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Study of The Ergonomics of The Worker Using The Rapid Entire Body Assessment Technique on Agri-Machinery Industry

Dr. Nihal Anwar Siddiqui*[a], *Ajith George Chacko*[a]

[a]*University of Petroleum and Energy Studies, Dehradum, 248007, India*

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ABSTRACT

In India the common occupational problem among the workers are musculoskeletal disorders. Musculoskeletal disorders (MSDs) are injuries and disorders of the muscles, nerves, tendons, ligaments, joints, cartilage and spinal disks. The low back or lumber area, serves a number of important functions for the men in working area. Many occupational tasks in industrial area still associated with strenuous working postures and movement. Assessment of exposure levels to MSD risk factors can be an appropriate base for planning and implementing interventional ergonomics programs in the workplace. Combined with a heavy physical workload, it results in a high frequency of work-related musculoskeletal disorders. The present study was aimed to evaluate the musculoskeletal disorder (MSD) of workers engaged in an Agri-machinery industry. Study was conducted on 10 workers of an assembly unit using the posture analysis tool REBA Technique. The Study recommended the awareness and proper ergonomics training to the workers and essential workplace changes.

1. Introduction

Work-related musculoskeletal disorders (WMSDs) constitute an important occupational problem for both developed and developing countries, with rising costs of wage compensation and medical expenses, reduced productivity, and lower quality of life. WMSDs are caused by multi-factorial interactions of various risk factors, which can be classified into three main groups: individual, psychosocial, and physical. Among the physical workload, body posture, repetitive and forceful activities, static muscle load, mechanical stress, vibration, and cold are known to be the most prevalent.

WMSDs are major problem in almost all countries and are important causes of work incapacity and loss of workdays. Several researchers have pointed out that poor working postures contribute to musculoskeletal problems in industry.

Research techniques that have been proposed for quantifying the amount of discomfort and postural stress caused by different body postures can be divided into observational and instrument based techniques. In the observational technique, the angular deviation of a body segment from the neutral position is obtained using visual perception. In the instrument-based techniques, continuous recordings of a body posture are taken through a device attached to a person. Because of non-interference with job processes, low cost, and use ease, the observational techniques are more widely used in industry.

* *Corresponding author.* Tel.: +91-9895720939.
E-mail address: ajithgeorgechacko@gmail.com
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Musculoskeletal disorders (MSDs) are common health problem throughout the world. Work related musculoskeletal disorders are group of painful disorders of muscles, tendons and nerves, recommended the awareness and proper ergonomics training to the workers. A significant proportion of the works are working in very bad postures. The study recommends that there is need of implementation of ergonomics intervention with proper awareness among worker.

2. Rapid Entire Body Assessment (REBA)

The REBA technique (Rapid Entire Body Assessment) is a postural analysis system sensitive to musculoskeletal risks in a variety of tasks, especially for assessment of working postures found in health care and other service industries. The posture classification system, which includes the upper arms, lower arms, wrist, trunk, neck, and legs, is based on body part diagrams. The method reflects the extent of external load/forces exerted, muscle activity caused by static, dynamic, rapid changing or unstable postures, and the coupling effect. This technique provides five action levels for evaluating the level of corrective actions:

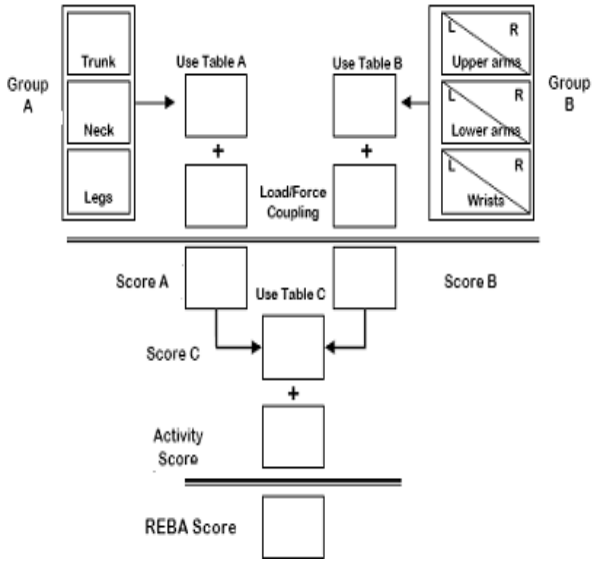
- Action level 0: corrective action including further assessment is not necessary;
- Action level 1: corrective action including further assessment may be necessary;
- Action level 2: corrective action including further assessment is necessary;
- Action level 3: corrective action including further assessment is necessary soon;
- Action level 4: corrective action including further assessment is necessary now.

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

3. Methodology

REBA method:

The REBA method was developed in 2000 and distributed in many countries. It is designed to assess the risk exposure associated with MSD's based on the posture of the operator at work. The method comprehensively considers the issue based on the observation of techniques used in performing the work activities. It takes into account the body postures taken by the employee during physical work, distinguishing the following segments: trunk, neck, legs, upper arms, lower arms and wrists. Also included are load/force required, hand-object coupling used and an activity score (static postures held repetition, large rapid changes in postures, or unstable base). The basis of the assessment of the degree of exposure is the aggregate position of the body and the rest of the REBA score gives scores divided by body group; score A is established by Neck, Trunk and Leg Analysis, score B is established by Arm and Wrist Analysis, score C is given by score A and score B combined and the final score is then created from score C with adjustment according to Figure 1.



Source: Hignett I McAtamney 2000.

Figure 1: Reba Score System.

Based on the resulting final score, the risk of exposure to MSD's, Categories (C) required for the improvement of working conditions on the assessed position can be classified. The authors singled out the following action categories:

- C 0: negligible exposure, corrective actions are not required;
- C 1: low exposure levels, corrective action may be required;
- C 2: medium level of exposure, corrective actions are required;

- C 3: high level of exposure, corrective action required soon;
- C 4: very high exposure levels, corrective action required immediately.

Assessment system:

The study was conducted in a lift assembly section in an Agri-Machinery Plant located in India. The assembly was divided into several stages and the analysis was done on workers in each stage. Both the left and the right upper limbs were taken for the study. The final value was considered according to the greatest value obtained from both sides. The video clips as well as the snaps of the postures were taken at the time of analysis

The work takes place in a standing position, from Monday to Saturday in three shifts of 8 hours working time.

4. Results & Discussion

No	REBA Score							Category
	A	B		C		F		
		L	R	L	R	L	R	
1	8	6	5	10	10	11	11	C4
2	6	7	6	9	8	9	8	C3
3	7	8	4	10	8	10	8	C3
4	6	6	7	8	9	8	9	C3
5	4	3	2	4	4	4	4	C2
6	10	8	9	12	12	14	14	C4
7	4	6	7	6	7	6	7	C2
8	8	4	5	9	10	10	11	C4
9	7	4	4	8	8	9	9	C4
10	4	4	3	4	4	4	4	C2

Table 2

- No 1- Lift Assembly stage 1 Washing Machine
- No 2- Lift Assembly stage 2
- No 3- Lift Assembly stage 3
- No 4- Lift Assembly stage 4
- No 5 -Lift Assembly stage 5
- No 6- Axile Assembly stage 8
- No 7- Test Rig
- No 8- Four Wheel Drive Assembly
- No 9- Axile Assembly Stage 3
- No 10- Seal Fitment

- A-Score A
- B-Score B
- C-Score C
- F-Final REBA Score
- L-Left Upper Limb
- R-Right Upper Limb

The study showed that 40% of the working postures had very high exposure levels.30% had high level of exposure and 30 % had medium level of exposure. None of the postures were coming under the acceptable criteria.

Trunk - significantly inclined, and in addition sometimes twisted to the side during all tasks performed by the employees for the majority of working time.

Lower limbs - associated with standing work on the assessed positions.

Arms - raised above 45° for a substantial proportion of working time - caused by the necessity of continuous lifting, carrying and depositing of assembly parts.

Forearms - as in the case of the arms, the employee spends most of the working time performing tasks involving very heavy use of the upper limbs.

Wrists - though usually not too strongly bent, a majority of the work forces the worker to twist them.

5. Conclusion

An important element in production systems, in addition to the physical components, is the human factor that affects performance, cost and quality. Improving the production system can not only cover the technical sphere, but also the realm associated with the environment and ergonomics. The aim of this study was to assess the level of exposure to MSD's in the process of order fulfilment using the REBA method.

Of all the respondents assessed, the following action categories were assigned:

C 2 - three activities,

C 3 - three activities,

C 4 - four activities.

The main factors affecting the risk of a negative assessments of posture were:

- Keeping the back bent and twisted;
- Maintaining a significant deviation of the arms from the body;

- working in a standing position;
- The weight of the parts handled.

Work at the assessed positions is associated with a Significant risk of MSD's, therefore corrective actions should be carried out soon.

Ergonomic intervention should be related to:

- Reorganization of workstations,
- Redesign of working methods.

After making changes on the assessed position, revaluation with the REBA method is recommended to verify the effectiveness of the changes.

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