
Manual Material Handling Training for Workers in The Furniture Industry

Early Widya Kusuma, Asriyani Fidia Anisa, Restyantika Mahadewi Intanni, Edwin Widodo, Jessica Gabriella Budi Santosa

Department Public Health Science, Faculty of Medicine, Universitas Negeri Semarang, Indonesia

*Correspondence to: earlywidya204@students.unnes.ac.id

Abstract: The work processes in the furniture industry starts from wood transportation, construction, sanding, assembling, and finishing. One of the potential hazards that always exist in every work process in the furniture industry is ergonomic hazards. The risks of Manual Material Handling (MMH) that includes lifting and lowering, pushing and pulling, rotating, carrying, and holding against an object adversely affect both the company and workers. This study aims to determine potential ergonomic hazards and control efforts to reduce risk of ergonomic hazards and injuries to furniture industry workers by providing training Occupational Safety and Health and proposed work system during Manual Material Handling activities. The method used to identify is the Hazard Identification Risk Assessment Control (HIRAC) technique. HIRAC used to help provide an understanding of the hazards that exist in each work process to minimize the occurrence of adverse Occupational Diseases. This research is qualitative research with observation and interview data collection techniques. Analysis techniques in this research included data reduction, data presentation, conclusions, and verification. Results of the evaluation showed that the identification of ergonomic hazards in the furniture industry was found in all furniture work processes from wood cutting to finishing.

Keywords : HIRAC; Manual Material Handling; furniture; training

INTRODUCTION

Occupational Health and Safety (OHS) is one form of effort to create protection and security from various accident risks so that they can be protected from work accidents, which ultimately increases work efficiency and productivity (Sarjono et al. 2021). The furniture industry is an informal sector business engaged in the production of good quality wood for housing needs, government agencies and companies. There is a potential hazard in the furniture industry that can cause accidents and Occupational Diseases at all stages. Hazard risk control is carried out by identifying hazards related to Occupational Safety and Health. Identifying potential hazards aims to find, recognize, and describe potential hazards that exist in each activity to carry out efforts to control accidents and diseases due to work. The implementation of Manual Material Handling training is an effort to protect workers to minimize adverse impacts.

The furniture industry market in Indonesia is currently developing along with consumer needs for household furniture. The furniture industry has high economic value and has competitiveness because Indonesia has abundant sources of raw materials, and various designs and patterns in each region. Based on raw materials, 80% of the total furniture production in Indonesia uses wood raw materials. The development of the furniture industry with wood raw materials and having many workers in Indonesia will certainly have a negative impact on health. The process of producing wood in large quantities can cause injury or musculoskeletal disorders to its workers. Therefore, it is necessary to control the risk of hazards in the workplace.

The first step in risk control management is to identify hazards to find and recognize all types of activities, production processes, tools used, products and services that can result in losses of company assets, both in the form of people, materials, machines, production tools, and finance. Identifying potential hazards has the aim of describing the potential hazards that exist in each activity to be carried out to control accidents and Occupational Diseases. Manual Material Handling Training is an effort to protect workers and minimize adverse impacts such as ergonomics. In addition, this Manual Material Handling training provides benefits including creating a safe and comfortable work environment, reducing repair costs for the company, improving productivity, improving the quality of human resources, and complying with applicable laws.

Risk at work is the possibility of accidents or losses in certain periods or certain operating cycles. Risks have a certain level of range from mild to severe risk. Anxiety work accidents cause various adverse impacts, including financial losses, health losses, damage to production assets, insurance premium costs, morale work, and so on related to productivity.

Analysis of the assessment of hazard potential in the workplace can use a variety of methods, both quantitative and qualitative. One of the potential hazard analysis techniques used is occupational hazard analysis. Hazard Identification Risk Assessment Control (HIRAC) is one of the methods of identification, hazard analysis and risk control techniques as well as the application of controls used to review processes or operations on a system systematically (Husni, L 2005). HIRAC focuses on identifying hazards, measuring, evaluating risks arising from a hazard, then calculating the adequacy of existing control measures and deciding whether the existing risks are acceptable or not.

Research on occupational Safety and Health hazard identification and Manual Material Handling training in the Trangkil furniture industry as well as on the work process from wood transportation to finishing was done in March 2023. This study aims to determine potential ergonomic hazards and risk control efforts using Manual Material Handling training on work processes in the Trangkil furniture industry.

METHODS

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Research on Occupational Safety and Health hazard identification and Manual Material Handling training in the Trangkil furniture industry as well as on the work process from wood transportation to finishing process in 2023 has not yet has been done before and this research will be carried out in March 2023. This study aims to determine potential ergonomic hazards and risk control efforts using Manual Material Handling training on work processes in the Trangkil furniture industry.

Table 1. Ergonomic hazard and risk assessment in the process of furniture work stages in the furniture industry

Work Activity	Danger	Risk
Wood Transport	When the workers carry wood on the shoulder in the wrong position and do it continuously	Shoulder pain, feeling pain in the shoulder
Cut the wood according to the pattern	The position of the worker with the body bent and the head down	Spinal cord injury and neck pain
Clean the wood from the rest of the powder	The position of the worker with the body bent and the head down	There are complaints of pain in the spine and arms
Assemble the pattern pieces	Worker with one leg bent	Pain in the legs
Finishing	The position of the worker's hand that bends and is done repeatedly	Pain in the joints and hands

RESULTS AND DISCUSSION

Image 1. Photo of worker in the furniture industry 1



Image 3. Photo of worker in the furniture industry 3



Image 2. Photo of worker in the furniture industry 2



Image 4. Photo of worker in the furniture industry 4



The results of data analysis using questionnaire methods and interviews show: Respondent data taken from furniture 1 with 6 workers showed that the vulnerable age of workers is 22-63 years old, the educational background of workers is junior high school with a long-time work from 1.5 years to 13 years. Data respondents on furniture 2 with 1 worker, he was 51 years old, the background of the upper secondary education, and the length of his work was 20 years. Data respondents on furniture 3 with 1 worker with working age of 40 years, junior secondary education background, and 3 years of work. Respondent data on furniture 4 with 2 workers. Their ages were 25 and 40 years old. Their educational background was senior high schools, and the length of their work were 1 month and 1 year. From each respondent data above, we carried out the data collection process using questionnaires and also clouds for each respondent which shows:

Respondents in furniture 1: The results obtained showed that every work process carried out by 6 respondents in furniture 1 was still not in accordance with the Material Handling Manual. Respondents in furniture 2: The results obtained showed that every work process carried out by 1 respondent in furniture 2 was still not in accordance with the Manual Material Handling. Respondent in furniture 3: The results obtained showed that every work process carried out by 1 respondent in furniture 3 was still not in accordance with the Material Handling Manual. Respondents in furniture 4: The results obtained showed that every work process carried out by 2 respondents in furniture 4 was still not in accordance with the Material Handling Manual.

Work Process and Use of Tools and Materials

Table 2. Results Hazard identification and calculation with the HIRAC method

Transportation		Tool Cutting		Sanding		Assembly		Finishing	
Tools and Material	Hazards	Tools and Material	Hazards	Tools and Material	Hazards	Tools and Material	Hazards	Tools and Material	Hazards
1. Material : wood	1. Hit by material (wood)	1. Material : wood	1. Hit by a wooden material	1. Material : wood	1. Injured by wood fibres	1. Material : wood, nails, bolts, glass, hinges, doorknobs	1. Injured by tools	1. Material : Polish, varnish, thinner	1. Injured by tools
2. Tools : -	2. Wounded	2. Tools : grinders, saws, drills, wood files	2. Wounded	2. Tools : sandpaper	2. Wood dust	2. Tools : drill, wood glue, hammer, polyurethane glue, Ethyl Cyanoacrylate glue	2. Hit by a tools	2. Tools : brushes, paints, sandpaper	2. Hit by a tool
	3. Wood dust		3. Noisy		3. Inappropriate work position		3. Wood dust		3. The dangers of using chemicals such as varnish and varnish
	4. Incorrect lifting position		4. Improper cutting position				4. The dangers of using glue		4. Inappropriate work position
	5. Excess wood load						5. Inappropriate work position		

Table 3. Respondent Profile

Furniture 1							
No	Gender	Age	Work	Education	Period of Service	Shift Work	
1	Man	48 Years	Furniture Worker	SD	10 Years	Morning afternoon	-
2	Man	37 Years	Furniture Worker	JUNIOR	3 Years	Morning Afternoon	-
3	Man	35 Years	Furniture Worker	JUNIOR	2-3 Years	Morning Afternoon	-
4	Man	22 Years	Furniture Worker	SMA	2 Years	Morning Afternoon	-
5	Man	63 Years	Furniture Worker	JUNIOR	1.5 Years	Morning Afternoon	-
6	Man	36 years old	Furniture Worker	SD	13 Years	Morning Afternoon	-
Furniture 2							
7	Man	51 Years	Furniture Worker	SMA	20 Years	Morning - Afternoon	
Furniture 3							
8	Man	40 Years	Furniture Worker	JUNIOR	3 Years	Morning Afternoon	-
Furniture 4							
9	Man	40 Years	Furniture Worker	SD	3 Years	Morning Afternoon	-
10	Man	25 Years	Furniture Worker	SMA	1 Month	Morning Afternoon	-

Table 4. Reba Assessment Results

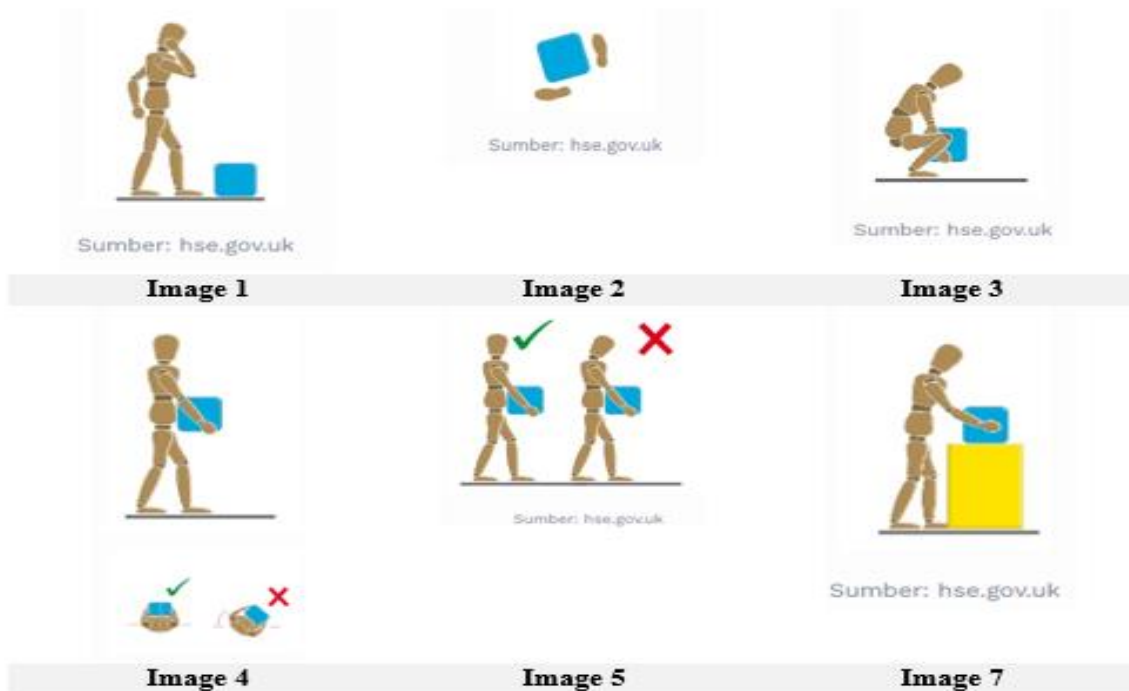
Age	Score REBA	Risk Level	Corrective Action
48 Years	9	High	Urgently
37 Years	9	High	Urgently
35 Years	5	Medium	Needed
22 Years	11	Very High	Very urgently
63 Years	10	Very High	Very urgently
36 Years	5	Medium	Needed
51 Years	9	High	Urgently
40 Years	10	Very High	Very urgently
40 Years	5	Medium	Needed
25 Years	11	Very High	Very urgently

From the results of identifying problems from each work process, potential ergonomic hazards were found with the risk of complaints of musculoskeletal disorders. Factors causing hazardous conditions and unsafe actions in the work environment can increase the risk of accidents and muscle injuries in works. The factors causing unsafe conditions were working environment conditions such as workplace layouts that were too narrow and crowded. The factor causing unsafe actions was the unnatural posture of workers continuously. The low educational background of workers affected knowledge about ergonomic work attitudes. Based on the results of REBA calculations for workers in the furniture industry in Trangkil, the score calculation for workers produced a high total score on ergonomic hazards in the workplace. The position of workers in carrying out work was still not in accordance with the correct ergonomic attitude by looking at the workers' high REBA scores.

Based on Law Number 13 of 2003 concerning Manpower, job training was carried out as an effort to equip, improve, and develop work competencies to improve abilities, productivity, and well-being. Therefore, training was given to workers regarding the Material Handling Manual in the form of posters. The training was carried out with a media entitled "Preventing Injuries, Workers Must Understand the Correct Material Handling (MMH) Manual Guidelines" containing 5 classifications of MMH activities according to Occupational Safety and Health Administration (OSHA) were lifting and lowering, pushing and pulling, turning, carrying, and holding. Then there were also risk factors that were dominant with the occurrence of injury due to MMH activities such as unnatural or forced posture (bending, squatting, kneeling, etc.), repetitive grappling (reaching, lifting, carrying), overexertion, pressure points (gripping, leaning against a surface sharp), static work attitude (maintaining the same position for a long time). Then there were also ways to control and tips on reducing injuries when doing MMH including modifying work objects, modifying the layout of the workplace and work station, using mechanical aids and personal protective equipment (PPE) such as goggles, chemical gloves, or chemical cartridge respirator masks, creating a safe and comfortable working environment, managing work schedules, working speeds or ways of working, providing recovery time (pauses or short breaks), reducing circular movements, and do not lift or move the bar beyond the limit.

Manual Material Handling (MMH) is an activity of a person or group to move an object manually or by using tool, for example manual handling include, lifting, pulling, pushing, launching, rolling, stacking, carrying, and holding activities. This included activities that required repetitive movements such as packing, typing, assembling, cleaning, and sorting, whether using manual tools or machine. Each worker has different abilities when lifting weights. Considerations for determining the maximum weight that humans can lift usually depend on several factors, including the size and shape of the weight, distance, height lifting weights. In this case, there are several guidelines that can be used as a reference to determine the maximum load weight.

Precise Material Manual Handling



Make a plan before doing manual handling activities. If the lifting distance is long, be sure to rest lowering the load on the table or bench to change the position of the handle. Take a stability test. Make sure the position when you want to lift the object is in stable condition. The position of the feet is close to the load to be lifted, ideally the distance between the legs is 20-30 cm to maintain balance. Avoid wearing tight clothing or improper footwear because it can hinder the manual handling process. Bend your knees, position your body to squat. Make sure the backbone current is upright when lifting weights. Lift weights as close to the body as possible. Stand by pressing your legs so that the load is absorbed by the leg muscles. Keep your body stable while moving. Keep the weight close to the waist when objects are moved and do not twist the body. Make sure the view must be free of obstacles and the state of the work area is not disturbed. Keep your head upright and your gaze straight ahead. Do not lift weights exceeding the maximum load weight limit. If you're not sure about lifting weights, ask for help using assistive devices. Place the object in the desired position. To remind workers about how to do manual handling correctly and maximize injury prevention measures when carrying out manual handling activities, you can install manual handling posters in the work area that there is such activity. From the training, it is expected to increase the knowledge of workers on the correct manual material handling and ergonomic work posture so as to minimize the risk of muscle injury to the workforce. Thus, companies can create a safe and comfortable work environment and achieve productivity.

CONCLUSION

In every work process in the furniture industry there was a potential ergonomic hazard in the form of a risk of complaints of musculoskeletal disorders. Control efforts were done, for example by providing Manual Material Handling training with workers. Training was provided using poster media containing information about the Material Handling Manual. The training aims to improve the attitude and posture of the workers to be more ergonomic, so that workers can work effectively and efficiently. From these risks, the action that must be taken is to justify the ergonomic position of workers when carrying out a series of jobs in the Trangkil furniture industry. Another recommendation regarding efforts to control the risk of ergonomic accidents in workers is the arrangement of workplace layouts. Further researchers are advised to use different analytical techniques, to update and develop existing research instruments, and increase the number of informants interviewed.

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