

Evaluating the Impact of Ergonomic Assessment and Modification (EAM) on Work-related Musculoskeletal Disorders and Productivity in the Industry Sector

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Background and Rationale

Work-related musculoskeletal disorders (WMSDs) are one of the leading workplace health issues that account for 17% of the worldwide burden of disease. Industries is the backbone of any countries economy, employing more than millions of people, accounting for 80% of export earnings. Still, due to unsuitable working conditions, resulting in excessive sitting/standing, repetitive activities, and inappropriate work stations, musculoskeletal disorders have been identified in about 60% of the workers.

This study aims to identify the effectiveness of Ergonomic Assessment & Modification (EAM) & Workplace Physiotherapy, which will ultimately provide recommendations at the industrial level. Furthermore, it will examine the link between ergonomic workstations and the musculoskeletal status of the workforce based on NMQ and RULA analysis. Still industries lack ergonomic intervention, leaving occupational health concerns mostly acute care-based, ignoring the preventive aspects.

Research Aim

Evaluate the effectiveness of ergonomically modified workstations in reducing work-related musculoskeletal disorders among the study populations.

Research Objectives

1. Establish the prevalence and level of severity of pain and WMSDs among the population.
2. Implementation and documentation of ergonomic interventions, such as modifying workstations, employee training, and management support.
3. Evaluation of alteration in musculoskeletal pain, postural hazards, and WMSD prevalence after carrying out the intervention.

4. Analyze the cost-benefit and return on investment (ROI) of the ergonomic intervention

Methodology

Study Design

A quasi-experimental pre-post intervention study will be done.

Participants: Industry workers.

Sampling Technique: Simple random sampling technique has been chosen.

Sample Size: A total of xyz participants will be included, calculated using prevalence estimates of WMSDs (60%) with a 95% confidence interval and 5% margin of error.

Data Collection

- **Health outcomes:** Nordic Musculoskeletal Questionnaire (NMQ), Visual Analog Scale (VAS), Rapid Upper Limb Assessment (RULA).
- **Productivity outcomes:** Productivity Record Sheet, Workstation Ergonomic Checklist.
- **Cost-benefit:** self-made questioner.

Data Analysis

- Data will be analyzed using SPSS version 25.
- Chi-square test to compare prevalence of WMSDs between groups. Independent t-test or Mann-Whitney U test for comparing pain scores.
- Multivariate logistic regression to identify predictors of WMSDs (e.g., posture, working hours, workstation type) (p-value < 0.05 will be considered statistically significant)

Data Collection Tools

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Health Outcomes

- Nordic Musculoskeletal Questionnaire (NMQ)
- Visual Analog Scale (VAS)
- Rapid Upper Limb Assessment (RULA)

Productivity Outcomes:

- Factory production records (pieces/hour, line efficiency)

Economic Evaluation:

- Cost of intervention
- Productivity gains and reduced medical expenditure

Data Analysis

- Paired t-tests and ANOVA for pre-post comparisons
- Mixed-effects regression models for repeated measures
- Difference-in-differences analysis where control groups exist
- ROI and cost-benefit analysis

Expected Outcomes

- Reduction in prevalence of WMSD and severity of pain in the study population.
- Increased productivity based on increased output and decrease in work breaks
- Positive return on investment for factory management
- A scalable model of ergonomics intervention in the concern industry.

Significance of the Study

This study will yield concrete empirical validation of the link between ergonomics-based interventions and worker health and productivity in a developing country environment. This data will be informative to industry leaders and policymakers in improving worker health conditions within factories and contribute to improvements in worker rights in the RMG sector.