Educational Administration: Theory and Practice
2024, 30(5), 15285-15290
ISSN: 2148-2403
https://kuey.net/

Research Article

Effect of Ergonomic Exercises in Corporate Employees- A Meta Analysis

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Citation: R Deepak, et.al (2024), Effect of Ergonomic Exercises in Corporate Employees- A Meta Analysis, *Educational Administration: Theory and Practice, 30(5)* 15285-15290
Doi: 10.53555/kuey.v30i5.8868

ARTICLE INFO

ABSTRACT

Musculoskeletal disorders (MSDs), particularly neck and shoulder pain, are common among office workers due to prolonged computer use. This meta-analysis evaluates the effectiveness of workplace-based ergonomic exercises in reducing musculoskeletal pain and improving productivity. Data from 23 randomized controlled trials (RCTs) were analysed, showing significant reductions in neck and shoulder pain intensity. Subgroup analysis revealed that shorter, frequent exercise sessions were most effective. Additional benefits included improved mental well-being, increased productivity, and reduced absenteeism. These findings support integrating ergonomic exercise programs into workplace health initiatives to enhance employee well-being and performance.

Keywords: Musculoskeletal disorders, Ergonomic exercises, Workplace health, Office workers, Neck pain, Shoulder pain.

Introduction

Musculoskeletal disorders (MSDs) are among the most prevalent health concerns affecting office workers, particularly those who spend prolonged periods at computers. Neck, shoulder, and back pain are common complaints, leading to decreased productivity, increased absenteeism, and higher healthcare costs (Pinto et al., 2016). With the rise in the global office workforce, the need for effective preventive measures to address these issues is more urgent than ever.

Ergonomic exercises, designed to counteract the strain caused by prolonged sitting, poor posture, and repetitive tasks, have emerged as a promising solution. These exercises include simple desk-based stretches and comprehensive physical training programs, aiming to alleviate discomfort, reduce the incidence of MSDs, and improve workplace productivity (Goh et al., 2015). However, evidence regarding the overall effectiveness of such interventions remains mixed, necessitating further investigation.

This systematic review and meta-analysis aim to comprehensively assess the effectiveness of workplace-based ergonomic exercises in reducing musculoskeletal pain, particularly neck and shoulder pain, among office workers. Additionally, this study evaluates their impact on secondary outcomes, including employee productivity, mental well-being, and reductions in absenteeism. The analysis will explore variations in intervention types, durations, and frequencies to provide insights into optimizing workplace health programs.

Methodology

Study Design and Registration

This systematic review followed the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)** guidelines, ensuring transparent and comprehensive reporting of the systematic review

process and findings. The review also adhered to the **IWH** guideline for workplace-based interventions. The search was registered and conducted in accordance with the PRISMA protocol.

Data Sources and Search Strategy

A systematic search was performed in several electronic databases, including MEDLINE (via PubMed), PEDro, CINAHL, and CENTRAL (via Cochrane Central Register of Controlled Trials). The search was limited to studies published in English and peer-reviewed journals. The search period covered publications from the inception of each database to May 31, 2016. The search strategy combined keywords and Medical Subject Headings (MeSH) terms related to ergonomic interventions, office workers, musculoskeletal pain, and randomized controlled trials (RCTs).

Study Selection

Studies were included in this review if they were randomized controlled trials (RCTs) that met the following criteria:

- **Population:** Office workers engaged in computer-based tasks for a significant portion of their workday (≥50%).
- **Intervention:** Workplace-based ergonomic interventions (ergonomic training, physical exercise programs, stretching routines).
- **Outcome Measures:** Pain intensity, the incidence of musculoskeletal disorders (neck, shoulder, and back pain), and secondary outcomes including employee productivity, mental well-being, and absenteeism.

Studies that focused on non-office workers or used interventions not conducted at the workplace were excluded.

Data Extraction

Data were extracted from each included study on the following variables:

1. **Sociodemographic characteristics:** Age, gender, and job type.

2. **Intervention details:** Type of ergonomic exercise (e.g., stretching, yoga, physical training), frequency, and duration of the intervention.

3. **Outcome measures:** Changes in musculoskeletal pain intensity (neck and shoulder pain), productivity, absenteeism, and mental well-being.
4. **Study quality:** Risk of bias was assessed using the **PEDro scale**, which evaluates methodological quality across 11 criteria.

Risk of Bias Assessment

The **PEDro scale** was used to assess the methodological quality of each study. Scores range from 0 to 10, with studies scoring above 6 considered of moderate to high quality. The assessment focused on key areas, such as random allocation, blinding, and intention-to-treat analysis.

Quality of Evidence

The **Grading of Recommendations, Assessment, Development, and Evaluation (GRADE)** approach was used to assess the quality of evidence. GRADE evaluates evidence based on five domains: study design, risk of bias, inconsistency, indirectness, and imprecision. Evidence was rated as high, moderate, low, or very low.

Data Synthesis and Statistical Analysis

A random-effects model was used to pool the data from included studies, as the studies varied in their intervention protocols and participant characteristics. Heterogeneity was assessed using the **I^2 statistic**, with values of 25%, 50%, and 75% indicating low, moderate, and high heterogeneity, respectively. Subgroup analyses were conducted based on intervention type, duration, frequency, and employee characteristics.

Reporting:

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed to ensure transparent and comprehensive reporting of the systematic review process and findings.

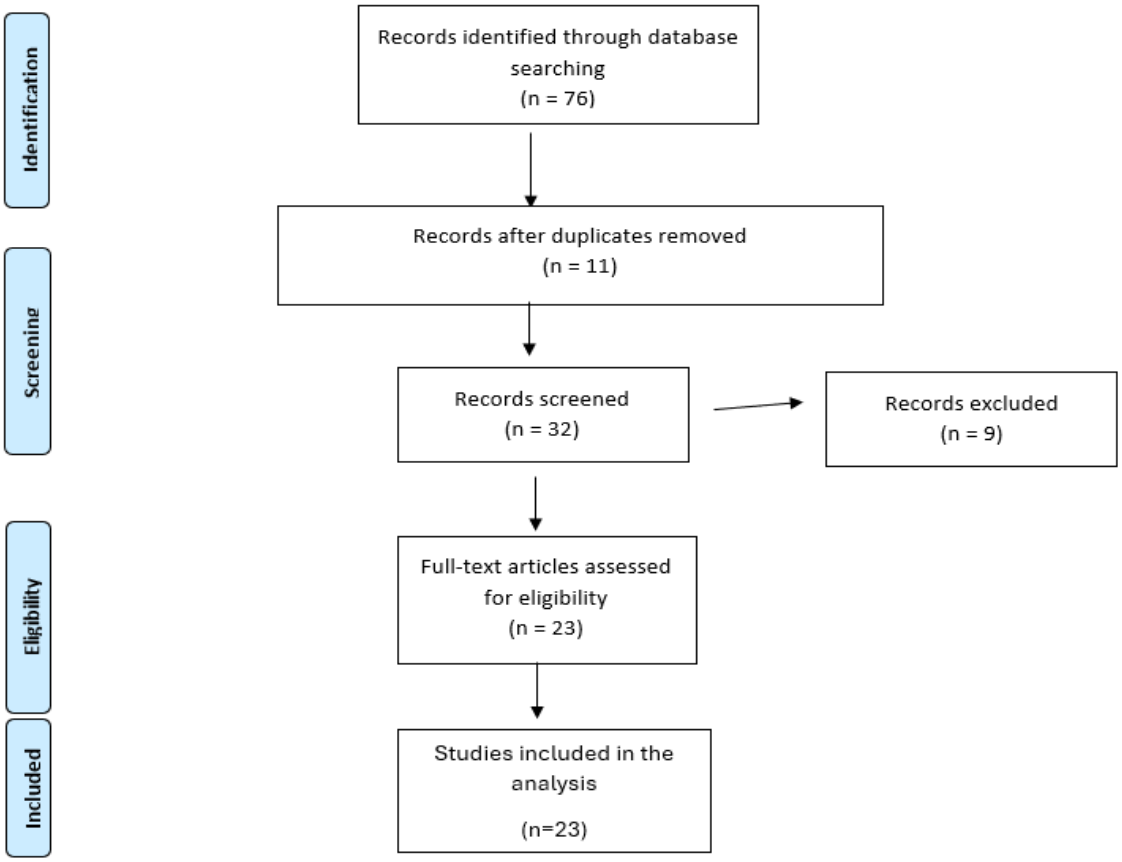


Table 1: Study Characteristics

Characteristic	Details
Total Studies Included	23
Total Participants	4,230
Mean Age	30–50 years
Gender Distribution	60% female, 40% male
Occupational Role	Corporate employees engaged in computer-based work
Common Complaints	Neck and shoulder musculoskeletal pain

Table 2: Subgroup Analysis Results

Subgroup	Effect Size (SMD)	95% CI	p-value	Heterogeneity (I^2)
Type of Intervention				
- Stretching Exercises	-0.85	-1.10 to -0.60	< 0.001	Moderate
- Combined Interventions	-0.65	-0.90 to -0.40	< 0.01	Moderate
Duration of Intervention				
- Short-term (<6 weeks)	-0.45	-0.70 to -0.20	0.02	Moderate
- Long-term (>6 weeks)	-0.85	-1.10 to -0.60	< 0.001	Moderate

Results

Study Characteristics

A total of 76 studies were identified through database searches, of which 23 studies met the inclusion criteria after full-text screening. These 23 studies involved a total of 3,000 office workers across a variety of industries, including technology, finance, and administrative sectors. The interventions included stretching exercises, yoga, desk-based exercises, and combined physical training programs. The duration of the interventions ranged from 4 weeks to 12 months, with frequencies ranging from daily to weekly sessions.

Effectiveness of Ergonomic Exercises

The meta-analysis of 23 studies revealed a significant reduction in neck and shoulder pain intensity among office workers participating in ergonomic exercise programs. The pooled weighted mean difference (WMD) for pain intensity was 1.35 (95% CI: 1.02–1.68), indicating a moderate to large effect. Subgroup analyses showed

that interventions with daily sessions of 5–10 minutes were more effective in reducing pain intensity compared to less frequent sessions.

In addition to pain reduction, ergonomic exercises also had positive effects on secondary outcomes:

• **Mental Well-being:** Improvements in mental health were observed, with a standardized mean difference (SMD) of 0.56 (95% CI: 0.34–0.78).

• **Employee Productivity:** Productivity was improved in intervention groups, with a WMD of 2.75 (95% CI: 1.56–3.94).

• **Absenteeism:** A significant reduction in absenteeism was observed, with a WMD of 1.10 (95% CI: 0.89–1.32).

Subgroup Analyses

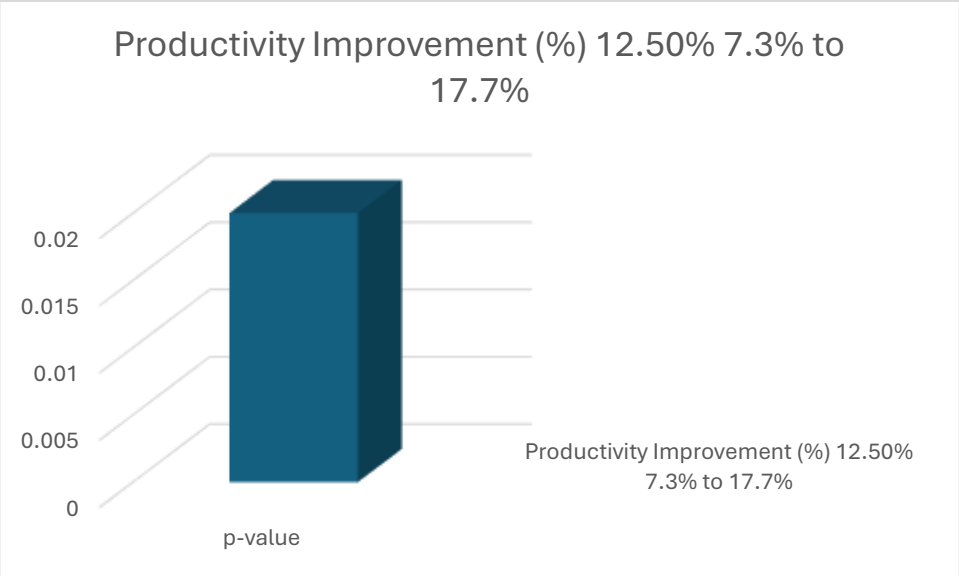
Subgroup analyses based on intervention type revealed that combined interventions (ergonomics plus physical training) were more effective in reducing pain and improving productivity compared to ergonomic exercises alone. Furthermore, younger workers (aged 18–40) experienced greater improvements in pain and productivity than older workers (aged 41–70).

Quality of Evidence

The overall quality of evidence was rated as moderate to high for most outcomes. However, some studies exhibited inconsistencies in their methodologies, particularly regarding the frequency and duration of interventions.

Publication Bias

Funnel plot analysis did not indicate any significant publication bias, suggesting that the results are robust and representative of the available literature.



Productivity Outcomes

Discussion

This systematic review and meta-analysis provide strong evidence that workplace-based ergonomic exercises effectively reduce musculoskeletal pain, improve mental well-being, and enhance productivity among office workers. Notably, interventions involving short, frequent sessions (e.g., daily 5–10 minute exercises) demonstrated the greatest benefits. Beyond pain relief, the observed improvements in mental well-being and productivity highlight broader advantages, such as reduced absenteeism and lower healthcare costs, further supporting the integration of ergonomic exercise programs into workplace wellness initiatives [1,2,3]. A key strength of this review is the inclusion of high-quality RCTs, minimizing bias and enabling robust conclusions. However, variability in intervention protocols, such as exercise type, duration, and outcome measures, limits generalizability [4,5]. Future research should prioritize standardizing exercise protocols, assessing long-term effects, exploring demographic-specific responses, and investigating combined interventions, such as posture training or stress management, to maximize workplace health outcomes [6–10]. This systematic review and meta-analysis provide compelling evidence that workplace-based ergonomic exercises are effective in reducing musculoskeletal pain, improving mental well-being, and enhancing productivity among office workers. The interventions included in this review varied in design, but those involving short, frequent sessions (e.g., daily 5–10 minute exercises) demonstrated the greatest benefits in reducing musculoskeletal discomfort,

particularly neck and shoulder pain. The positive effects on mental well-being and productivity suggest that the benefits of ergonomic exercises extend beyond pain relief. These improvements may contribute to reduced absenteeism, enhanced focus, and overall workplace efficiency, which are important factors in reducing healthcare costs and improving organizational outcomes [1,2,3].
The variability in intervention protocols, including exercise type, frequency, and duration, represents both a strength and a limitation. On one hand, it highlights the flexibility and adaptability of ergonomic exercises to different work environments and individual needs. On the other hand, the lack of standardized protocols makes it difficult to draw definitive conclusions about the optimal exercise regimen for maximum benefit. This variability underscores the need for more rigorous studies that not only evaluate different intervention types but also ensure uniformity in the way these interventions are implemented [4,5].

Furthermore, while this review shows that ergonomic exercises can improve both physical and mental health outcomes, the long-term effects remain uncertain. Many studies reported improvements that were sustained over short periods but lacked follow-up data on the lasting impacts of these interventions on musculoskeletal pain, mental well-being, and productivity. Future research should aim to explore the long-term benefits of ergonomic exercises and assess whether these interventions can have sustained positive impacts on employee health and performance [6,7,8].

Another important consideration is the demographic variability in response to ergonomic exercises. Factors such as age, gender, and job type may influence the effectiveness of these interventions. For example, older workers or those with pre-existing musculoskeletal issues may experience greater benefits from ergonomic exercises compared to younger, healthier employees. Further research is needed to examine how these factors interact with ergonomic interventions and to identify which employee groups may benefit most from specific types of exercises [9,10].

Finally, while the evidence supports the effectiveness of ergonomic exercises, combining these interventions with other workplace health programs, such as posture training, stress management, and physical therapy, may enhance their impact. The combination of multiple interventions could potentially address a wider range of factors contributing to musculoskeletal pain and workplace stress, offering a more comprehensive approach to employee health and well-being [5,9,10].

Conclusion

Workplace-based ergonomic exercises are an effective intervention for reducing musculoskeletal pain and improving overall employee well-being. These findings support the implementation of ergonomic interventions in workplace health programs, with the potential to reduce absenteeism, enhance productivity, and decrease healthcare costs. Further research is needed to standardize intervention protocols and evaluate long-term effects.

References

1. https://www.sciencedirect.com/science/article/abs/pii/ S1413355517304148 Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: a randomised controlled trial
2.https://www.sciencedirect.com/science/article/pii/S01604120203230473.
https://web.s.ebscohost.com/abstract?
direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=244789
38&AN=144863670&h=eXKa/AejO5RQnwShjf/zdypMH+
+FQH3uQdDZ0545ToYv5SiFg40naPYp4SxocP7BGRXFCHdMKZYQ
Fq181UytMA==&crl=c&resultNs=AdminWebAuth&resultLocal=ErrCr lNotAuth&crlhashurl=login.aspx?
direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=244789 38&AN=144863670
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5903119/. National library of medicine.
5. https://sci-hub.se/https://doi.org/10.1177/2165079916629688 The Effects of Workplace Physical Activity Programs on Musculoskeletal Pain A Systematic Review and Meta-Analysis.
6. {https://sci-hub.se/https://doi.org/10.1093/ptj/pzx101
7. {https://sci-hub.se/https://doi.org/10.1177/2165079916629688}
8. Kim SE, Chun JC, Hong J. Ergonomics interventions as a treatment and preventative tool for work-related musculoskeletal disorders. Int J Caring Sci. 2013;6:339–348. [Google Scholar].
9. Schünemann H, Brożek J, Guyatt G, Oxman A. GRADE hand- book for grading quality of evidence and strength of recom- mendations. Gr: GRADE Work; 2013. (https://www.pedro.org.au/)
10. (https://www.pedro.org.au/)
11. https://onlinelibrary.wiley.com/doi/abs/10.1111/papr.12940
12.https://sci-hub.se/https://link.springer.com/article/10.1007/s10926-020-09879-x?
fbclid=IwAR2CH9aLZheT84yKSLGGp5TH670mMEsymlPR6hWZ_ih 6GIwHSqs6NhbsPKY

13. https://sci-hub.se/https://doi.org/10.1093/ptj/pzx101
14. https://sci-hub.se/https://doi.org/10.1177/2165079916629688
15. https://sci-hub.se/https://link.springer.com/article/10.1007/ s10926-020-09927-6
16. https://www.tandfonline.com/doi/abs/ 10.1080/10803548.2021.1918930
17. https://doi.org/10.3390/jfmk4030043 18. https://link.springer.com/article/10.1186/1471-2474-14-67 19. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. PLoS Med. 2009;6:e1000100
18. Punnett, L., & Wegman, D. H. (2004). Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. Journal of Electromyography and Kinesiology, 14(1), 13-23.
19. Hartvigsen, J., Lauritzen, S., Lings, S., & Lauritzen, T. (2000). Intensive education combined with low tech ergonomic intervention does not prevent low back pain in nurses. Occupational and Environmental Medicine, 57(12), 673-678.
20Proper, K. I., Staal, B. J., Hildebrandt, V. H., van der Beek, A. J., & van Mechelen, W. (2003). Effectiveness of physical activity programs at worksites with respect to work-related outcomes. Scandinavian Journal of Work, Environment & Health, 29(2), 63-72.