ello evidencia un déficit de prácticas ergonómicas en las instituciones donde prestan sus servicios, ya que en su mayoría no tienen las políticas necesarias o no se cumplen las indicaciones dadas para evitar dichas problemáticas.

Conclusiones: La ergonomía en los trabajadores de la salud es importante como medida preventiva para salvaguardar el bienestar y la buena salud. Un ambiente laboral más seguro y saludable es posible, al implementar estrategias ergonómicas específicas en cada área de trabajo, lo que beneficia la atención de los profesionales del área de salud y su desempeño superior en la atención al paciente.

Palabras clave: ergonomía; enfermedades musculoesqueléticas; postura; condiciones de trabajo; enfermedades profesionales.

RESUMO

Introdução: A ergonomia é a disciplina que estuda a adaptação do trabalho ao homem e á maquina, para melhorar sua segurança, bem-estar, eficiência e efetividade na execução de tarefas. Devido ao fato de que os trabalhadores da área da saúde estão expostos a fatores de risco em seu ambiente de trabalho, apresentam diferentes alterações musculoesqueléticas.

Objetivo: Analisar a importância da ergonomia dos trabalhadores da saúde entre 2008 e 2023.

Materiais e métodos: Revisão da literatura das bases de dados Pubmed, Scopus, Proquest, Science Direct, Medline e SciELO, levando em consideração critérios de busca como: ergonomics, working conditions y worker, aplicando operadores booleanos AND e OR. Foram incluídos artigos originais tanto em espanhol quanto em inglês.

Resultados: Foi constatado que os trabalhadores da área da saúde apresentam alterações musculoesqueléticas derivadas de movimentos repetitivos, sobrecarga de trabalho e estresse. Isso evidencia um déficit de práticas ergonômicas nas instituições onde prestam seus serviços, uma vez que, na sua maioria, não tem as políticas necessárias ou não seguem as orientações dadas para evitar tais problemas.

Conclusões: A ergonomia nos trabalhadores da saúde é importante como medida preventiva para salvaguardar o bem-estar e a boa saúde. Um ambiente de trabalho mais seguro e saudável é possível ao implementar estratégias ergonômicas especificas em cada área de trabalho, o que beneficia a atenção dos profissionais da área da saúde e seu desempenho superior no atendimento ao paciente.

Palavras-chave: ergonomia; doenças musculoesqueléticas; postura; condições de trabalho; doenças profissionais.

Introduction

Ergonomics is a scientific discipline that studies the relationship between humans and machines. It identifies key guidelines for task organization, which result in the reduction of musculoskeletal disorders (1). Furthermore, its goal is to achieve an ideal human-task system that maintains a balance between the worker and the work environment (2). Ergonomics has become a crucial approach in the healthcare field, as workers in this sector face unique challenges and intense physical and emotional demands in their daily tasks (3).

Healthcare workers, including physicians, nurses, nursing assistants, surgeons, dentists, laboratory technicians, and auxiliary staff, are prone to various risk factors in their work environment. These may include repetitive movements, lifting and transporting patients, awkward postures, exposure to chemical and biological substances, mental and emotional strain, and long working hours (3,4). Such conditions can negatively impact the health and well-being of healthcare professionals, as well as the quality of care they provide to patients.

It is important to emphasize that if the personnel providing care to individuals with illnesses or conditions are not in good health themselves, the quality of care will suffer. Therefore, when good work practices are implemented, ergonomics improves the quality of care (5). For this reason, it is essential to implement ergonomic practices in the work environments of healthcare professionals, aiming to enhance their safety and well-being. By doing so, the efficiency and effectiveness of each professional's work can be improved (6).

Ergonomics focuses on adapting work environments, equipment, tools, and work practices to better meet the needs and capabilities of healthcare workers. This involves designing ergonomic workstations, promoting task rotation, providing training on proper techniques for lifting and transporting patients, improving lighting and ventilation, and encouraging regular breaks for rest and recovery.

The implementation of ergonomics in healthcare can yield numerous benefits. Healthcare workers experience a reduction in musculoskeletal injuries and pain, which can also affect related anatomical structures. These injuries and pains manifest as symptoms that can range from minor discomfort to disabling conditions (7). Such disorders result from movements that accumulate due to repetitive exposure over an extended period, leading to health consequences for professionals, such as a significant decline in their quality of life, resulting from the pain and suffering caused by these changes (8).

Additionally, ergonomics contributes to greater comfort and job satisfaction, improves quality of life, and enhances the capacity to provide solid care in optimal conditions for patients. Adopting an ergonomic approach at work helps to assess all risk factors that may lead to issues affecting workers' quality of life and performance. Consequently, this approach is based on various studies or the application of tests or scales that assist in the early identification of any potential disorders (9). Moreover, ergonomics can help reduce costs associated with absenteeism, medical treatments, and compensation for injuries. The objective of this study was to analyze physical ergonomics in healthcare workers through the analysis of studies published in Colombia and worldwide.

METHODOLOGY

A review of scientific literature was conducted using the PubMed, Scopus, ProQuest, Science Direct, Medline, and SciELO databases, employing MeSH and DeCS search criteria, such as *ergonomics*, *working conditions*, and *worker*, with Boolean operators AND and OR (Table 1). Original articles in English and Spanish were included. The selected information was analyzed within the 2008-2023 observation window. Exclusion criteria included gray literature, review articles, and systematic reviews.

Table 1. Search Strategies

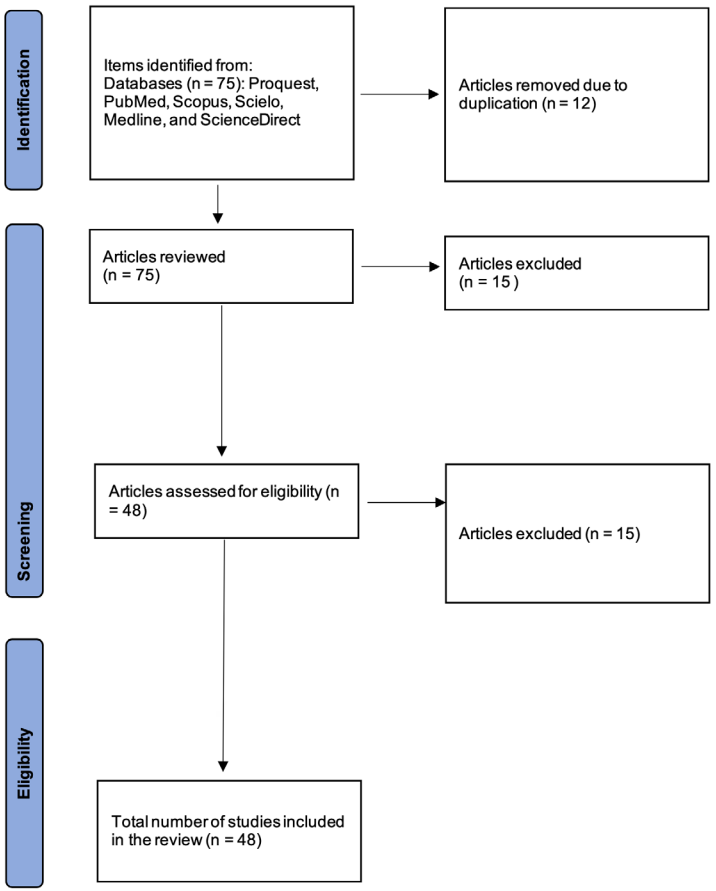
Complete search strategy in Spanish	Ergonomía **AND** condiciones de trabajo **AND** trabajo Ergonomía **OR** condiciones de trabajo **OR** trabajo
Complete search strategy in English	Ergonomics **AND** working **AND** conditions **AND** worker Ergonomics **OR** working **OR** conditions OR worker

For the selection and analysis of articles, the PRISMA flow diagram was used (Figure 1). In the initial phase, a review of the abstracts of each article was conducted, yielding a total of 75 articles. The information was then analyzed to identify literature that met the established inclusion criteria. As a result, 12 articles were excluded due to duplication, and 15 were excluded for not meeting the inclusion criteria. Ultimately, 48 articles were selected for the narrative review.

DEVELOPMENT AND DISCUSSION

In the context of the implementation and management of ergonomic risks faced by healthcare workers, a research deficit has been identified in other fields derived from sciences such as medicine, biomedicine, or psychology. Although the narrative review contains material focused on identifying the ergonomic risks healthcare workers are exposed to, there is a lack of institutional policies proposed to prevent these issues. Below is a description of the results according to the analysis.

Figure 1. Study Selection Process



Implementation of Ergonomics for Healthcare Workers

According to the narrative literature review, the implementation of ergonomics throughout human history has become essential, as its objective is to balance work and the tools humans use with their psychological and functional aspects (10). Moreover, it provides guidance or corrections to properly perform various activities. When ergonomics is not applied in the different areas of healthcare work, musculoskeletal disorders occur, leading to absenteeism or reduced productivity.

Musculoskeletal risk factors are understood as any aspect present in the workplace that affects the employee and triggers a response, such as discomfort, pain, or injury (11). The work performed by healthcare employees involves additional risk factors, including biomechanical factors, which are the most prevalent, resulting from strenuous physical work, load handling, forced postures of the spine, and rotational and flexion movements of the trunk (12,13). Additionally, some authors take into account individual factors, such as non-work-related situations that can also lead to musculoskeletal disorders: child care and household chores, for example, as employed women might have less time to rest or exercise (14).

It is important to highlight that some hospitals have not implemented minimum ergonomic standards. This leads to musculoskeletal disorders, which in turn reduce the quality of life of workers, require medical assistance, decrease productivity, and increase healthcare costs for treatment and rehabilitation (15). The work style "is a pattern of behavior, defined as the way in which a worker performs their job to meet the demands of a work task" (16). However, when referring to an *adverse work style*, it is one that involves physical and psychological demands, with a tendency to continue working or performing the corresponding activity, despite persistent pain.

Other authors identify adverse work styles as the result of insufficient healthcare staff to cover all patient needs; thus, current workers are compelled to carry out their daily activities without taking active breaks. Various studies highlight the knowledge that healthcare professionals possess about ergonomic risk factors; however, due to limited staffing, this knowledge is often overlooked when performing tasks (17).

Measures Used to Assess Ergonomic Risk

The impact and prevalence of musculoskeletal disorders are on the rise, creating a public health issue. Therefore, it is essential to identify these disorders in the workplace in order to implement preventive measures and stop their progression (18,19). It is necessary to assess the work area in a timely manner to identify the variety of ergonomic factors and disorders that may be present, enabling early treatment. Among the validated tools suitable for such evaluations is the Nursing Station Ergonomics Assessment (NSEA), an assessment method that covers fundamental aspects such as the design and layout of the workstation, workspace, safety, and environmental conditions—components essential for optimizing work activities (20).

The Questionnaire to Evaluate Work Posture in Dental Students (MAPETO-br) is designed to analyze ergonomic postures. It identifies different body

angles, specifically highlighting the anatomical areas most affected or at higher risk for musculoskeletal disorders (21). As for the REBA method (Rapid Entire Body Assessment), it evaluates sustained postures during healthcare procedures. This posture analysis technique is particularly sensitive to tasks requiring sudden posture changes, often resulting from handling unstable or unpredictable loads (19,22). This method helps determine work cycles and which postures should be assessed depending on the body segment most utilized. It also assesses the risk posed to workers by these postures (7,23), identifying the presence of musculoskeletal discomfort in body sections such as the neck, shoulders, upper or lower back, elbows or forearms, and wrists or hands, classifying them as negligible, low, medium, high, or very high risks.

Likewise, the RULA method (Rapid Upper Limb Assessment) allows for the evaluation of risks that workers face from poor postures, which can lead to upper limb disorders (24). This methodology relies on direct observation of the worker and is divided into two sections: the first, Group A, covers the arm, forearm, and wrist, and the second, Group B, covers the legs, trunk, and neck. It is important to note that unacceptable risk levels involve handling poorly placed loads for prolonged periods or with high frequency (25).

Finally, the MAPO method (Manual Handling of Hospitalized Patients) allows for determining the level of risk for lumbar spine injuries when handling patients in any type of healthcare unit or medical center (26,27). This methodology helps identify the characteristics of load handling, that is, handling patients, and evaluates the risks to which healthcare professionals are exposed. Additionally, it serves as a key tool for creating timely preventive action programs aimed at reducing or eliminating risks.

In general, it is necessary to conduct an ergonomic analysis for each healthcare profession.

Implementation of Ergonomics in Dentists/ Stomatologists

In the narrative review, 11 articles were found that mention postures and musculoskeletal symptoms in both dental professionals and students. It was determined that individuals in this profession tend to experience greater musculoskeletal strain in the neck and upper trunk due to poor posture habits that start as early as undergraduate studies (21,28).

Moreover, the most frequent musculoskeletal symptom associated with poor working postures in dentists is pain. The body parts most affected include the hand, wrist, neck, and upper lower back. These symptoms are reported more

frequently during adulthood and old age (29). Another important factor to consider is the accumulation of work experience and the number of hours worked per week, which contributes to the presence of pain and discomfort in the forearms, arms, neck, and shoulders (30).

According to the study by Molina Bravo and colleagues (31), dental ergonomics is based on the adoption of proper postures during patient care. As such, dentists must be aware of the importance of maintaining optimal working conditions to ensure their well-being and that of their patients, and thereby reduce injuries caused by poor posture or improper ergonomic techniques (31).

Additionally, it is important not only to mention the symptoms that affect professionals but also to analyze and be aware of what constitutes proper posture. Most individuals tend to adopt poor postures, which can lead to health problems even before becoming professionals. According to the Kuorinka Nordic Questionnaire, the main ergonomic issue is the adoption of poor posture, which causes pain in the dorsal/lumbar region (32). Postural analysis is a fundamental tool for evaluating ergonomics in dentistry. The use of technologies such as motion capture and posture recording can provide a precise quantitative assessment. In a 2013 study, Gopinadh and colleagues (33) used a motion capture system to analyze the postures of dentists during clinical procedures. Their results highlighted the most common postures and provided ergonomic recommendations for improving occupational health.

A Chilean study by Acevedo Ávila and colleagues (34) demonstrated that students frequently experience musculoskeletal symptoms. Additionally, it was found that musculoskeletal symptoms are more common in women than in men, with the most reported symptoms being pain and discomfort. The study also highlighted that the most affected areas of the body are the neck and back. Furthermore, pain and discomfort were repeatedly mentioned as the primary symptoms, followed by physical limitations.

Implementation of Ergonomics in Nursing

In the nursing field, a total of 17 articles were found out of the 75 initially selected. These articles evaluated the potential ergonomic threats faced by nursing staff and identified symptoms such as musculoskeletal disorders or injuries, focusing on the prevalence and intensity of lower back pain, work-related stress of congenital or traumatic origin, and ergonomic risks in the workplace. Various methods, such as RULA, NSEA, and the application of the Nordic Questionnaire, were used in these evaluations. The most frequently used methodology was the Nordic Questionnaire, which gathers information on discomfort, pain, or unease in different body areas (35).

Nursing workers face greater physical demands in emergency or intensive care units, in elderly care, and in mobile care services. The studies also emphasized the configuration of workspaces and self-care practices, identifying that improper footwear use contributes to the development of musculoskeletal disorders (36).

Regarding the time nursing staff spends standing, the neck, shoulders, and lower back were identified as the most affected areas. These injuries were attributed to excessive exertion during patient care, as well as the inadequate distribution of furniture, and the lack of proper equipment and supplies needed to provide quality care to patients (37).

Based on studies in the nursing field and various settings, it was found that different ergonomic risks can cause both physical and psychological harm to these professionals due to the strain on the musculoskeletal system related to the performance of daily activities, work demands, and job positions, which in turn affects productivity (37). Moreover, these risks have not been adequately controlled in many healthcare centers.

Although the majority of healthcare workers' musculoskeletal issues stem from their daily work, stress must also be considered, as it is associated with repetitive activities and improper postures. In this regard, when comparing dental staff with nursing workers, it is identified that the former experience issues primarily due to repetitive neck and arm postures, while in the latter group, improper postures when lifting objects cause back discomfort. Therefore, if training were provided to ensure proper ergonomic practices across all healthcare institutions, the damage to healthcare personnel could progressively decrease.

Implementation of Ergonomics in Physiotherapy

Four articles focused on the field of physiotherapy were found, addressing ergonomic risks. These represent approximately 6% of the total original articles. To assess ergonomic risks, the most commonly used methodology was observational-descriptive cross-sectional studies, in contrast to epidemiological studies, the Nordic Questionnaire, and the REBA method. Similarly, the risks highlighted in this field emphasize musculoskeletal disorders and forced postures.

Work-related musculoskeletal disorders are described as affecting the musculoskeletal system due to the exposure of structures, elements, and tissues of the locomotor system to mechanical loads generated during work tasks (38). Forced postures refer to work positions where one or more parts of the body are in an uncomfortable or improper position, deviating from its natural position of comfort. This can lead to hyperextension,

hyperflexion, or hyperrotation of the body (39). The persistence of physically demanding activities in physiotherapy units, particularly in rehabilitation services involving repetitive tasks and the use of force to manage patients, generates musculoskeletal symptoms.

The most affected anatomical regions among physiotherapy professionals are the lumbar region, neck, spine, and upper limbs (7). It was also found that work-related musculoskeletal disorders can worsen due to an unfavorable work environment, which is associated with reduced productivity and the onset of disabilities (40).

The high prevalence of symptoms and diseases resulting from ergonomic risks among physiotherapists underscores the importance of implementing preventive and control measures to improve the execution of daily tasks. From an ergonomic perspective, it is necessary to develop techniques that address aspects such as load handling, forced postures, and repetition, among others. Additionally, ergonomic redesign of the workplace, based on scientific evidence (41), should be considered with the goal of preventing musculoskeletal injuries and avoiding physical disability that affects professional performance.

These findings highlight the value of continuing research and developing specific ergonomic strategies for healthcare professionals. To reduce risks and improve the physical well-being of these professionals, it is essential to implement preventive measures that promote proper posture, ergonomic work techniques, and safe work environments.

Knowledge of Ergonomics

The review revealed that not only is ergonomic knowledge necessary, but the means to implement and practice these behaviors must also be available. Therefore, it is crucial to invest in appropriate working conditions and provide continuous training for healthcare staff, as knowledge about ergonomic risks serves as a preventive factor for musculoskeletal disorders. This reinforces the importance of identifying these risks, especially when it is linked to improving workplace safety and health (42,43).

Considering the criteria for assessing the aforementioned risk factors, professionals must also have the ability to care for themselves, meaning they should use the knowledge they acquire appropriately to avoid any disorders. Self-care is defined as behavior observed in specific life situations that individuals direct toward themselves or their environment, with the aim of regulating factors that impact their development and functioning, to benefit their life, health, and well-being (36).

Work-related musculoskeletal disorders of a cumulative nature develop gradually, progressing through different stages. In the initial stage, fatigue and moderate discomfort appear, while in the second stage, occasional posture-related discomfort and mild pain occur, which can be relieved with adequate rest (38). Furthermore, ergonomics aims to ensure the availability of appropriate work components and physical conditions, as well as sufficient personnel to perform tasks optimally (44). Knowledge of techniques for each intervention is also necessary—hence the need for greater efforts in training. However, despite the evidence provided by numerous studies in the field of ergonomics, common errors in posture and body positioning persist (45), which is why knowledge levels must continuously evolve to adapt to the way tasks are performed.

On the other hand, when ergonomic positioning techniques are unknown, tasks are not performed optimally. At the same time, there are unknown factors that impact workers' health. Additionally, work-related discomforts related to infrastructure should be considered, both in terms of physical space and staff mobility during task execution (46). Therefore, improving the working conditions of these professionals is essential to promote a more favorable work environment. The risk of illness has harmful consequences both in the workplace and in the personal lives of the affected professionals (47).

CONCLUSIONS

This review emphasizes a comprehensive approach to ergonomics for healthcare professionals, considering aspects such as workplace design, staff training, the implementation of policies and occupational safety standards, and the promotion of a preventive and health-oriented culture. Beyond the immediate benefits for healthcare workers, it has also been found that an ergonomic approach to healthcare delivery has a positive effect on overall health.

Furthermore, the implementation of ergonomic principles among healthcare professionals has been linked to several significant advantages, including a reduction in work-related accidents and injuries, increased performance and job satisfaction, and improved patient care.

Ergonomic risks affecting nursing staff cause both physical and mental harm due to the overload on the musculoskeletal system and cognitive functions required to carry out daily activities, leading to absenteeism from work and long-term leave requests.

Healthcare professionals who have direct contact with patients, such as physiotherapists, perform tasks at an accelerated pace, which leads to musculoskeletal disorders and associated ergonomic risks due to prolonged maintenance of static and

dynamic postures, repetitive upper limb movements, and particularly, overload movements of the spine. This makes physiotherapy the profession most susceptible to ergonomic risks compared to other health disciplines.

The persistence of risk factors results in a gradual deterioration process, worsening pain, and eventually interfering with daily activities.

Finally, the findings of this narrative review highlight the importance of ergonomics in the hospital setting as a preventive measure to safeguard the well-being and health of employees. A safer and healthier work environment is possible with the implementation of specific ergonomic strategies in each work area, benefiting healthcare professionals and improving their performance in patient care.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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