



Ergonomic Risk Analysis of Sitting Posture During Work

¹Narendra Singh, ²Akarsh kumar Shrivastava, ³Juhi Verma

¹¹Assistant professor, ²¹Assistant professor, ³¹Assistant professor

¹MECHANICAL ENGINEERING DEPARTMENT

¹IIMT GROUP OF COLLEGE, Greater Noida, India

Abstract: This research aims to determine the ergonomic risks and the musculoskeletal disorders that are associated with the sitting posture of employees working continuously for six to eight hours in an office. The ergonomic risk is measured by analyzing the different postures attained by employees while sitting and working. The main tool that we have used for this purpose is REBA (Rapid Entire Body Assessment). A total of 20 employees were interviewed and questions were asked about the problems that they were facing while working in a chair. A questionnaire was prepared to collect data on their demographics, work history and musculoskeletal pain history. A REBA score of 6 to 7 considering the different postures of the workers signifies that there is a high risk of developing a musculoskeletal disorder if the height, orientations of the chair, and table are not right and further investigation would be needed. The analysis of the work-related musculoskeletal disorders (MSD) using the REBA shows that the employees are under threats of musculoskeletal disorders and there is a need to alter the working posture to prevent musculoskeletal disorders.

Index Terms - *Sitting posture, REBA method, Analysis, musculoskeletal disorders.*

I. INTRODUCTION

Ergonomic Assessments can also be referred to as workspace assessments that safeguard a worker's workplace is ergonomically designed or not. It minimizes the musculoskeletal disorders related to that particular work with the help of the ergonomic analysis tool Rapid Entire Body Assessment (REBA). The musculoskeletal disorders (MSDs) which are associated with work consist of conditions such as pain, inflammation, tingling, numbness, etc. that involve the tendons, muscles, nerves, cartilage, ligaments, and joints. Nowadays humans work in offices sitting in a chair continuously for more than two to three hours and a total of six hours approximately, and this may cause sleeping legs, fatigue, pain in the backbone, neck pain, etc. Thus, the objective of this paper is to analyze the ergonomic risks that employees encounter while sitting and working for several hours and to investigate the problems occurring due to this, and solutions to prevent any musculoskeletal disorder. We have analyzed different body parts like neck, arms, wrists in sitting posture for the evaluation of musculoskeletal disorders. We have chosen a very well-known ergonomic analysis tool namely Rapid Entire Body Assessment (REBA) and for analysis, we have taken the average height of the chair and table as 19, 30 inches respectively. The above method has been utilized extensively in the field of ergonomics for determining whether a particular posture or design is advantageous or disadvantageous ergonomically and based on the ergonomic evaluation of the REBA muscular-skeletal disorders, its severity and impact on human's health is determined.

II. REBA AND MSD

2.1 REBA

There are various tools available for analysis of different body posture and position. REBA is one of the body posture analysis tool. Its full form is rapid entire body assessment. In this method a well-structured procedure is followed to inspect the musculoskeletal disease associated with body posture and the dangerous factors related to explicit everyday movement at the work place. A worksheet is used in Rapid Entire Body Assessment in which different body postures are mentioned and according to posture, weightage is assigned in the sheet in terms of numerical values. Based on these values REBA score is calculated and by the help of the score we can inspect the kind of injuries i.e. the injury is minor or serious. We can choose body stances, and investigate other related factors like intense effort, weakness, and redundant development, and so forth.

2.2 MSD

MSD stands for Musculoskeletal disorder. It occurs due to different wounds that are caused due to unequal improvements which are rehashed normally after some time. Musculoskeletal Disorders generally happen to the tendons, ligaments, joints, muscles, nerves, shoulders, neck and arms, etc. Many business-related MSDs may occur after some time due to the delegates working condition or by the working posture itself. Musculoskeletal Disorders causes constant pain, fatigue, wretchedness etc. MSD in a general sense impact the back, neck, shoulders and upper members.

III. DIFFERENT TYPES OF MUSCULOSKELETAL DISORDERS

3.1 NERVE AND CIRCULATION DISORDER

At whatever point irritation or grinding causes expanding, conduits and nerves both can be pressed in this manner limit the surge of bloodstream to the muscles. This can realize a physical issue called thoracic outlet disorder. The indications of the issue are tormenting in the entire arm, briskness, numbness, and deficiency in the fingers, arm, and hand. Signs consolidate horrendous affectability, shuddering, chilliness, deadness, and whiteness in the fingers. It can impact one or two hands.

3.2 CARPAL TUNNEL SYNDROM

Tunnels are channels for nerves which are framed by some delicate tissues and ligaments. Harm to the delicate tissues can bring about swelling that packs the nerves that go through the passage. These nerves are the ulnar, medial and radial nerves that go through the passage in the wrist and forearm. Carpal passage disorder is the fiery disorder that is brought on because of dull anxiety, physical harm or whatever other condition that makes the tissue around the middle nerve expand. Torment suffered with carpal passage wounds can be exceptional, and individuals with this harm may encounter insensibility, shivering, and lost holding power.

3.2.1 HUMAN TASKS ASSOCIATED WITH MUSCULOSKELETAL DISORDERS

- lifting
- reaching
- carrying/transporting
- repetitive work
- head supported weight

3.3 Muscle and Tendon Disorders

The muscles, tendons and bones must healthy and function-ing properly for body to move. Muscles which contract to produce movement, are connected to the bones by the tendons.

Depleting a tendon can achieve change of its structure and due to repetitive movement of body structure may get change temporarily or permanently and this results in to lot of pain and MSD. Sometimes inflation in the tendon may occur and this phenomenon is known as tendinitis. It occurs in the shoulder muscles, lower arm. Tendinitis causes torment in wrist, muscles, and fingers.

IV. METHOD AND ANALYSIS

The regular stances which are to be thought of while structuring any item and keeping in mind that doing any examination that includes human collaboration is as per the following

- Standing
- Typing
- Sitting

In this paper, Entire Body Assessment (REBA) strategy is utilized for the examination of the ergonomic hazard factors and right now, the whole body is dissected including neck development, wrist development, arms and shoulder development, legs and so forth.

V. REBA ANALYSIS

REBA is an ergonomic planned tool that calculate load requirement of human body in different working position. It is a simple analysis in which a single worksheet is required to calculate different load requirement of human body in working position (Working in office at the system for many hours in same position and at the same place). Analysis of stress handling position is divided into two sections. First section include neck, trunk and leg analysis and other section include arm and wrist analysis. In RBEA different scores are entered for section first and second in a single worksheet. This comfort designed planned tool use an organized process to calculate whole-body postural MSD and risks associated with tasks.

The REBA was planned for easy use without any unconventional or expensive equipment. You only require a worksheet and a pencil. Using the REBA worksheet, a score will be assigned for each of the body regions such as wrists, forearms, elbows, shoulders, neck, trunk, back, legs and knees force, and repetitions. After the data for each region is collected, stored, and compiled the risk factor variables, generating a single score that represents the level of MSD risk using the Reba table..

5.1 REBA score, level of risk and necessary actions

Table 1

SCORE	LEVEL OF MSD RISK
1	Negligible risk, no action required
2-3	Low risk, change may be needed
4-7	Medium risk, further investigation, change soon
8-10	High risk, investigate and implement change
11+	Very high risk, implement change immediately

VI. RESULTS OF REBA ANALYSIS

The REBA score was computed by analyzing different postures of workers such as while writing, typing, working in a sitting posture which suggests that the ergonomic condition of the job is poor and should be changed. The final REBA score comes out approximately 6 or 7 which indicates that there are more likely chances of Musculoskeletal Disorder among the workers, and more investigation is required. The most commonly affected body regions were lower back (85%), neck (80%), shoulder (55%), upper back (80%), thigh (40%) and knee (90%).

VII. CONCLUSION

Before proposing modifications in the working posture and duration of continuous work of employees, a thorough investigation has been carried out using ergonomic evaluation techniques of REBA. The final score indicates that the employees have a high risk of developing a musculoskeletal disorder. In the current study, an attempt has been made to lower the associated ergonomic risks by suggesting improvements in the design of chair and table's height, sitting posture etc. and after questioning to the number of employees we got know that orientation of chair also matters. These changes may allow the driver to attain a comfortable and convenient posture while working. Secondly, taking some break from continuous working, or taking a walk for 2 to 3 minutes after every 40 to 50 minutes of continuous work would help in maintaining the proper blood circulation and to avoid any musculoskeletal disorder. There is tremendous scope for carrying out future research work in this field, the primary reason being the involvement of a large workforce who is extremely prone to an occupational hazard.

REFERENCES

- [1] Costa, A. R., Almeida, J., Figueiredo, J. P., & Ferreira, A. (2015). Ergonomic analysis—case study of passenger transport company. *Occupational Safety and Hygiene* volume III, 405-411.
- [2] Gangopadhyay, S., Dev, S., Das, T., Ghoshal, G., & Ara, T. (2012). An Ergonomics Study on the Prevalence of Musculoskeletal Disorders Among Indian Bus Conductors. *International Journal of Occupational Safety and Ergonomics*, 18(4), 521-530.
- [3] Hebbal, S. S., & Kumar, A. C. S. (2013). Ergonomic Risk Assessment using Postural Analysis Tools in a Bus Body Building Unit. *Industrial Engineering Letters*, 3(8), 10-20.
- [4] Singh N., Shrivastava A., Suryavanshi L., Ergonomic Risk Analysis of Auto Rickshaw Drivers Using RULA and REBA, *International Journal of Trend in Research and Development*, Volume 7(1), ISSN: 2394-9333