



REBA Technique on Small Scale Casting Industry

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ABSTRACT: The common occupational problem of the workers is musculoskeletal disorders in India. Work related musculoskeletal disorders are group of painful disorders of muscles, tendons and nerves. 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 Small scale casting industries. Study was conducted on 55 workers of a casting industry using the posture analysis tool REBA Method. A video showing the different activities of the workers was shot and the snapshots were taken from it for the analysis. The results of REBA showed that about 28 % of the workers were under very high risk levels and required immediate change. About 51.5 % of the workers were at high risk levels which required changes soon and 20.5 % of the workers were at medium risk levels. The present Study recommended the awareness and proper ergonomics training to the workers.

Keywords: Musculoskeletal disorders, Posture analysis, casting industry, REBA.

I. INTRODUCTION

There has been an increasing effort in recent years to investigate the causes of musculoskeletal disorders (MSDs) and to take action to prevent them. This has led to increasing recognition from workers, employers and government agencies that a strong relationship exists between factors within the working environment and the development of MSDs, and that these conditions result in significant sickness absence and reduced productivity. Musculoskeletal Disorders (MSD) are injuries affecting muscles, tendons, ligaments and nerves. They are sometimes called Repetitive Strain Injuries (RSI), Cumulative Trauma Disorders (CTD) and Repetitive Motion Injuries (RMI). MSD develop due to the effects of repetitive, forceful or awkward movements on injuries include Low Back Strain, Neck Strain, Tendonitis, Carpal Tunnel Syndrome (CTS) Rotator Cuff Joints, ligaments and other soft tissues. The objective of this study is to analyse the working postures of workers engaged in various processes of small scale casting industry. The study used assessment tool REBA (Rapid entire body Assessment), was developed by Higné, and McAtamney (2000), to provide a quick and easy observational postural analysis tool for whole body activities (static and dynamic giving musculoskeletal risk action level [1]. Saraji *et al.* (2004) were evaluation of WMSDs risk factors among the crew of the Iranian Ports and shipping organization's vessels. This paper clarify the

WMSDs are major problem in almost all countries and are important causes of work incapacity and loss of work days. The aim of their studies is evaluation of WMSDs symptoms among the workers by using Nordic Musculoskeletal Questionnaire (NMQ) and determination of WMSDs risk factors by application of OWAS. After determination of risk factors, the OWAS methods can be used to identify any possible correction in working posture that leads to a better and less harmful posture [2]. Cleaning is associated with high physical and psychosocial workloads and musculoskeletal disorders related to it were studied. A few studies concern equipment design, working environments and factors affecting individual workers. A need to conduct research on cleaning tools and equipment, working environments and individual risk factors is apparent [3]. The study used assessment tool RULA (Rapid Upper Limb Assessment), REBA was developed by McAtamney and Corlett to provide a rapid objective measure of musculoskeletal risk caused by mainly sedentary tasks where upper body demands were high; where work related upper limb disorders are reported [4]. The relationship between the subjective ride comfort in a vehicle seat and whole-body vibration can be modeled using frequency weightings and rms averaging. From the results obtained in this study, it was clear that the alternative approach could give superior predictions of comfort than the method used in ISO 2631-1 [5].

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 [6]. A significant proportion of the works are working in very bad postures. The study recommended proposed that there is dire need of implementation of ergonomics intervention with proper awareness among worker [7].

II. MATERIAL AND METDHODS

The study was done in small scale casting industry in Jalandhar Region. A video of different sections like Pouring , Mould making , Furnace loading and grinding etc. showing different movements of the workers during an activity was recorded. Snapshots of 55 workers working in different sections were

obtained. The snapshots were analyzed to fill the scores in REBA.

III. REBA METHOD

REBA Method is a quick and easy to use observational postural analysis tool for whole body activities and giving a musculoskeletal risk action level. The method is similar to RULA tool where the assessor assigns scores to postures and body alignment based on body part diagram. Load, Force and coupling scores are added to calculation for the body and then final score for both groups are summated to form the final action score. The REBA method evaluate the ergonomics risk factor by observation the posture of employees while they working at their workstation directly (Hignet and McAtamney 2000). Postural and biomechanical loading was assessed on the entire body by valid REBA method.

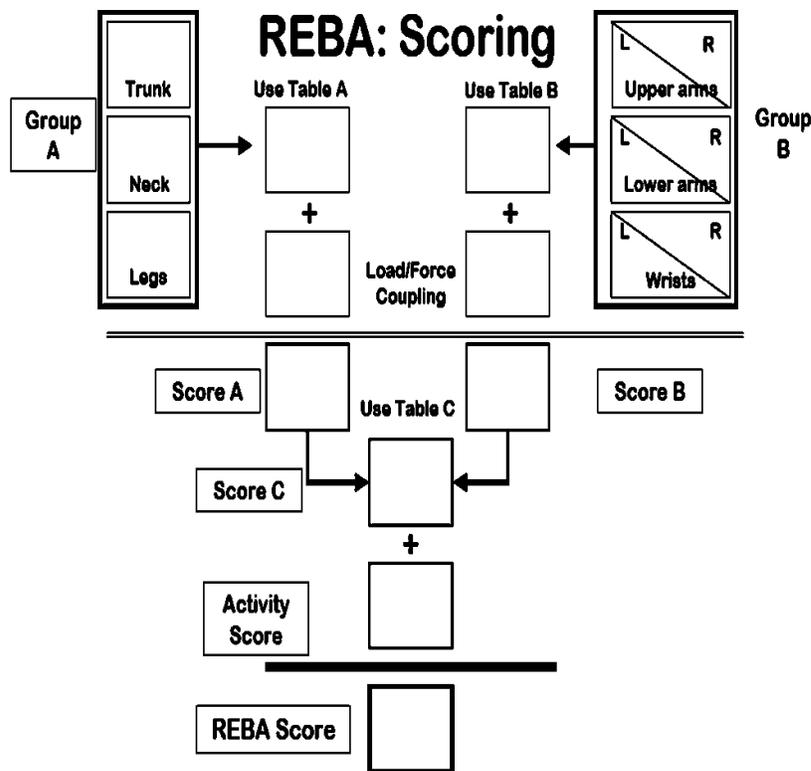


Table 1. Analysis of REBA.

REBA SCORE	Risk level	ACTION LEVEL
1	Negligible	Corrective action including further assessment is not necessary
2 to 3	Low	Corrective action including further assessment may be necessary
4 to 7	Medium	Corrective action including further assessment is necessary
8 to 10	High	Corrective action including further assessment is necessary soon
11 to 15	Very high	Corrective action including further assessment is necessary now

We used several score in this method with the help of REBA score sheet, that the scores evaluate the posture of different body parts Neck, Trunk and Legs give posture score A with the help of standard Table and Upper Arm, Lower Arm, Wrist, and Wrist twist give the posture score B with the help of standard Table. The loading or coupling scores were added to posture scores A and posture score B to obtain scores A and B, respectively (McAtamney and Corlett 1993). Combination of scores A and score B give the Grand score with the use of standard Table and table score C is obtained. After this the activity score is added in the table score C the final REBA score is obtained. The range of Grand scores varies from 1 to 11 and reflects the musculoskeletal loading associated with the worker's posture. Whereas low scores of 1 indicate that the work posture is acceptable if not maintained or

repeated for long time (action level 1), For low score of 2 to 3, further investigation is needed and changes may be necessary (action level 2). Investigation and changes are required for scores of 4 to 7 (action level 3). Further investigation and changes are required soon for score of 8 to 10 (action level 4). Further investigation and the changes required immediately for the score of 11 and onward. REBA action level is shown in Table 1. REBA score 1 show the negligible risk level, REBA score 2 to 3 shows the low level risk, REBA score 4 to 7 shows the medium level risk, REBA score 8 to 10 shows the high level risk. REAB score 11 to 12 shows very high level risk. Figure 2 to 5 shows the work of worker at different processes in awkward posture like Pouring, mould making, furnace loading, and grinding process.



Odd posture in Pouring



Odd posture in mould making



Odd posture in furnace loading



Odd posture in grinding

IV. RESULTS

The results of the REBA assessment of the Workers are shown in Table 2, 3. According to this technique of posture analysis 20.5 % of workers are working in medium Risk Level Posture requires further assessment and change necessary. About 51.5 % workers were found be at high risk level and require further assessment and change necessary soon. Around 28 % workers are working in posture of very high risk level

and require further assessment and change now. These results reveal that all categories of the risk levels exist in jobs postures from left to right positions. In First category Pouring as shown in a table 7.9 % of this category is of medium level risk in which investigation is required and changes are necessary 24.6 % of this category is calculated to be as high level risk and rest 67.3 % is of very high level risk.

Investigations are to be done immediately and changes are needed as soon as possible. Next category in the Table 2 is of Mould making 27% of this category is of medium level risk in which investigation is required and changes are necessary, 70.5 % of this category is calculated to be as high level risk, take necessary action soon and rest 2.5 % is of very high level risk, Investigations are to be done immediately and changes are needed now. Next category is Furnace loading 30% of this category is of medium risk level in which investigation is required and changes necessary, 46 % of this category is calculated to be as high level risk, take necessary action soon and rest 24 % is of very high level risk, Investigations are to be done immediately and changes are needed now. last category is Grinding 16.6% of this category is of medium level risk in which investigation is required and changes are

necessary, 66.6% of this category is calculated to be as high level risk , take necessary action soon, rest 16.6 % is of very high level risk. Investigations are to be done immediately and changes are needed now. As mentioned in the above processes examinations are to be made to check whether the methods can be improved to reduce the load on the worker and he could perform his duties with-full-efforts. As mentioned in the above processes examinations are to be made to check whether the methods can be improved to reduce the load on the worker and he could perform his duties with full efforts. Table-2 shows the No. of posture with REBA score in each section and. No. of posture left hand and right hand with percentage and risk level shown in Table 3.

Table 2: Number of posture with REBA score in each section and Abbreviations are L = Left, R = Right & T = Total.

Process	Reba score														
	1			2 to 3			4 to 7			8 to 10			11 to 15		
	L	R	T	L	R	T	L	R	T	L	R	T	L	R	T
Pouring	0	0	0	0	0	0	5	6	11	18	16	34	46	47	93
Mould Making	0	0	0	0	0	0	27	27	54	72	69	141	1	4	5
Furnace Loading	0	0	0	0	0	0	8	7	15	11	12	23	6	6	12
Grinding	0	0	0	0	0	0	1	1	2	4	4	8	1	1	2
Total	0	0	0	0	0	0	41	41	82	105	101	206	54	58	112

Table 3.

Reba score	Risk level	No. of worker's posture		% age of workers posture	
		Left	Right	Left	Right
1	Negligible	0	0	0	0
2 to 3	Low level	0	0	0	0
4 to 7	Medium level	41	41	20.5	20.5
8 to 10	High Level	105	101	52.5	50.5
11 to 13	Very high level	54	58	27	29
	Total	200	200		

V. DISCUSSIONS

After visiting various small scale industries, it was observed that in the small scale industries the ergonomics is hardly given preferences and the space provided to the workers is not appropriate. Workers are performing the operations under great difficulties and bear stress on their bodies. This is due to several reasons as justified by the photographs taken of the workers performing the operations.

By using REBA method, it was observed that in every category of processes taken into consideration, each

worker is under muscular stress. This has been shown by the percentage calculated from the REBA Score Sheet which is based on the posture analysis of photographs of the worker taken from different small scale industries.

It is mandatory to make some urgent improvement in the industries for the betterment of the workers to perform their operations/tasks with minimum load and stress on their bodies. During the calculations of the postures, it was observed that the workers are subjected to different muscular disorders while performing different tasks. In the Pouring operations the worker has to lift the heavy loads and to hold them for certain time while operation is to be performed. As in the Mould making, furnace loading and grinding operation, the worker has to bend and the stress is observed on the back and neck. Hence the necessary and requisite improvement should be done in every operation. The owners of the industries must concentrate on the ergonomics to increase the productivity of the worker and to get the best results.

VI. CONCLUSION

Methods of postural analysis closely co-relate with the awkward postures adopted by the male workers. According to REBA Method the postures adopted by workers in these small scale casting industries have been categorized as having high to very high risk level. Pouring, mould making, furnace loading and grinding workers are at very high risk of musculoskeletal disorders hence the ergonomically interventions are required in these sections. Proper training of workers and awareness may reduce the risk of musculoskeletal disorders. The results show that the operators are working in an inadequate working environment with

awkward postures the results are supported by the subjective assessment of discomfort.

REFERENCES

- [1]. Patrick G.Dempsey (2003). A survey of lifting and lowering tasks. *International journal of industrial ergonomics*; vol. **31**, pp.11-16.
- [2]. Peregrinspielholz (2006). Calibrating Borg scale rating of hand force exertion. *Applied ergonomics*; vol. **37**, pp.615-618.
- [3]. Joann Kennedy Randoh (2000). A comparison of flexion and extension exercises for developing cumulative trauma disease.
- [4]. Fernanda Diniz de sa (2006). Comparison of methods RULA and REBA for evaluation of postural stress in odontological services. *Third international conference on production research Americas' region (ICPR-AM06)*.
- [5]. Alex Burdof, Marcel Van Riel (1996). Design of strategies to assess lumbar posture during work. *International journal of industrial ergonomics*; vol.**18**, pp. 239-249.
- [6]. Vincent M.Ciriello, Stover H. Snook, LobatHashemi, John Cotnam(1999). Distribution of manual material handling task parameters. *International journal of industrial ergonomics*, vol. **24**, pp. 379-389.
- [7]. Tycho K.Fredericks, Anil R.Kumar, Sadat Karim (2008). An ergonomic evaluation of manual metal pouring operation. *International journal of industrial ergonomics*, vol. **38**, pp.182-192.