Study and Analysis of Postures and Ergonomic Design Tool to Minimize the Work-Related Musculoskeletal Disorder (WRMSD) of Construction Workers in The States of Maharashtra and West Bengal In India

ABSTRACT

The construction industry is both dynamic and hazardous, presenting unique challenges for the implementation of ergonomic practices on-site. As such, there are numerous factors to consider when it comes to controlling ergonomic risk factors in construction environments. Ergonomic controls aim to adapt the workplace to fit the worker, helping to position the body in a neutral posture while minimizing various ergonomic risks. To effectively improve ergonomics in the workplace and reduce potential risk factors, several approaches can be adopted. These include enhancing communication, implementing management controls, focusing on ergonomic design, providing training and education, and developing written ergonomics programs. These strategies must cater to a diverse range of personnel to ensure the safety and well-being of all workers.

An individual's efficiency and job performance are directly influenced by their working posture, overall health, and safety at the workplace. Therefore, identifying and assessing hazards and risk factors should be a high priority for effective control. Ergonomics on the other hand, refers to the practice of fitting the task to the individual rather than forcing the individual to adapt to the task. This approach fosters compatibility between human capabilities and the work system. Ergonomics involves designing jobs and workplaces that align with the needs of workers. It is essential to consider various factors when designing the workplace, including equipment, machinery, tools, products, environment, and overall systems. These factors must take into account human physical, physiological, biomechanical, and psychological capabilities to optimize effectiveness and productivity while ensuring the safety, health, and well-being of workers. The aim of human factors and ergonomics is to create a safe and productive workplace for individuals. It is also recognized that all forms of physical and mental stress can be associated with work and the work environment.

Work-related musculoskeletal disorders (WRMSDs) are prevalent in workplaces and construction sites. These disorders affect the muscles, nerves, tendons, ligaments, joints, and spinal cord due to awkward working postures. While automation and automated machines are available to reduce human intervention in various industries, manual work remains essential and plays a significant role. Additionally, the treatment for WRMSDs can be costly, making it

crucial to implement preventive measures before issues arise. Maintaining high work efficiency while minimizing physical strain helps ensure that workers stay healthy and maintain proper postures. Poor body alignment can lead to occupational injuries, muscular diseases, and imbalances in muscles and tissues. Therefore, systematic observation, assessment, and intervention can significantly reduce the risk of WRMSDs. Research indicates that lower back pain is the most common spinal issue, which can restrict individuals' movement.

This research work provides an overview of work-related musculoskeletal disorders (WRMSDs) in construction and related occupations. It explores the causes and contributing factors of WRMSDs, the role of ergonomics, the necessity for postural analysis, and various ergonomic assessment methods. Additionally, it includes a literature review of previous studies that employed different ergonomic assessment techniques. The research identifies existing gaps and outlines its objectives. Postural analyses were conducted on excavation workers, labourers involved in concreting work, rebar workers, and masons, focusing on traditional working techniques. The study presents the design of an iron pan for material handling in excavation, a collection and eviction table for transporting concreting work materials, a foldable multi-tasking workable platform for rebar operations, and a prototype design for a multi-tasking portable workbench suitable for masonry and other construction tasks, such as painting and electrical work.

The current research aims to assess the working postures of various construction workers in Maharashtra and West Bengal. It provides valuable information and guidance for researchers on the nature of construction work, the roles performed by different workers, their working environments, and identifies the most vulnerable occupations and postures, along with potential remedial solutions to improve worker safety and ergonomics.