

Study and Development of Participatory Ergonomics Intervention to Avoid Hazards of Musculoskeletal Disorder in Industry

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Abstract - Over the past few years, doctors realized that workers who carried heavy loads or maintained body positions with such loads for extended periods developed musculoskeletal problems and work environment hazards. In the long-ago years of research, the connections between specific job tasks and Musculoskeletal Disorders (MSD) with the study of ergonomics have been established. Ergonomics has become a significant contribution to the working environment to achieve or to complete the allotted work on time duration with perfection. This knowledge is necessary since the participation of all workers from the higher end to the lower end with the planning of intervention can create a suitable means of solutions in the industry. Some of the operational problems like repetitive work due to continuous sitting, standing and hazards may create fatigue. Hence, there is a need to find solutions for all these problems. The work gives analyses of ergonomics, hazards and safety techniques are related which develops a new framework to workers and safety is important with an ergonomics improvement of the workplace. The methodology classify and analyze the hazards in relation to physical, electrical and environmental parameters- as reported in the framework At conclusion of the study, the work reports data and insights from one manufacturing industry verifying different section with cases, which is relevant to industries.

Key Words: Safety, and Environment, Musculoskeletal Disorders (MSD), Participatory Ergonomics, Rapid Upper Limb Assessment, Repetitive Strain Injuries, Work-related musculoskeletal disorders

1. INTRODUCTION

This document shows the suggested format and appearance of a manuscript prepared for SPIE journals. Accepted papers will be professionally typeset. This template is intended to be a tool to improve manuscript clarity for the reviewers. The final layout of the typeset paper will not match this template layout. This study was done in one of the manufacturing industries of Karnataka where air filters are produced. The labors of production department are more than 100. The work consisted of assembling of air filters, 6 assembly lines which consist of different machines and products their participation ranges from starting till end this part study was selected for intervention and participatory ergonomics. The observation study made one of risk of problem due to hazards, there were also a number of machine, operation, MSD's and health safety problems that had to be dealt with solutions. In view of that, the health and safety group were made to try a change in the working method, implementing. Participatory ergonomics (PE) has been defined as the group of workers in forming and evaluating amount of their effort activities, with sufficient knowledge and practice to improve both process and conclusion to achieve desirable aim. Musculoskeletal disorder (MSD) is a condition that creates a pain of muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs. This looks less pain in initial but gradually increases if neglected thus, MSDs are cumulative-type injuries. It is important to know just what a risk factor is, or rather is not. A risk factor itself is not necessarily a caution factor for any particular MSD [1]. Once the groups were absolute, they need to be trained in ergonomics to find modified solutions to help the risk factors associate with Musculoskeletal Disorders (MSD's) and

hazard. The overall length of training should include mechanisms of MSD injuries, associated risk factors, identification of hazards, and effective strategies to reduce it. Occupational Health and Safety (OHS) programs explain about organization safety management and reducing work hazards like electrical, physical hazards, and environment. But complex set of risk factors, including psychosocial and work-organizational factors. These can be prevented if certain policies, procedures, and practices were followed.

Some of the small-scale industries neglect labors problems like accidents or injuries by paying some compensation amount but it'll not apply for all time. If the injuries are repeated for then there may be a chance of remove of laborers from industries by telling the reason of incapable so many laborers to hide the pain. In this type of problem, PE helps to take care labors by some points which are as follows.

Four key themes for discussion have been identified.

1. There are multiple causes of current workplace damage, disease, and disorder; preventing these causes requires multiple solutions, operating in synergy.
2. An overall strategy to reduce workplace injuries, disease, and disorder must build on the strengths of traditional lower and higher level preventive approaches, combining these to form a more effective plan.
3. Before it can be accepted upon which prevention of plans work and which do not, a shared understanding of how best of occupational health and safety interventions should be correction is important.
4. Stronger workplace relationships must be made between those who do research and those who apply the awareness gained so that same research idea is produced that is readily taken up and applied for improvement in occupational health and safety.

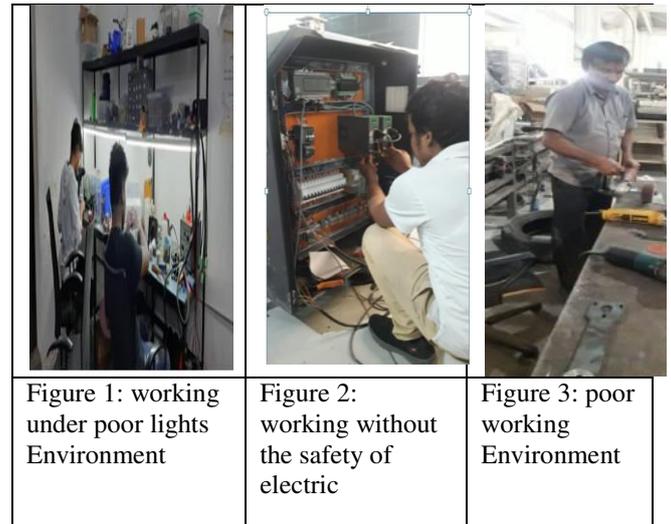
Participatory ergonomic (PE) interventions or programs are often used to reduce work related musculoskeletal disorders (MSD) in workplace [2]. That focused to find the incidence of MSD's among school teachers of Kuala Lumpur 6month duration. This sought to give the relationships between psychosocial factors, depression and MSD among teachers.

The hypothesis addressed by this cross-sectional study was that depression would prove to be a bridge for the psychosocial factors affecting MSD this also gives awareness among teachers. The Malaysian Education Minister regarding the issues of MSD in the workplace [3]. Behavioral interventions focus on the division of labors behavioral or capacity it aims on improving fitness strength on stress reduction of work on improving work methods. Consequently these people perform strenuous manual tasks for prolonged periods and suffer from musculoskeletal disorders affecting different body parts. For them ergonomics interventions are the best solutions for the preventions of work related musculoskeletal disorders [4].

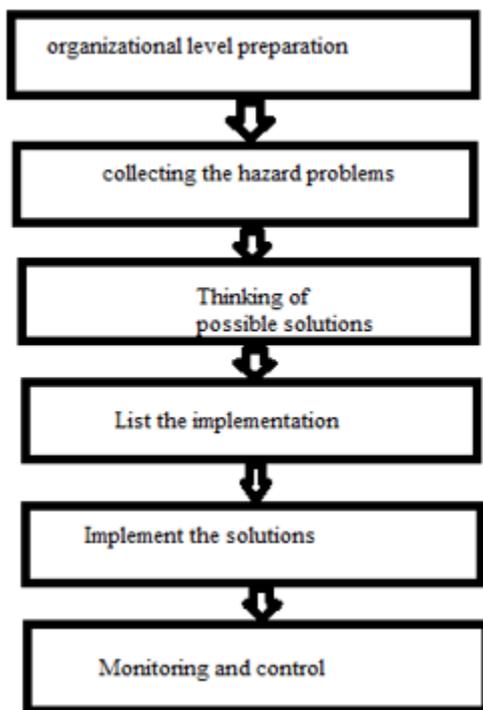
The women workers working in industrial activities facing more problem of hygiene that related to work problems such as work environment discomfort and body pains (musculoskeletal problems) of with different work related risk. The ergonomics solution technique leads the user through the identification of ergonomic risk factors by body parts first. Outcome is to work related risk factors in development of work related body pains can be reduced, even be avoided by ergonomic interventions [5]. The training agreed of educating about PE, workplace assessment and discussion among workers groups and admin made compulsory to follow rules and regulations, the safety of machine operation, avoid slips and trips, fire/ explosion prevention, ergonomics, recognition other workplace hazards. So that workers could recognize and identify hazards, which can be seen in China that explored to improve implementing solutions to problems.[6]. This study employee participation was implemented from the very beginning. The strategy was to form a group of operators, supervisors, medical and engineering staff, and to weekly discuss issues related to ergonomics. During this period, the repeated health issues like production process, motivation were assessed and evaluated with a group of operators in the similar conditions working in a conventional manner and the company decided to implement the PE in order to prevent repetitive strain injuries (RSI) [7]. Similar to

other industrial sectors, agricultural labors too are faced with many hazards include chemical hazards, biological hazards, ergonomic hazards, psychosocial hazards, and physical hazards. The agriculture sector is physical hard work related with a many of MSD's occupational harm and illnesses. In this first decade of the 21st Century, the third most hazardous industrial sector in Malaysia continues to be agriculture, forestry, and fishing [8]. The occupational health and safety risks of workers in Indian sawmills. The workers in the saw mill industry were suffering from various MSD's risks, hazards conditions (high temperatures, slippery and uneven ground), heavy work load (self-made handling offloads, wrong postures,) risk tools and exposure machinery noise .The expolosure towards problem related to noise levels above the OSHA's safe limits for more time. These work related problems leads injury and MSD's and warrant early possible ergonomics intervention [9].

prepared and implementing them with solutions and finally evaluating it with continuous monitoring. By doing the survey of laborers in industries some questions has been asked related to physical work how it affects the mental and health of labor which reduce the concentration on work and cause the health illness. During the observation collected some figures which are shown below.



2. Methodology



As shown in this flow chart is methodology of work applied in industry where depending on the observation discussing with organization for preparation secondly collecting list of problems according to that solutions are

After the collection of information and discussion with laborers, the major problems are divided into three categories like physical, electrical, and environmental hazards. Some of the details of hazards are classified into three categories which are listed below.

Classifications of hazards in industry

1. Physical Hazards



Figure 4: Representation of physical hazards

1. Temperature, Heat, Pressure
2. Confined space – defective layout
3. Bad housekeeping
4. Defective Machinery & Plant
5. Slips and trips
6. Falls from height
7. Noise, vibration & impulse
8. Dust & fumes
9. Light, Radiations – UV & IR

2. Electrical Hazards



Figure 5: Electrical hazards

- Shock
- Electrocutation
- Burns
- Flash
- Bare wires without plugs
- Defective appliances
- Damaged Cables & loose wires
- Earthing
- Fire & Explosion

3. Environmental Factors



Figure 6: Environmental hazard

- Dust
- Uneven floor
- Poor illumination
- Over noise

2.1 A solution to Physical Hazards

1. Some periodic breaks should be given to avoid the heat and pressure and shower facility to reduce the temperature of the body.
2. The working area and workstation should be designed according to ergonomics rules like S shape, U Shape and L shape.
3. Bad housekeeping may create irritation in the working environment so we have to provide clean and well arranged with spacious area.
4. Defective machinery will take more time off work and every time repaired is not possible.
5. Slips and trips occur due to oily or greases on the floor which may cause sudden injuries.
6. A random arrangement of items or materials on the shelf or material movements in the crane may also have a chance to fall from a height so we need to provide an instruction board for that movement.
7. Dust & fumes, may cause severe health issues which may create problems in the lungs so we need to care about these factors maintaining a clean environment and providing chimneys to send fumes to the environment from the company.
8. Light, Radiations - provide sufficient lighting facility because a small problem may create a big impact to work i.e chance of accidents. Also to avoid the harmful radiation from heat surfaces



Figure 7: Inclined bin stand



Figure 8: Goggle



Figure 9: Mask

2.2. Solution to Electrical Hazards

1. To the electric hazards everywhere necessary like Shock, Electrocutation, Burns, Flash, Bare wires without plugs, Defective appliances, Damaged Cables & loose wires, Earthling and Fire & Explosion need to put display boards like caution written on that to take precautionary measures.

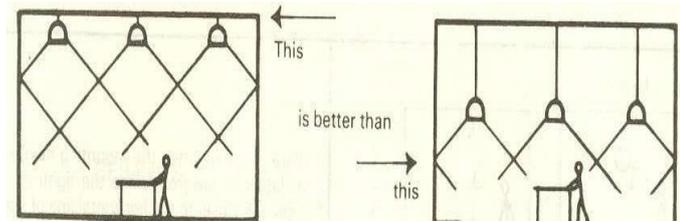
2.3 Solution to Environmental Factors

1. Dust providing a clean environment in the company should be the first priority like good housekeeping and avoiding dust entering the working environment.
2. Uneven floor or irregular floor in the industry may create slip to avoid that providing even surface with good friction force on the surface so that grip to the foot.
3. Poor illumination: providing good lighting is very important
4. Over noise: this problem may cause ear damage so to avoid that earplugs should be used.



Figures 10: pail tipper

As shown in figure 10, House keeping is important to keep the industry clean and hygienic, during this situation pail tipper helps as it will be at a height with no problem of bending and easy remove of waste from a bin.



Figures 11: Good lighting arrangement

As shown in the figure 11, The light shouldn't fall directly to the face it will strain the eye and after some time darkness will create surrounding for few seconds this problem can be avoided by using the correct light arrangement as showed in the above figure both are better than each other.

3. Results and Discussion

- Safety training
1. Thousands of workplace death may cause each year due to lack of safety training. For industry safety training will save time and money .there may be the amount paid for medical bills, health insurance, employee replacement titrating them again and equipment damage are going to be more problem to industries hence industry should give compulsory safety training program to save the life of an employee. PE helps to coordinate both management and labor to over some problems related to them like one of the large issues is the safety of employees so some of the points discussed related to that Industry training is primarily a management activity that is concerned with
 2. Minimizing
 3. controlling
 4. reduce hazards
 5. Creating awareness among workers about Safety education, training, and promotional activities.
 6. Discussion on work environment survey reports, HSE (health, safety, and environment) audits emergency preparedness.
 7. Analysis cause of accidents and fixing responsibilities

8. Arrange for dustbins, scrap containers wherever necessary
9. Keep gangway clean
10. Check for oily floor & take removal action by putting sawdust and removing them by sweeping.
11. Some of the safety instruments are as follows
12. Wearing helmet
13. Safety shoes
14. Hand gloves

Conclusion

The participatory ergonomic makes the involvement of group workers from higher level to lower level to learn, discuss the problems related to work and implement for increases of product and satisfaction to workers. One of the problem is discussed in this paper hazards, MSD's and no safety leads to risk of labours life in work environment which is divided into three groups(physical ,electrical and environment) and suggested some suitable solutions with use of safety measures some corrective measures to reduce the risk level seemed essential. Ergonomics shows industry commitment to safety and health as a core value that is benefit much safety culture for the company then before.

Healthy workers are the most valuable asset; after implementing these solutions in industry and getting feedback worker experienced less fatigue (MSD) and uncomfortable during work which is good change in turnover, decrease absenteeism, morale and increased worker involvement the safety & health practices at the industry shows better performance for the society and OSHA will also give solutions to the problems of health hazards.

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