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Impact of Posture on Health Status of Welders in Different MSME in West Bengal

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Abstract

Manufacturing industries play a big role in development of a nation. There is always a need of human involvement to successfully plan and execute the operations involved in various industrial tasks. Welding is the most significant part to produce products in manufacturing sector. In welding industries the body postures of the welders are not scientific. Prolonged duty hours exceed the capacity of the workers causes' uneasiness, elevated risk of chronic pain, swelling, strain, sprain of ligaments and soft tissues. Musculoskeletal disorders (MSD) in the form of repetitive motion injuries, cumulative trauma disorders and strain injuries are very common health problems of workers of different small & medium scale welding industries in West Bengal. In this present research work brings the information and also observed MSD of welders by ergonomic posture analysis tools like RULA & REBA. The results show that welders are in the protected or safe region or not. It is also clearly shows that lack of ergonomic planning and system might result in muscular stress & muscular disorders which affects the health status of welders in different welding industries in West Bengal. This paper suggests that to improve the quality of work and health status of the workers significant reduction of the MSD and body posture are required. Consciousness is also a significant issue.

Keywords: Health; MSD; Posture Analysis; RULA; Welding.

Introduction

Welding is the most essential part of manufacturing the products. Health and safety of workers are significant issues in welding industries. High productivity is the greatest interest of these industries now a day. Earning more profit and maximize it is the only target without any improvement in the working environment and work conditions of these industries **[1].** Target oriented work impose some pressure on the workers that also increase their muscular and body stresses. The fixed layouts are observed and found in different welding units. Welding workers are involved and also perform their work in very bad and unscientific body postures in these industries **[2, 3**]. This operation consists of cutting, drilling and joining different steel sections at various workstations. The jig and fixture that are generally used by the welders for welding are to be placed on the ground. As welding in these industries is done on kneeling posture the worker has to sit on a fixed posture and has to perform the welding work continuously. Muscular fatigued, joint pain, disorder in muscles tendons & ligaments are very common health problems of welders in welding industries. These muscular problems come from uncomfortable postures and the static nature of welding work [**4**]. Static type of work is considered ergonomically unsound and has firm physiological basis. It concludes that if no ergonomics alertness taken among welders, work-related diseases will come and more rapidly musculoskeletal system will be collapsed. Worker gets exhausted repeatedly due to continuous kneeling posture and it is also observed that musculoskeletal problems are identified. Due to unscientific plan of workstations and negligence of ergonomics measures the Work Related Musculoskeletal Disorders (WRMDs) occurred generally. Proper ergonomically design of

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workstation guarantees to execute the objectives of manufacturing industries with the context which considers productivity, integration, workers comfort, worker variety and security & safety **[5, 6]**. Severe problem of trunk, shoulder, wrist & arm may happen due to heavy weight and nonstop holding of welding gun so that welders might not work properly for a long period of time. They might not lift the weight properly due to these musculoskeletal problems in near future. To avoid Work Related Musculoskeletal Disorders (MSD) various methods are available for the study of estimate of working postures and physical workloads. Physical load, body postures can be measured and evaluated by using tool RULA [**7, 8**]. The purpose of this research is to analysis and evaluate the working postures of workers engaged in welding industries in West Bengal. To increase the working environment, health status of welders and the quality of work, the assessment tool RULA (Rapid Upper Limb Assessment), is used in this present research work and that recommend the changes to be made in the body posture while working in industries.[**9,10**]. High scoring of RULA indicating that posture is not scientific and granted for occupational health and safety of workers. Efficiency & quality of products will get reduce and internal fatigue and pain of muscle & tissue should be increased. Well organized ergonomic planning and scientific body postures of welders can reduce the high RULA score [**11, 12**]. The gap between ergonomic considerations and real practices at the workplace gives the viewpoint to design the workstation. So the proper ergonomics guidance and consciousness programmers to the workers are essential to overcome work related musculoskeletal disorders and painful disorders of muscles tendons and nerves and that will helps to recover health of workers and finally the quality of work.

Methodology

The present research work has been done in small scale welding unit in south 24 parganas in west Bengal. The snapshots of worker working in different body postures in welding unit are taken to analysis and it shows the different movements of the workers during their activities inside work station. The snapshots are analyzed and RULA score is obtained from that. High risk jobs are numbered higher and less risk are numbered lower as per working method. Instant corrective actions and essential changes are recommended as well as suggested for upper activities numbered to avoid any musculoskeletal disorders, body fatigue and risk.

RULA Method

In 1993 Lynn Mc Atamney and E Nigel Corlett both are developed the method RULA, to examine the workplaces' ergonomics, where work related upper limb disorders of the workers are common. It provides a rapid assessment of the musculoskeletal loads on workers due to posture, motion repetition and force. No special equipment of this tool is required in providing a quick assessment of postures of the neck, trunk and upper limb along with muscle function and the external loads experienced by the body during work. A coding system is used to generate an action list that indicates the level of intervention necessary to decrease the risk of injury due to physical loading on the operator. This method accomplished these goals by providing a "Grand Score" that can be categorized by Action Levels. Upper score representing urgent changes to be made in the body posture for reducing muscular fatigued and also for enhancement of work quality.

Table 1: RULA Score Table

Sl. No	Score	Action Level	Description
01	1–2	1	Posture is acceptable, if it is not maintained for long time.
02	3–4	2	Further investigation is needed and changes may be required
03	5–6	3	Investigation & changes required soon
04	7	4	Investigation & changes are required immediately.

RULA Clarification

RULA recommend & also suggest a total job measurement and also give the instructions for modifying body posture to reduce the possibility of musculoskeletal hazards at work places. RULA is a simple analytical tool which allows surveying different tasks connecting particularly the upper limbs at work places. This method focuses on use of arms, wrists, position of the head, and the posture of the upper body.

Observation and Case Study

It has been observed that details investigations of MSD and occupational health of welders are required

in welding units in West Bengal. For finding the severity of the problems body postures and muscular fatigues are evaluated with the RULA method. The figures give details the different postures of the workers in the welding industries. For investigation of arm, wrist, neck, trunk and limbs the whole body is divided into part-A and part-B respectively. The working postures of the workers and the angles at which they work inside the shop floor are recorded with the help of different snapshots. The posture scores of arm, leg, body, trunk etc. can be measured through RULA method.

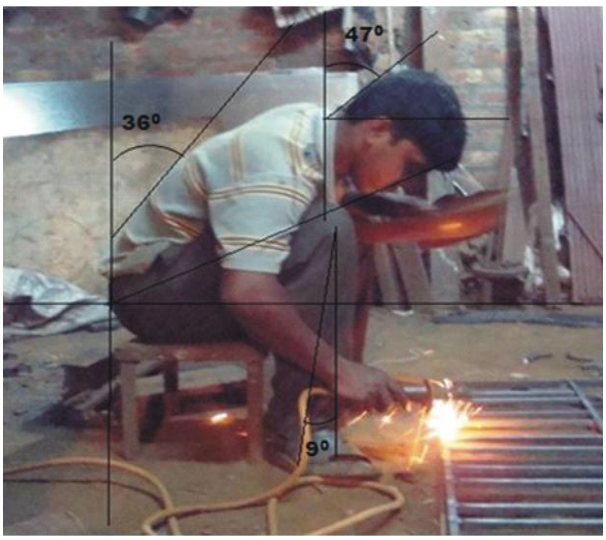
Fig. 1: Upper and Lower Arm Angle

From fig.1 & 2 the score has been obtained from RULA work sheet by observing upper & lower arm angle of the welder. The shoulder of workers gets raised and arms get abducted also, so it gives score of '1' individually and it will be get added to the previous score while working. So the final upper arm score is '4'. In the same way for lower arm, by selecting the mannequin score of '2' has been obtained and as the arm is working across midline of the body and from the fig.2, position of wrist has been observed and by selecting the related location of the wrist from the worksheet we get the score of 1 While working the wrist bent from the midline which gives the score of '1' and this is added to the previous score and the final wrist score is '3'. Here welding is of continuous type so for this type of welding the wrist twist position score is '2'. After getting these four scores, the posture score-A (part-A) is 5 that can be calculated and evaluated from RULA assessment work sheet. This score will have to be further added to muscle and force / load score for ultimate and grand score of Part-A. Muscle score of '1' has been found as the posture is mainly static and the welding action is repetitive. The load of welding gun is of around 2.5 kg and is static and monotonous so it gives the score of '2'. The grand score of part-A is the addition of muscle and load score that is '8'.

Fig. 2: Lower Arm angle and Abduction Angle

By observing the neck angle of the worker, the calculated posture score is '3'. Now the neck twist that is for, continuous welding operation has to twist till the end of the welding length so it gives score of '1' which will get added to previous score of neck. So the final score of neck is '4'. From fig 3, it can be observed that the angle of posture of trunk of worker and related to that the mannequin is selected and it gives the score of '2'. The score of '1' individually for trunk twist and trunk side bend is added to the

Fig. 3: Forward bending angle neck and leg angle



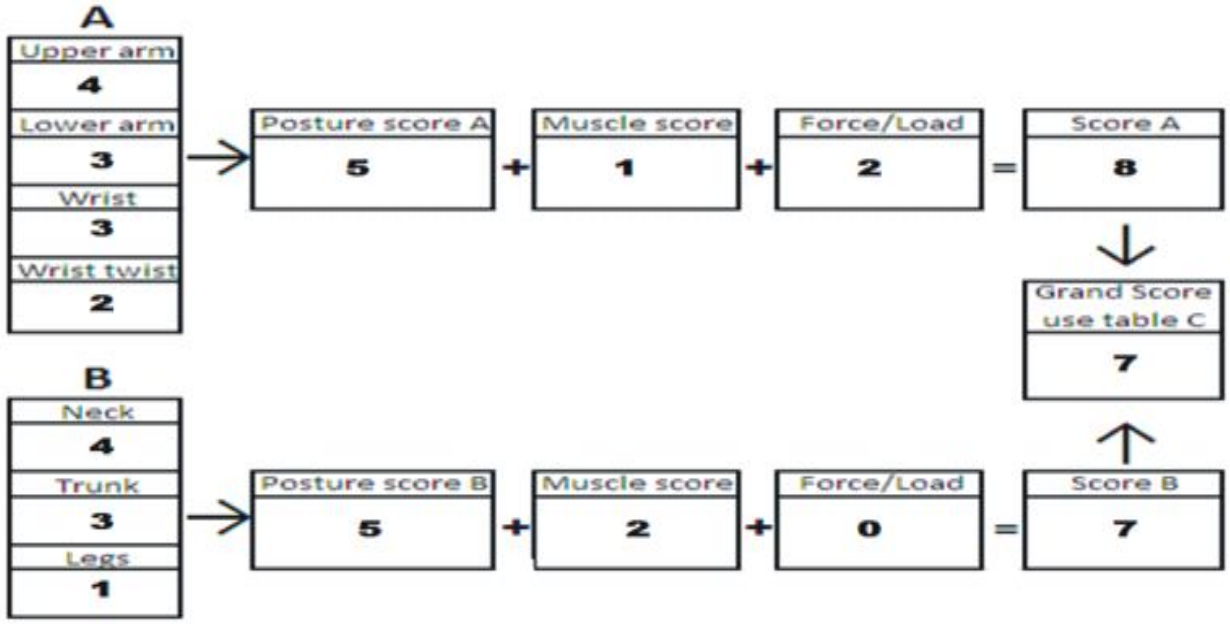
previous score of trunk and it gives the final score for trunk as 3'. The worker works on both of their legs so it gives score for limb as '1'. So from the RULA

assessment & evaluation work sheet the posture of B (part-B) that is neck, trunk & limb is "5". By adding muscle and force / load score to get grand score for Part-B. The muscle score is '2' as work is mainly static and it is repetitive and the force / load score is '0' as the worker is not having any load on his back. So the grand score for the Part- B by adding '5' to '2' and '0' is '7'. The worksheet of employee assessment with RULA can be used to assess directly the RULA score and severity of the problem.

Result

For calculating final RULA score & final result of investigation, the grand score of arm & wrist (part-A) and neck, trunk & leg analysis (part-B) are used. From the RULA assessment worksheet the final RULA score is 7 which is under action level "4". High score indicates that workers suffer painful disorders of muscles tendons and nerves and severe chronic disease in their shoulder & neck in near future. Target oriented work impose some pressure on the workers that also increase their muscular and body stresses. Most of the welding industries in West Bengal force the workers to perform their assigned work in unhealthy, inappropriate and non- ergonomically designed work places for this reason workers also suffer painful disorders of muscles tendons and nerves . This score indicates that instant investigation and changes of body postures are required in the welding related workstations for improvement of work quality as well as betterment of workers occupational health.

Fig. 4: RULA Assessment Sheet



Discussion

The space provided in the welding industries is not sufficient for the welders to work. Workers performed their work in the work stations under great difficulties and body stresses. This is owing to several reasons as justified by the snapshots taken of the workers performing the operations. By using RULA method, it is observed that the works taken in to consideration is under high muscular and body stresses. This is justified by the percentage calculated from the RULA Score Sheet which was made by the posture analysis of the worker taken from the photograph. Urgent improvement in the industries is essential for the workers to perform their operations with minimum load and muscular stress on their bodies. It is also observed from the calculation of the postures that the welders are subjected to different muscular disorders and body stresses that directly affect their health.

Conclusion

There is no awareness about ergonomics in welding industries among workers in West Bengal

.Immediate change in the body postures is required of the workers in welding units because workers are working in very bad kneeling postures that cause musculoskeletal problems and body fatigue. It is suggested that proper sitting arrangement and proper arrangement for the machineries get diminish risk level of work. Proper rest periods for the workers can solve the problems partially. It is also recommended to provide appropriate jigs and fixtures to hold the jobs, so that the workers should not bend while welding the job. Also, all the workers are made aware about the correct posture. Different training programs, systematic appraisal on safety can minimize the chances of accident of welders. These industries should incorporate health education and training programs among workers to ensure safety. In some of the portions of the body region the extremity of pain is more and it can cause so many difficulties to workers in the near future which they are not realize now a days. Evaluation of postures by RULA method shows that there is need of investigation and immediate changes are needed in the workstation for healthy working environment and good quality of work.

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