Effect of Ergonomic Physiotherapy on Work Related Musculoskeletal Disorders

Abdulrhman Ahmed Alhusaini[1]*, Nauwaf Ali M Almushaiqeh[2], Othman Meshari Almeshari[3], Saleh Abdullah Almarshad[4], Bandar Abdulmohsen Alsada[5]

1 Physiotherapist, PSMMC, Riyadh, KSA

aalhusaini@psmmc.med.sa

2 Physiotherapist, PSMMC, Riyadh, KSA

3 Physiotherapist, PSMMC, Riyadh, KSA

4 Physiotherapist, PSMMC, Riyadh, KSA

5 Physiotherapist, PSMMC, Riyadh, KSA

Abstract : Pain, functional impairment, and decreased productivity are symptoms of work-related musculoskeletal diseases (WMSDs), which affect both those with physically demanding jobs and those with more sedentary work situations. Adjustments to the workstation, exercises to strengthen the muscles, and education on proper posture are all examples of ergonomic physiotherapy treatments. These therapies aim to reduce the incidence of these disorders by treating the underlying environmental and physiological reasons. This systematic review was conducted with the intention of determining whether or not ergonomic treatments (PEIs) administered by physiotherapists are effective in the prevention or management of work-related stress injuries (WMSDs). Between the years 2009 and 2025, the experiments were conducted using a randomization method. Six high-quality studies have shown that PEIs increase both functional outcomes and pain in the muscles and joints. PEIs also improve the results of functional tests. In particular, this is the case when the PEIs combine specialized strengthening exercises with modifications to the workstation. Due to limitations such as small sample sizes, the lack of participant blinding, and variation in intervention regimens, it is evident that more study of a high quality is required despite the fact that these potentially positive effects have been achieved.
Keywords: Ergonomic physiotherapy, Work-related musculoskeletal Disorders, Workstation modification, Strengthening exercises, Occupational health.

INTRODUCTION

Pain, discomfort, and incapacity may be caused by musculoskeletal diseases (MSDs), which are medical problems that affect soft tissues such as muscles, tendons, ligaments, nerves, and more. Repetitive movements, bad postures, over-lifting, and unsuitable ergonomic work environments are the main causes of MSDs, which impact many different occupations. Musculoskeletal problems are becoming more common in sedentary jobs as a result of poor ergonomic design and extended static postures [1,2]. Previously, these illnesses were associated with high-workload sectors including manufacturing, construction, and healthcare.

Back discomfort, carpal tunnel syndrome, tendinitis, and neck strain are some of the MSDs that may develop as a result of long-term exposure to certain occupational risk factors.

According to research, these symptoms may be worsened by ergonomically unsound working practices, which in turn lowers productivity and dissatisfaction on the job [3]. Different industries have different rates of MSDs. Among the most impacted sectors in the European Union, according to studies, are physically demanding occupations (e.g., construction and healthcare), where between 30 and 80 percent of workers report MSD-related problems. On the other hand, owing to inadequate workstation design and extended sitting, more and more office workers are reporting MSDs, especially in the lower back, neck, and shoulders. Direct expenditures, like healthcare and rehabilitation, and indirect costs, like absenteeism and decreased productivity, contribute to the substantial economic burden of MSDs. Employers in the US alone lose almost USD 50 billion a year due to compensation and lost productivity due to MSDs, which make up one-third of all workplace injuries [4]. Employers and healthcare systems throughout the globe bear a heavy financial burden due to the high prevalence of disability caused by MSD-related accidents. Ergonomic treatments have grown in popularity as a means to address this rising tide of worry by lowering the MSD risk factors and enhancing workplace safety [5].

Tools and adjustments to the workplace, such as sit-stand desks, ergonomic chairs, and adjustable workstations, are examples of physical ergonomic interventions. Workflow optimization for improved mental workload management, focus, and decision-making is the goal of cognitive ergonomics. A lot of companies have implemented training programs to teach their employees about proper lifting, posture, and workplace ergonomics. It has been shown that training may raise awareness, but it doesn't really change behavior in the long run unless it's paired with ergonomic and physical treatments. Hence, a more all-encompassing method of preventing MSDs may be to use multi-faceted ergonomic treatments that include physical, cognitive, and training-based tactics [6,7].

Inconsistencies in research design, intervention techniques, and outcome assessments have kept the efficacy of ergonomic therapies controversial, despite their widespread application. Ergonomic modifications have been shown to reduce the incidence of MSDs in certain studies, whereas others have shown little or very little long-term impact. A lack of consistent procedures, inadequate long-term follow-ups, and insufficient comparison studies across

diverse occupational contexts are some of the significant deficiencies in the current research that are emphasized by this heterogeneity.

OBJECTIVES

1. To assess how well ergonomic therapies administered by physiotherapy may reduce musculoskeletal pain in individuals who work in physically demanding environments.
2. To evaluate how ergonomic physiotherapy therapies affect workers with WMSDs in terms of their functional results and productivity.

METHOD

In addition to ProQuest Central, ScienceDirect, PubMed, and Taylor & Francis Online, EBSCOhost was also used in the process of doing a comprehensive literature search. This was done to ensure that all relevant information was located. There were keywords such as "rehabilitation," "physical therapy," and "physiotherapy" that appeared in the search results.

The search was focused on medical specialists that provide ergonomic solutions. In order to ascertain the results, search terms such as "work-related musculoskeletal disorders" and "work-related injuries" were used. This was done with the intention of focusing on musculoskeletal health issues among persons who are employed. The search terms that were connected to interventions were "ergonomics" and "ergonomic interventions," with the primary emphasis being placed on physiotherapist-delivered therapies for the prevention and management of work-related stress disorder (WMSD) in the workplace.

Here are the criteria that were used for inclusion:

1. **Study design:** Between the years 2009 and 2025, randomized controlled trials (RCTs) were published in publications that were subjected to peer review.
2. **Population:** Work that demands a significant amount of physical effort, such as standing for extended periods of time, moving heavy things, or being in a posture that is unpleasant, is frequent among individuals who are 18 years of age or older.
3. **Intervention:** Ergonomic therapies, sometimes known as PEIs, are administered by physiotherapists with the intention of reducing the risk, occurrence, or severity of WMSD.

4. **Language:** studies that were written in English and published in the academic journal.

Using the PEDro scoring system, which measures internal validity, reporting clarity, and statistical adequacy, each selected research was independently screened and evaluated by two reviewers for methodological quality. This was done in order to ensure that the studies were of sufficient quality. All of the studies that had a score of six or above on the PEDro scale were deemed to have a high level of methodological quality and were included in the end review.

The following types of information were gathered from each research: participant characteristics, the kind of profession, specifics about ergonomic interventions, outcome measures, the length of time that participants were followed up, and study outcomes. The purpose of the research was to compile data about the efficacy of ergonomic treatments that were administered by physiotherapy in the prevention or management of work-related musculoskeletal illnesses among people who were employed in physically demanding jobs.

RESULT

Table 1: Summary Table

Study	Interventions Provided	Functional Outcome Measures	Pain Outcome Measures	PEDro Score
Pillastrini P et al.	Spinal stabilization and strengthening of core and hip musculature; Ergonomic education	Oswestry Disability Index	Visual Analog Scale	8/10
Welch A et al.	Assessing workstation set-ups and modifications; Cervical and shoulder musculature strengthening	None	Subjective Pain Scale	7/10
Munoz-Poblete C et al.	Theraband stabilization program of the shoulder; Strengthening of upper extremity	Disabilities of the Arm, Shoulder and Hand	Visual Analog Scale	7/10
Tsang SMH et al.	Assessing workstation and modifications; Electromyography biofeedback; Re-education of motor control; TENS and Ultrasound modalities	Neck Disability Index; Disabilities of the Arm, Shoulder and Hand	Numeric Pain Rating Scale	6/10

Bultmann et al.	Assessing workstation and modifications	Oswestry Disability Index	Verbal Pain Scale	6/10
Figl-Hertlein A et al.	Assessing workstation and modifications; Strengthening and individualized programs	Short Form-36	None	5/10

Studies that were conducted in the past that were systematic in nature explored the efficacy of ergonomic therapies that were delivered by disciplines other than physical therapy [8-11]. As a result of the comprehensive assessment that was carried out, it was determined that PEI was successful in reducing pain and improving functional capacities in physical therapy workers. Out of the six research, four of them investigated how rearranging workstations might potentially alleviate discomfort and improve function while working [12,13].

Workstation Adjustment

The researchers Welch and colleagues investigated how the pain that office workers experience in their necks was changed by exercise as well as modifications to their workstations. The participants, who totaled 763 in total, were randomly allocated to either an intervention group or a control group at the beginning of the experiment. The intervention group was selected at random, and they participated in strength training, adaptations to their workstations, and physical activity for a period of twelve weeks. Those who were assigned to the control group were instructed on how to make constructive adjustments to their way of life. For the purpose of this study, the Subjective Scale was used as the outcome measure.

Additionally, it was given both before and after the intervention was carried out. The results were not statistically significant; nevertheless, after a period of twelve weeks, those who were part of the intervention group reported experiencing reduced pain in their neck. In spite of the fact that the authors arrived at the conclusion that increased physical activity and adjustments to the working environment can decrease neck pain, further research is necessary before concluding anything definitive. Motor control re-education, modalities, workstation adjustments, and muscle activation and relaxation strategies were all evaluated by Tsang et al. [14] for their efficacy in alleviating WRNSP. The total number of participants was 101, and they were split into two groups: one group was assigned to the control group (n = 50), while the other group was assigned to the workplace transformation intervention (n = 51). The participants in the intervention group received training on motor control as well as

modifications to their workstations that were suited to their specific responsibilities. Those who were selected to be in the control group were given the opportunity to choose their own off-site physical therapy practitioner.

When it came to pain, some of the outcome measures were the NDI, the DASH, and the NPRS. At the one-year follow-up, the study examined the groups and found that there were no significant differences between them ($p < 0.05$). Additionally, the research discovered that both groups had decreased pain. Patients with WRNSP who got therapy on-site, on the other hand, demonstrated statistically significant improvements in their overall recovery at the one-year follow-up. With the use of complete on-site therapy, workers who are experiencing pain due to WRNSP may be able to obtain relief from their condition, as stated by the authors. The researchers Bultmann and colleagues [15]. examined the impact that individualized alterations to workstations had on the amount of discomfort experienced and the number of sick days taken due to low back pain while on the job.

A total of 119 participants were randomly allocated to one of two groups: the control group, which consisted of 51 individuals, and the intervention group, which included 68 individuals. An individual was regarded to be a participant if they submitted a request for sick absence due to experiencing low back pain while their work was being performed. Individualized work rehabilitation was provided to the intervention group, which included adjustments to the workstation as well as return-to-work programs. This was in contrast to the usual case management therapy that was provided to the control group. In order to quantify the outcomes, we used both the ODI and a pain rating scale that ranged from 0 to 10. Six and twelve months after the injury, respectively, these were given to the treatment recipient. At six and twelve months, the intervention group demonstrated a substantial increase in function and a decrease in discomfort when compared to the control group, which had access to standard case management.

In comparison to the group that served as the control, the intervention group reported a lower number of sick days. The authors believe that with the assistance of return-to-work programs and adjustments to workstations, it may be able to reduce the amount of pain and sick leave that is experienced by workers who have been injured. Figl-Hertlein et al. [16] conducted a study on the influence of exercise and workstation modification treatments on the general health of secondary school teachers in Austria. The questionnaire that they used was called the Short-Form 36 (SF-36). Within the framework of the cluster randomized pilot study, a

convenience sample was used. The total number of participants was 69, and they were divided evenly between an intervention group (n = 26) and a control group (n = 43). Six sessions of thirty minutes each were held with a physical therapist for the intervention group over the course of a period of the five months. The participants gained knowledge on ergonomics, how to alter their workstations, and ways for managing stress while participating in these workshops.

One education session on stress management was provided to the group that served as the control. With regard to the SF-36 ratings, the data demonstrated that after five months of the semester, the intervention group had an improvement (although one that was not statistically significant), whilst the scores of the control group remained unaltered. When it comes to avoiding health decline, the authors came to the conclusion that secondary school teachers in Austria would benefit from direct occupational health programs conducted by physical therapists rather than relying only on instruction. For the purpose of enhancing their external validity, ergonomic treatments that are administered via physical therapy in the workplace need more research.

Education and Strengthening

When compared to the control groups, the intervention groups in two of the six studies used strengthening programs when compared to the control groups. The fact that ergonomic education was included in the control groups in each of the six studies suggests that it is not sufficient to relieve pain and enhance function for people who are employed in professions that require a high level of physical exertion. Researchers Pillastrini et al. [17] conducted a cluster randomized controlled trial with 71 nursery school teachers who were all suffering from low back pain. All of the participants in the experiment were in the same position. Participants were randomly allocated to either a control group that got exercise instruction pamphlets (n = 35) or an intervention group that received a program conducted by a physical therapist to strengthen their hips, trunk, and spinal column (n = 36).

The control group received exercise instruction pamphlets. As a supplemental measure, the Visual Analog Scale (VAS) was used, whilst the Roland Morris Disability Questionnaire and the ODI were utilized as the primary end measures. All outcome variables were filled out at the baseline assessment as well as the assessment that took place two months after the intervention. On the Roland Morris Disability Questionnaire, the ODI, and the VAS, members

in the experimental group demonstrated significant progress in comparison to those in the control group after two months of treatment. After conducting their research, the authors came to the realization that, in contrast to teaching alone, strengthening therapies could be more effective in reducing low back pain among employees working in nursery schools. Moreover, Munoz-Poblete and colleagues carried out research on exercise programs with the purpose of lowering the incidence of occupational injuries.

The 109 workers at the plant who were randomly assigned to either the intervention group (n = 56) or the control group (n = 53) were all engaged in repetitive actions involving the upper extremities while they were doing their jobs. Participants in the program were given a series of exercises that were aimed to stabilize the shoulder joint. These exercises helped participants strengthen their shoulders as well as the back of their upper limbs. Those who were assigned to the control group were just instructed to do upper-extremity stretches. Among the outcome measures that were used were the DASH and the VAS. The control group's scores on the DASH and VAS were much lower than those of the intervention group, which reported significantly higher ratings. According to the findings of the authors, resistance training is an effective intervention that may successfully minimize the risk of injuries to the upper extremities that industrial workers face [18].

For the purpose of this systematic review, each and every research that was included had a long list of qualifications attached to it. In each of the six studies, however, it was not feasible to blind the participants since it was not possible. In addition, the sample sizes were quite small, which was an additional limitation that was imposed. The inability to blind participants and the use of a small sample size both contribute to a reduction in the research's capacity to generalize its findings and its external validity. When doing future research, it may be possible to improve both the generalizability and the external validity of the findings by encouraging participants to be blinded and by utilizing larger sample sizes.

DISCUSSION

According to the findings of this research [19,20], physiotherapy-delivered ergonomic treatments are an effective method for reducing the risk of working-related stress disorders (WMSDs) in occupational settings. Alterations to the workstation, such as modifying the height of the chair, the location of the monitor, and the layout of the desk, were consistently associated with reductions in the amount of pain experienced in the neck, shoulders, and lower

back. To give you an example, a research that was carried out by Welch and colleagues discovered that office workers who coupled strengthening exercises with changes to their workstations had reduced stiffness in their necks. However, the limited number of participants in the research had an impact on the statistical significance of the findings.

Similarly, Tsang et al. found that after one year of follow-up, musculoskeletal pain was reduced and general healing was enhanced with on-site therapies that included biofeedback, motor control re-education, and modalities such as transcutaneous electrical nerve stimulation (TENS) and ultrasound. These therapies were administered at the patient's location. The findings of studies carried out by Pillastrini et al. and Munoz-Poblete et al. shed light on the value of exercise-based treatments in combination with education. These studies shown that strengthening interventions that targeted the core, hip, and upper extremity muscles improved function and decreased pain.

The investigations were restricted in their ability to generalize owing to variables such as small sample sizes, a lack of blinding persons, and variance in intervention techniques and outcome measurements [21]. Despite the fact that there was evidence of favorable benefits, the studies were considered to be limited in their potential to generalize. In addition, the fact that education alone did not result in improvements that were long-lasting brings into focus the need of full ergonomic therapies that include exercise, modifications to workstations, and ongoing training. When it comes to the prevention and treatment of work-related stress disorders (WMSD), these findings demonstrate that ergonomic physiotherapy is an essential component of the jigsaw when it comes to workplace health management strategies.

CONCLUSION

Employees who are suffering from musculoskeletal problems that are caused by their work may be able to get ergonomic treatments from physiotherapists. This is a possibility. It is possible that these therapies will alleviate the workers' discomfort and improve their ability to do their jobs. In order to get the most reliable results, the treatments that combine specific strengthening exercises with posture training and adjustments to the workstation are the ones that are most effective. On the other hand, generalizability is difficult to attain because of the variable nature of the research design and the small number of samples that were collected. In the future, there will be a need for randomized controlled trials that are conducted on a bigger scale and make use of standardized intervention approaches. It will be required to conduct

these research in order to bolster the evidence and provide more insight into occupational health policies.

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