

ORIGINAL ARTICLE

A CASE STUDY ON MANUAL HANDLING AT AN ELECTRONIC COMPONENT MANUFACTURING COMPANY

Deros BM¹, Daruis DDI², Ghani JA¹, Saleh C³, Wazir RM¹, Yasim MK¹, Hassan NH¹, Wazir MFM¹, Saidin MS¹, Noridan WNAW¹, Saidi MS¹

¹Department Dept. of Mechanical & Materials Engineering, Faculty of Engineering and Built Environment, UKM, 43600 UKM Bangi, Selangor, MALAYSIA

²Dept. of Mechanical Engineering, Faculty of Engineering, UPM, KemPerdana Sg. Besi, 57000 Kuala Lumpur, MALAYSIA

³Department of Industrial Engineering, Faculty of Technology, Islamic University of Indonesia, Yogyakarta - 55501, INDONESIA

ABSTRACT

This An Ergonomic hazard often exists in any industry. However, majority of the employees are not aware of practicing good body posture until the MSDs symptoms become permanent and chronic. The main objective of this study is to determine the manual handling problems among workers at an electronic component manufacturing company. The scope of this study focused on the study entire body disorders among workers on electronic manufacturing company using the Rapid Entire Body Assessment (REBA). A cross sectional study involving observation of the workplace, the work task and the working environment, photographs and videos taken during the observation. Later, a survey questionnaire was given to the respondents to obtain their socio-demography information, work activity and health problems. Rapid Entire Body Assessment (REBA) was conducted on all respondents to determined REBA scores in different work positions. The study was conducted at an electronic component manufacturing company located in Klang Valley, Selangor. A total of 124 workers were surveyed and REBA assessment was performed on 20 workers at Company X production area. It includes 5 categories of position at Company X, such as: loading steel bar into casing; pushing the steel bar, turning movement while adjusting the steel bar, adjusting steel bar into the loading area, unloading steel bar from casing into the machine. The study found that turning section has the highest MSDs problems regarding manual handling because majority of the respondents in the turning department felt the pain while performing their work. This is due to their job demand, which they need to handle with tools weighing from 200 to 400 kg. The REBA scores showed that 17 out of 20 respondents performing turning operations, moving and pushing the steel bar recorded the highest score of 11 or more which are categorize in the very high risk group. The position of pushing and turning steel bar while moving the steel bar has higher risk that contributed to the ergonomics risk factor, which in-turn can contribute to Muscular Skeletal Disorders (MSDs). More detailed investigation and remedial measures should be taken immediately, especially for the workers performing the manual handlings activities.

Keywords: Manual handling, employee, REBA, MSDs, ergonomic, hazard, health

INTRODUCTION

Currently, in a growing modernization technology world, it was realized that technology and innovation are very important in real life situations. However, it becomes difficult to observed essential features, especially in development of pathologies and injuries associated with manual handling. In reality, not all the cases of manual handling had been reported, there are only approximate values. Musculoskeletal Disorders (MSDs) have consistently remained the most commonly reported type of work related ill-health in Britain according to National Surveys of work related illness¹.

Manual handling can be defined as any activity requiring the use of force exerted by a person to lift, lower, push, pull, carry, move, hold or restrain a person, animal, or objects². If these tasks were not carried out safely, there are lot of risks and injuries can arise from these activities. There are research shows a significant

linkage between musculoskeletal injuries and manual handling with the primary area of physiological and biochemical concern being lower back, particularly the discs of the lumbar spine.

Manual handling is any activity that involves transporting or supporting of a load by one or more worker, which includes the following activities: lifting, holding, putting down, pushing, pulling, carrying or moving of a load. Company X employees have been complaining about back pain with respect with manual handling tasks performed at production area which involves transferring of a steel bar into the machine. Based on the complained, company X safety and health officer had analysed and evaluated the situation using an Rapid Entire Body Assessment (REBA) observational method and had make recommendations and actions to solve the problem.

REBA is an observational tool that can be used to analyze working posture. It divides the body into segments to be coded individually with reference to movements' planes. It provides a scoring system for muscle activity caused by static, dynamic, rapid changing or unstable posture³. Selection of the postures are based by three main factors; the most difficult posture and work task, the posture sustained for the longest period of time and the posture where the highest force loads occurs. Training for safe lifting of materials, proper work-rest schedule, modifications of some working procedures and the use of ergonomically designed equipment may certainly reduce the work-related musculoskeletal disorders and improve the health status of laborers working in industrial and service sectors. This study has three main objectives, they are: to identify problems regarding manual handling activity; to measure the severity of transferring steel bar activity using REBA method; and to evaluate the risk of transferring steel bar activity.

METHODS

Based on workers' complaints of back pain as a result of performing manual handling activities, a cross sectional study on manual handling was carried out at Company X located in the Klang Valley. This study focused on manual handling activities among workers in the company. Survey questionnaire was distributed to all 124 workers in the production department (i.e. 42 workers turning section; 48 workers from assembly section; 20 workers from grinding section; 14 workers from heat treatment section). Meanwhile, 20 of the production department workers with MSDs complaints took part in the Rapid Entire Body Assessment (REBA).

RESULTS AND ANALYSES

Survey Results

The survey results showed 41.3% of workers from turning section; 21.4% workers from assembly section and 14% workers from grinding experience pain while doing their work. None of respondents from heat treatment section have felt pain while doing their work. In terms of the weight of the tool: 82.6% from turning section; 2% from grinding section and 7.1% from heat treatment handled tools weight ranging from 201 - 400 kg. With respect to pain on the body parts: 78.9% of workers in turning section have experienced pain at their body parts, 15.8% at foot and 5.3% has hand pain. For grinding section 85.7% have pain on the body parts and 14.3% on the hands. Meanwhile, 100% of workers in assembly section have pain on the body part and none of them has pain on the foot and hand.

Rapid Entire Body Assessment (REBA) Results

These assessments were done on 20 workers performing steel bar transferring activities from the store to the machines in the production lines and have been divided into five different positions. Raw data result from REBA assessments are shown in Table 1 and Figure 1.

Table 1 - REBA score results

W	Positions & REBA Scores				
	1	2	3	4	5
N1	10	13	12	10	10
N2	9	12	12	9	10
N3	8	9	13	10	9
N4	10	8	9	10	9
N5	10	12	10	12	10
N6	9	12	12	13	8
N7	10	12	12	9	8
N8	11	10	13	10	8
N9	9	13	12	9	11
N10	9	9	10	8	10
N11	11	12	13	10	8
N12	9	12	12	11	9
N13	10	11	13	11	9
N14	10	12	12	12	10
N15	10	9	12	10	11
N16	9	9	10	12	10
N17	10	12	11	12	11
N18	11	13	12	10	12
N19	9	12	12	10	11
N20	10	12	9	12	11

Abbreviations: W = workers

Workers positions are depicted in Figure 2. From Table 1, REBA result has shown for position 1 (load steel bar into casing) scoring ranging from 8-11. For position 2, push steel bar, the scoring result range from 8-13. Position 3 which is turns while steel bar movement, result score from 9-13. Adjust steel bar to loading area which is position 4, score of the result ranging from 8-13. While for position 5, unload steel bar from casing into machine, the score range from 8-12.

The result in Table 1 shows that for position 1, 17 workers fall in the high risk score while three workers get score under very high risk. For position 2, six workers get score of high risk value and 14 workers falls under very high risk

score value. Position 3 shows that five workers get high risk score while 15 workers fall under very high risk score. For position 4, 12 workers has been in high risk score value and eight workers get

very high risk score value. While for position 5, 14 workers falls under high risk score and 6 workers has get scoring on very high risk score value.

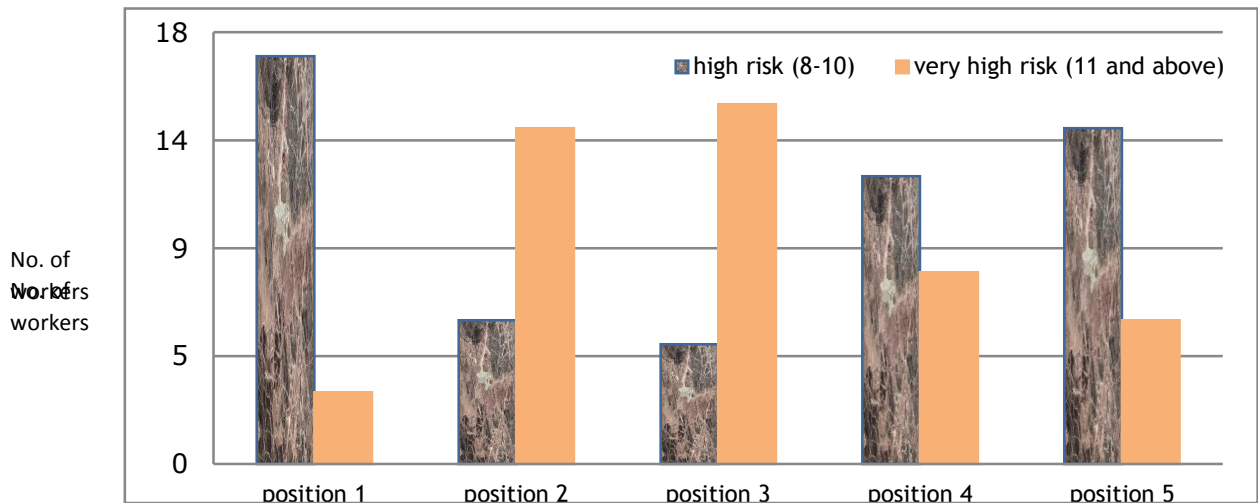


Figure 1- REBA scoring



Figure 2 Workers task positions

DISCUSSIONS

One hundred and twenty four survey questionnaires were distributed to all sections in production department which consists of turning, heat treatment, grinding and assembly. The survey questionnaire result is important for the purpose of identifying which section is facing the critical problem regarding manual handling issue. Based on the survey results, turning section has the highest critical problem regarding manual handling because high majority of the respondents in turning section felt the pain during doing their work. This is due to their job demand, which require them to handle heavy tools weighing from 201 - 400 kg. Employees work with manual handling of heavy tools considerable risk to health⁴. Based on the survey result, Rapid Entire Body Assessment (REBA) has been focused to the workers in the turning section.

In the REBA method, the result of scoring are divided into five categories which are from negligible risk till very high risk. For the negligible risk, the score is one. For scores between two and three, the risk falls under low risk category, which suggests change may be needed. Meanwhile, scoring rating from four to seven are categorized under medium risk that need further investigation and necessary changing method of work. While scores from eight to 10 are classified as high risk activity, whereby management need to carry out investigation and implement the new method to reduce the risk. For very high risk category the scores are from 11 to 15. In this case, the management need to carry out investigation immediately, changing and implement new method instantly³.

Based on the REBA assessment results carried out at turning section shows majority of the workers in the position 2 and 3 falls under very high risk scores followed by position number 5, 4 and 1. This is because the activities in position 2 and 3 needs the workers to flex and move their trunks, also perform bending and twisting of their body for transferring the steel bar. Moreover, they need to push the heavy load of the steel bar manually and their posture during the activity consider in awkward posture. Job demand involving repetitive trunk bending and carrying heavy load pose high risk factor for Low Back Pain (LBP)⁵. Besides that, pushing and pulling activities and its association to the risk of MSDs are well documented⁶.

From the REBA result, it can be seen that all the activities at turning section are high risk. Starting from loading the steel bar into the casing, pushing the steel bar, turning while moving the steel bar, adjusting steel bar to loading area until unload steel bar from casing into machine. This showed that the pain they felt are due to their work activity which involved manual handling of heavy

load, pushing, pulling and repetitive of work activity for long working hours (i.e. 12 hours). Heavy lifting, excessive repetition motions and awkward posture are known to be ergonomic risk factors that contribute to the work-related musculoskeletal disorders⁷.

RECOMMENDATIONS

In order to reduce risk for Company X workers, some control measure has to be implemented immediately. Refer to Figure 3, the hierarchy of control from elimination of hazard, substitute, apply engineering control, apply administrative control and use personal protective equipment (PPE) suitable step to implement is Engineering control, Administrative control and use of PPE. Engineering control can be implemented by using manual handling equipment for transferring steel bars at Company X. Today, manual handling equipment can be bought from suppliers, such as stainless steel pallet truck to lift heavy load (Figure 4). Its small make it easy to operate and to go through between the machines. It also needs minimum maintenance and no oil leakage. Load capacity from 500kg to 3500kg. This truck only requires minimum pulling power and operates silently.



Figure 3



Figure 4

In addition, manual handling workers can use manual triplex scissor equipped with a hydraulic system (Figure 5), which can perform lifting very easy. It also is very compact and manoeuvrable. The equipment operated with AC hydraulic or battery powered DC hydraulic. This equipment can be operated by 1 or 2 person.



Figure 5

Other than that, it is also advisable to use thick glove. Current practices the worker grip the box full with steel bar by bare hand, therefore it is strongly recommended to use thick glove (Figure 6). The pressure at the wrist can be reduced by using this personnel protective equipment (PPE).

It is also very practical to practice job rotation. Company X workers involved needs to practice job rotation in order reduced risk in transfer steel bar. Scheduling with difference person can distribute the workload to others and avoid concentrated to only same people.

It is also suggested that employer provides appropriate training, such as specific lifting technique (skill improvement), biomechanics training, awareness of and self-responsibility for back injury, thereby changing attitudes and body training need to be provided to the workers. Body training involves physical fitness to improve the muscle via physical activities in order to reduce injury susceptibilities. Effectiveness of training can be compared by medical record before and after training. Proper technique is important because the job can cause health disease such as back pain or slip disc. The effect can last for entire life.

If job rotation is impossible, frequent rest breaks need to be provided to the workers. Frequent rest does not include lunch hour and will lower the risk getting health problem.

Finally, is to design appropriate load size. Current load is about 363 kg per box. The load can be reduced by using smaller box size.

CONCLUSION

Entire body disorder or muscle pain has relationship with work activity done by worker in electronic industry especially for manual handling workers at Company X. All workers that are exposed to ergonomic risks have a very high chance to faced entire body disorders or muscles pain which has been tested in different position for transferring the steel bar. In this study, REBA tool was used to evaluate the risk for body postures while working. In addition a survey a questionnaire has provide support to give more evidence in identifying which activity and position contribute to muscle pain or entire body disorders. The most critical activity has REBA score of 13, 17 of the workers turn their bodies while moving the steel bars, followed by activity of pushing the steel bar with REBA score 12. Both these activities were done using wrong positions and angles. The risk evaluation showed that transferring steel bar activity has a strong relationship with high value of REBA score. In addition, body postures while working can also contribute to muscle pain or entire body disorders.

Figure 6

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