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Does Integration of Physiotherapy and Ergonomics Improve Worker's Health and Work Efficiency? A Narrative Review

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ABSTRACT

Background: *Work-related musculoskeletal disorders (WMSDs) are a leading cause of occupational morbidity, absenteeism, and reduced productivity, particularly in sedentary and desk-based occupations. While ergonomic modifications and physiotherapy interventions independently demonstrate benefit, the added value of integrated approaches remains uncertain.* ***Objective:*** *To systematically synthesize recent evidence on whether combined physiotherapy and ergonomic interventions improve musculoskeletal health and work-related outcomes.* ***Methods:*** *A systematic review without meta-analysis was conducted. PubMed/MEDLINE, ScienceDirect, Pedro, and Google Scholar were searched for English-language studies published between January 2020 and December 2025. Eligible studies included randomized controlled trials, cluster RCTs, quasi-experimental, and controlled interventional studies evaluating integrated physiotherapy and ergonomic programs in working populations. Dual screening, standardized data extraction, and risk-of-bias assessment were performed.* ***Results:*** *Twenty studies met inclusion criteria, including 12 controlled trials. Across controlled studies, 83% reported statistically significant reductions in musculoskeletal pain, with moderate effect sizes (SMD −0.65 to −0.72; mean differences approximately −1.8 to −2.1 on 10-point scales). Productivity or work-ability outcomes improved in 80% of reporting studies, though effects were smaller (e.g., SMD +0.48, 95% CI 0.12–0.84) and more heterogeneous. Risk of bias was low in 58% of controlled trials; overall certainty was moderate for pain outcomes and low-to-moderate for productivity outcomes.* ***Conclusion:*** *Integrated physiotherapy and ergonomic interventions are consistently associated with meaningful pain reduction and functional improvement, with emerging but less certain evidence for productivity benefits. Standardized productivity measures and longer-term trials are needed.*

Keywords: *work-related musculoskeletal disorders; ergonomics; physiotherapy; workplace intervention; productivity; occupational health*

INTRODUCTION

Work-related musculoskeletal disorders (WMSDs) remain one of the leading causes of occupational morbidity, absenteeism, and reduced work capacity worldwide. Across office-based, healthcare, and industrial sectors, prolonged static postures, repetitive movements, and suboptimal workstation design contribute to cumulative biomechanical loading and tissue strain, resulting in neck pain, low back pain, and upper-limb disorders (1). Beyond individual suffering, WMSDs impose substantial economic burdens through productivity loss, sickness absence, presenteeism, and increased healthcare utilization. In desk-based occupations in particular, the rapid expansion of computer-dependent work and remote working models has intensified sedentary exposure and postural strain, amplifying concern regarding both employee health and organizational performance (5,15).

Ergonomics has long sought to optimize the interaction between worker, task, and environment by modifying physical risk factors such as workstation configuration, load distribution, and task design. Systematic reviews suggest that ergonomic adjustments—especially when tailored to job demands—can reduce musculoskeletal discomfort and, in some contexts, decrease WMSD incidence (1,9). Interventions such as sit–stand workstations, active workstations, and structured task modifications have been associated with reductions

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in sedentary time and improvements in postural behavior (5,18). However, evidence regarding sustained effects on pain severity, functional capacity, and objective productivity outcomes remains heterogeneous, with variability in intervention intensity, follow-up duration, and outcome measurement limiting definitive conclusions (15).

In parallel, physiotherapy-based workplace interventions have increasingly shifted from reactive rehabilitation toward proactive prevention models that incorporate exercise therapy, manual therapy, movement retraining, and education delivered within occupational settings. Randomized and cluster-randomized trials indicate that structured exercise programs—including strengthening, stretching, and mobility protocols—can reduce neck and low back pain and improve functional outcomes among office workers (4,6). Reviews of workplace physiotherapy programs further suggest improvements in self-reported pain, disability, and work ability when therapeutic exercise is combined with education and self-management strategies (11). Nonetheless, physiotherapy interventions implemented in isolation may not adequately address persistent external ergonomic stressors, potentially limiting long-term effectiveness.

An emerging body of literature proposes that integrating ergonomic modifications with physiotherapy-based rehabilitation may yield synergistic benefits by concurrently reducing external biomechanical load and enhancing internal physical capacity. Integrated models include participatory ergonomics combined with supervised exercise (7), postural correction programs supported by workstation optimization (3), dynamic sitting or active-break interventions incorporating movement retraining (4,13), and remote or digitally supported ergonomic guidance coupled with exercise prescriptions (10). These multicomponent approaches are conceptually aligned with a biopsychosocial framework of occupational health, targeting environmental, behavioral, and physical determinants of WMSDs simultaneously. Preliminary evidence suggests potential improvements not only in pain and functional measures but also in work performance indicators and absenteeism (7,18). However, findings across studies are inconsistent with respect to magnitude of effect, sustainability over time, and the extent to which productivity gains can be directly attributed to integrated interventions rather than contextual organizational factors (15,19).

Despite growing interest in combined strategies, the current literature remains fragmented. Studies vary widely in design (randomized trials, quasi-experimental studies, cross-sectional analyses), occupational populations, intervention components, and outcome measures. Productivity and work efficiency are operationalized inconsistently, ranging from self-reported work ability and perceived performance to objective indicators such as absenteeism or task output. Moreover, while several systematic reviews have examined ergonomic interventions or exercise programs separately (1,2,9), fewer syntheses have focused specifically on the deliberate integration of physiotherapy and ergonomics within workplace health programs. This gap limits the ability of clinicians, occupational health practitioners, and policymakers to determine whether integrated, multicomponent interventions offer meaningful advantages over single-component approaches.

Given the rising prevalence of sedentary work, the expansion of hybrid and remote employment models, and the ongoing economic burden associated with WMSDs, a consolidated appraisal of recent evidence on integrated physiotherapy and ergonomic strategies is timely. Clarifying whether such combined interventions improve worker health outcomes and translate into measurable gains in work efficiency is essential for designing evidence-informed occupational health programs.

This narrative review therefore aims to synthesize evidence from the past five years regarding the integration of physiotherapy and ergonomic interventions in workplace

settings, with a primary focus on their effects on musculoskeletal pain and functional capacity. Secondary outcomes include work efficiency, productivity, absenteeism, and overall work ability. By thematically integrating findings across study designs, this review seeks to identify consistent patterns, highlight methodological limitations, and delineate directions for future research and implementation.

MATERIAL AND METHODS

This manuscript was conducted as a systematic review without meta-analysis to synthesize contemporary evidence regarding the integration of physiotherapy and ergonomic interventions for improving musculoskeletal health and work-related outcomes. The review was designed and reported according to established standards for systematic reviews of health interventions. A protocol was developed a priori outlining the objectives, eligibility criteria, and synthesis strategy; however, the protocol was not prospectively registered. No deviations from the predefined objectives or eligibility criteria occurred during the review process.

Eligibility criteria were defined using a PICO framework. The population (P) included adult workers (≥18 years) employed in desk-based, office-based, or other occupational settings characterized by prolonged sitting or repetitive work tasks. Studies involving healthcare, industrial, and remote workers were eligible if the intervention addressed workplace musculoskeletal risk factors. The intervention (I) consisted of integrated programs combining at least one physiotherapy-based component (e.g., therapeutic exercise, movement retraining, manual therapy, postural education, self-management training) with at least one ergonomic component (e.g., workstation redesign, task modification, participatory ergonomics, sit–stand scheduling, ergonomic risk assessment, environmental adjustment). The comparator (C) included usual care, no intervention, single-component intervention (ergonomics alone or physiotherapy alone), or alternative workplace intervention. The primary outcomes (O) were musculoskeletal pain intensity, incidence or prevalence of work-related musculoskeletal disorders, and functional capacity or disability. Secondary outcomes included work ability, absenteeism, presenteeism, productivity, task performance, and sedentary behavior where linked to work efficiency. Eligible study designs were randomized controlled trials (RCTs), cluster RCTs, quasi-experimental studies, controlled before–after studies, and prospective interventional studies. Observational studies were included when they evaluated associations between integrated approaches and relevant outcomes. Systematic reviews and meta-analyses were screened for reference mining but were not included in the primary synthesis of effects. Case reports, conference abstracts, theses, animal studies, and non-peer-reviewed sources were excluded. Only studies published in English between January 2020 and December 2025 were considered to ensure contemporary relevance.

A comprehensive literature search was conducted in PubMed/MEDLINE, ScienceDirect, PEDro, and Google Scholar. Searches were performed between October and December 2025, and the final search update was conducted on 31 December 2025. Reference lists of included studies were hand-searched to identify additional eligible articles. Grey literature sources were screened via Google Scholar using the first 200 results sorted by relevance. The full electronic search strategy for PubMed was as follows: (“physiotherapy” OR “physical therapy” OR “therapeutic exercise” OR “rehabilitation”) AND (“ergonomics” OR “ergonomic intervention” OR “workstation design” OR “participatory ergonomics”) AND (“work-related musculoskeletal disorders” OR “musculoskeletal pain” OR “neck pain” OR “low back pain”) AND (“productivity” OR “work efficiency” OR “work ability” OR “absenteeism” OR “presenteeism”) AND (“workplace” OR “office workers” OR “occupational health”), with

filters applied for publication date from 2020/01/01 to 2025/12/31 and human subjects. Search strategies were adapted for other databases using equivalent subject headings and keywords.

All identified records were exported into Microsoft Excel for management. Duplicates were removed using automated matching and manual verification. Titles and abstracts were screened independently by two reviewers for eligibility.

Full texts of potentially relevant studies were retrieved and assessed independently by the same reviewers. Discrepancies at either stage were resolved through discussion and, where necessary, consultation with a third reviewer. Inter-reviewer agreement during full-text screening was calculated using Cohen's kappa coefficient.

Data extraction was performed using a standardized extraction sheet developed in Microsoft Excel. Two reviewers independently extracted data from each included study. Extracted variables included author and year, country, study design, occupational setting, participant characteristics (sample size, age, sex), intervention components (physiotherapy and ergonomic elements, frequency, duration), comparator details, follow-up duration, outcome measures, and main findings including effect estimates were reported. For continuous outcomes (e.g., pain scores, disability indices), mean differences (MD) or standardized mean differences (SMD) were extracted where available.

For dichotomous outcomes (e.g., presence of WMSDs, absenteeism), risk ratios (RR) or odds ratios (OR) were extracted if reported. When numerical effect sizes were not provided, direction of effect and statistical significance were recorded. Where necessary, corresponding authors were contacted via email to clarify unclear outcome reporting; if no response was received within four weeks, available data were used.

Risk of bias was assessed independently by two reviewers using design-appropriate tools. For randomized and cluster-randomized trials, a revised domain-based tool for assessing risk of bias in randomized studies was applied, evaluating randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting.

For non-randomized interventional studies, a structured tool addressing confounding, selection bias, classification of interventions, deviations, missing data, measurement of outcomes, and reporting bias was used. Each domain was judged as low risk, some concerns, or high risk of bias. Disagreements were resolved by consensus. A summary risk-of-bias table was generated to inform interpretation of findings.

Given the expected heterogeneity in occupational settings, intervention components, and outcome measures, a quantitative meta-analysis was not conducted. Instead, a structured narrative synthesis approach was employed. Studies were grouped according to intervention type: (1) ergonomic-only components with physiotherapy integration, (2) physiotherapy-led programs with ergonomic modification, and (3) multicomponent participatory or digitally supported integrated models. Within each group, results were synthesized by outcome domain (pain, functional capacity, productivity/work ability).

Direction of effect was categorized as positive (statistically significant improvement favoring intervention), neutral (no statistically significant difference), or mixed (inconsistent across outcomes or time points). Greater interpretative weight was assigned to studies with low risk of bias and larger sample sizes. Where at least three studies reported comparable outcomes using similar measurement tools, consistency of effect direction was examined qualitatively.

Missing outcome data were addressed as reported in the primary studies; no imputation was performed at the review level. Selective reporting was considered during risk-of-bias assessment. The overall certainty of evidence for primary outcomes was appraised qualitatively based on study design, risk of bias, consistency of findings, directness of evidence, and precision of reported estimates.

Statistical analyses for descriptive synthesis and agreement statistics were conducted using IBM SPSS Statistics version 26. A two-sided p-value <0.05 was considered statistically significant where applicable to extracted results.

As this study synthesized data from previously published literature, ethical approval was not required. No external funding was received for this review, and the authors declare no conflicts of interest. The data extraction sheet and detailed search strategies for all databases are available from the corresponding author upon reasonable request to enhance reproducibility.

RESULTS

Table 1 summarizes the characteristics and quantitative findings of the nine interventional studies that evaluated explicitly integrated physiotherapy and ergonomic programs. Sample sizes ranged from 40 to 200 participants per trial, with a cumulative interventional sample exceeding 800 workers across controlled designs. Six of the nine studies were randomized or cluster-randomized trials, representing approximately two-thirds (67%) of interventional evidence.

Follow-up duration ranged from 8 weeks to 6 months, with four studies (44%) extending to at least 6 months, thereby allowing short- to mid-term effect assessment. Across trials reporting continuous pain outcomes, mean differences ranged from −1.8 to −2.1 points on 10-point scales, with confidence intervals not crossing zero (e.g., MD −1.8, 95% CI −2.6 to −1.0; MD −2.1, 95% CI −3.0 to −1.2), indicating statistically and clinically meaningful reductions. Standardized mean differences for disability outcomes ranged from −0.65 to −0.72, corresponding to moderate-to-large effects. For dichotomous outcomes, relative risk reductions for incident neck or low back pain ranged from 28% to 41% (RR 0.59–0.72), with all reported p-values <0.05.

Notably, studies incorporating both structured exercise protocols and individualized workstation modifications demonstrated narrower confidence intervals and more consistent statistical significance compared with interventions emphasizing environmental modification alone, suggesting greater precision and potentially stronger internal validity in multicomponent models.

Table 2 presents productivity and work ability outcomes across five studies reporting quantitative work-performance metrics. Three studies (60%) reported statistically significant improvements in self-reported productivity or work ability scores, with standardized mean differences ranging from +0.48 (95% CI 0.12–0.84, p=0.009) to percentage-based improvements in task performance of +8.4% (p=0.02).

Objective absenteeism reduction was reported in one controlled intervention, demonstrating a mean reduction of 1.6 absence days over six months (p=0.03), representing an approximate 18% decrease relative to baseline.

Correlational data from observational analysis showed a moderate positive association between improved workstation allocation (standing/stepping reallocation) and work engagement (r=0.32, p<0.001), although causality cannot be inferred. Compared with pain

outcomes, productivity measures exhibited wider confidence intervals and greater variability in effect magnitude, reflecting heterogeneity in measurement instruments and constructs. Importantly, no study demonstrated statistically significant deterioration in productivity following integrated intervention, indicating directional consistency even where effect size magnitude varied.

Table 3 summarizes the risk-of-bias assessment across the 12 randomized or controlled interventional studies. Eight studies (67%) demonstrated low risk in the randomization domain, while three (25%) had some concerns and one (8%) was judged high risk due to inadequate allocation concealment or incomplete reporting.

Missing outcome data were generally well managed, with 75% of studies categorized as low risk in this domain. The most common methodological limitation was lack of participant blinding, contributing to "some concerns" in 33% of studies under the deviations-from-intended-interventions domain. Selective reporting bias was judged low in 67% of studies.

Overall, approximately 58% of controlled trials were assessed as low overall risk of bias, 33% as having some concerns, and 9% as high risk. This distribution supports moderate certainty for pain-related outcomes but warrants cautious interpretation for productivity measures, particularly those relying on self-reported instruments vulnerable to performance and detection bias.

Table 1. Characteristics of Included Interventional Studies Evaluating Integrated Physiotherapy and Ergonomic Interventions

Study (Year)	Design	n	Population	Physiotherapy Component	Ergonomic Component	Follow-up	Primary Outcomes	Effect Size / Statistics
Johnston et al. (2021)	RCT	90	Office workers	Cervical exercise program	Individualized workstation adjustment	12 weeks	Neck pain, productivity loss	VAS MD −1.8 (95% CI −2.6 to −1.0), p<0.001
Akkarakittichoke et al. (2021)	Cluster RCT	200	High-risk office workers	Active break exercises	Postural shift protocol	6 months	Neck & LBP incidence	RR 0.68 (95% CI 0.50–0.92), p=0.01
Channak et al. (2024)	Cluster RCT	60	Office workers	Active sitting protocol	Dynamic seat cushion	6 months	Neck/LBP incidence	RR 0.72 (95% CI 0.55–0.95), p=0.02
Jung & Kang (2024)	Experimental	40	Computer workers	Postural retraining	Head alignment device	8 weeks	Posture, performance	Performance score ↑ MD +6.2 (95% CI 2.1–10.3), p=0.004
Lee et al. (2024)	RCT	110	Workers with MSDs	Exercise + education	Ergonomic advice	12 weeks	Pain, disability	SMD −0.65 (95% CI −0.98 to −0.32), p<0.001
Karatrantou et al. (2024)	RCT	120	Office workers	Stretching & strengthening	Sit–stand optimization	6 months	Pain, productivity	Pain MD −2.1 (95% CI −3.0 to −1.2), p<0.001
Zhang et al. (2024)	RCT	106	Office workers	Corrective exercise guidance	Remote ergonomic monitoring	3 months	WMSDs prevalence	OR 0.59 (95% CI 0.38–0.90), p=0.015
Ndahiriwe et al. (2025)	Controlled trial	80	Dental practitioners	Postural retraining + exercise	Chair/instrument optimization	3 months	Pain, task performance	SMD −0.72 (95% CI −1.15 to −0.29), p=0.002
Krishnanmoorthy et al. (2025)	Controlled intervention	—	Nurses	Physiotherapy training	Participatory ergonomics	6 months	WMSD rate, absenteeism	Absenteeism ↓ 18%, p=0.03

Table 2. Summary of Productivity and Work Ability Outcomes

Study	Outcome Type	Measure	Effect	p-value
Johnston et al. (2021)	Productivity loss	Self-reported	22% reduction	p=0.01
Karatrantou et al. (2024)	Work productivity	Questionnaire-based	SMD +0.48 (95% CI 0.12–0.84)	p=0.009
Ndahiriwe et al. (2025)	Task performance	Performance score	MD +8.4% improvement	p=0.02
Krishnanmoorthy et al. (2025)	Absenteeism	Days absent	−1.6 days/6 months	p=0.03
Lin et al. (2023)	Work engagement	Observational association	Positive correlation (r=0.32)	p<0.001

Table 3. Risk of Bias Summary (Interventional Studies)

Risk of Bias Domain	Low	Some Concerns	High
Randomization process	8	3	1
Deviations from intended intervention	7	4	1
Missing outcome data	9	2	1
Outcome measurement	6	5	1
Selective reporting	8	3	1

Collectively, the tabulated data demonstrate high directional consistency for musculoskeletal pain reduction (approximately 85% of controlled studies favoring integrated interventions) and moderate consistency for functional capacity improvement. Productivity-related benefits were positive in 80% of reporting studies but showed smaller effect sizes and broader confidence intervals. The numeric patterns across tables suggest that integrated physiotherapy and ergonomic interventions yield clinically meaningful reductions in pain with moderate effect magnitudes, while improvements in work efficiency appear present but comparatively modest and more methodologically heterogeneous.

DISCUSSION

This systematic review without meta-analysis indicates that integrated physiotherapy and ergonomic interventions are consistently associated with reductions in musculoskeletal pain and improvements in functional capacity among working populations, particularly desk-based and high-risk occupational groups. Across controlled trials, approximately 83% demonstrated statistically significant pain reduction favoring integrated approaches, with moderate effect sizes (SMD −0.65 to −0.72) and mean pain reductions approaching 2 points on 10-point scales. Evidence for productivity and work ability outcomes was directionally positive in 80% of reporting studies, although effect magnitudes were smaller and more heterogeneous, and certainty of evidence was lower than for pain outcomes. Overall, the synthesis supports a clinically meaningful benefit of multicomponent workplace programs, while highlighting variability in measurement and methodological rigor across studies.

Interpretation of these findings must consider heterogeneity in intervention design, occupational setting, and outcome measurement. Interventions varied in intensity (from brief active breaks to comprehensive 6-month programs), delivery format (in-person, participatory, or remote), and degree of individualization. Studies incorporating both structured therapeutic exercise and individualized workstation modification tended to report more precise estimates and sustained improvements, suggesting additive or synergistic effects. However, variability in productivity metrics—ranging from self-reported work ability to objective absenteeism—limits direct comparability and precludes quantitative pooling. The risk-of-bias profile was generally acceptable, with 58% of controlled trials rated low risk

overall, yet performance bias due to lack of blinding and potential detection bias in self-reported outcomes were common. These methodological considerations underpin the moderate certainty assigned to pain outcomes and the low-to-moderate certainty for productivity endpoints.

The present findings are consistent with prior systematic reviews demonstrating beneficial effects of ergonomic adjustments on musculoskeletal discomfort (1,9) and of workplace-based exercise programs on neck and low back pain (2,6). However, earlier reviews largely examined ergonomic or exercise interventions in isolation. Emerging integrated models—such as participatory ergonomics combined with physiotherapy guidance (7), active break protocols with postural correction (4), and digitally supported remote ergonomic programs paired with corrective exercise (10)—appear to offer broader improvements across symptom and functional domains. These integrated strategies align with contemporary occupational health frameworks emphasizing multifactorial risk modification rather than single-component solutions. Landmark cluster RCTs targeting sitting reduction and postural variability have shown modest improvements in musculoskeletal symptoms and occupational behavior (18,19), and the present synthesis suggests that adding physiotherapy-based physical conditioning may amplify these benefits.

From a clinical and policy perspective, the magnitude of pain reduction observed—approaching moderate standardized effects—supports implementation of structured exercise programs embedded within ergonomic optimization, particularly in sedentary office environments. A mean reduction of approximately 2 points on a 10-point pain scale exceeds commonly accepted minimal clinically important differences for chronic musculoskeletal pain, indicating practical relevance. Reductions in absenteeism of approximately 1.6 days over six months, though derived from limited studies, suggest potential economic value when extrapolated across large workforces. Nevertheless, productivity gains appear modest and may depend on contextual factors such as organizational culture, supervisory support, and adherence to intervention protocols. Thus, employers should interpret productivity improvements as secondary benefits contingent upon effective implementation and sustained engagement.

Subgroup patterns imply that interventions of longer duration (≥12 weeks) and those incorporating active participation and behavior change components may produce more durable outcomes. Plausible mechanisms include reduction of biomechanical load through optimized workstation alignment, improved muscular endurance and motor control via therapeutic exercise, enhanced proprioceptive awareness through postural retraining, and behavioral reinforcement through scheduled active breaks. These components collectively address both external ergonomic stressors and internal physical capacity, consistent with a biopsychosocial model of occupational health. However, heterogeneity in occupational populations—ranging from office workers to dental practitioners—suggests that context-specific tailoring remains essential.

Several limitations of the evidence base warrant caution. First, follow-up durations were generally short to mid-term, limiting inference regarding long-term sustainability and prevention of chronic disability. Second, productivity outcomes were often self-reported and susceptible to reporting bias. Third, non-randomized designs contributed to potential confounding and selection bias, particularly in participatory ergonomic programs. Fourth, selective outcome reporting could not be fully excluded in studies lacking preregistration. Additionally, heterogeneity in intervention components complicates identification of the most effective “dose” or configuration of integration.

The review process itself also has limitations. The search was restricted to English-language publications from 2020 to 2025, potentially excluding relevant earlier or non-English studies. Grey literature searching was limited, and formal statistical assessment of publication bias was not feasible due to absence of pooled meta-analysis. Although dual screening and risk-of-bias assessment were performed, extraction and synthesis of heterogeneous outcome measures required narrative interpretation, which introduces subjective judgment. Finally, inclusion of diverse occupational settings may enhance generalizability but increases clinical heterogeneity.

Future research should prioritize adequately powered, multicenter randomized trials with standardized intervention protocols and clearly defined productivity metrics. Studies should incorporate objective measures such as absenteeism records, work output indices, or performance analytics alongside validated pain and disability scales. Longer follow-up periods (≥12 months) are necessary to evaluate sustainability and cost-effectiveness. Economic evaluations and implementation science frameworks would further inform scalability and policy adoption. Comparative trials examining integrated interventions versus single-component ergonomics or exercise alone would clarify additive effects and optimize resource allocation. Collectively, these steps will strengthen causal inference and enable more definitive recommendations regarding integrated physiotherapy–ergonomic strategies in occupational health.

CONCLUSION

This systematic review without meta-analysis indicates that integrated physiotherapy and ergonomic interventions are associated with consistent and clinically meaningful reductions in musculoskeletal pain and moderate improvements in functional capacity among working populations, particularly in sedentary and desk-based settings. The certainty of evidence for pain outcomes is moderate, supported by a majority of low-risk randomized trials demonstrating effect sizes in the moderate range, whereas evidence for productivity and absenteeism outcomes is low to moderate due to heterogeneity in measurement methods, reliance on self-reported metrics, and fewer objective evaluations. While directional findings across studies favor integrated, multicomponent approaches over single-component strategies, variability in intervention design and follow-up duration limits definitive conclusions regarding long-term sustainability and magnitude of work-efficiency gains. Clinically, the findings support implementation of structured exercise programs combined with individualized ergonomic optimization as part of comprehensive workplace health initiatives. Future research should prioritize standardized productivity outcomes, longer-term follow-up, and economic evaluations to clarify cost-effectiveness and optimize scalable implementation models

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DECLARATIONS

Ethical Approval: Ethical approval was by institutional review board of Respective Institute Pakistan

Informed Consent: Informed Consent was taken from participants.

Authors' Contributions:

Concept: NF; Design: NF, AK; Literature Search: NF, AK; Screening/Extraction: NF, AK; Analysis/Synthesis: NF, AK; Drafting: NF, AK, NS

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