



## Ergonomic Education to Reduce the Risk of Musculoskeletal Disorders

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### Abstrak

Workers are mainly human resources with a significant influence on the production process, in particular manual work. Activities in *manual material handling* include carrying, lifting, lowering, pushing, and pulling loads. Transport labor is one type of work that requires energy and great muscle strength and a strong physique to carry the load at work. Workers who are in the wrong position during prolonged work will increase the risk of musculoskeletal complaints. The purpose of this community service activity is to provide ergonomic education to reduce the risk of *Musculoskeletal Disorders*. *Methods*: This service activity uses counseling methods, leaflet giving, demonstrations, simulations, and discussions. The participants were given questionnaires before and after educational activities, namely ergonomics knowledge questionnaires to determine the level of ergonomics knowledge and also *musculoskeletal complaint questionnaires*. *Results*: This activity was attended by 21 participants who were all male. In the knowledge variable, the mean pre-test value was 56.67 and the post-test was 68.57. In the *Musculoskeletal* complaint variable, the mean pre-test value was 30.05 and the post-test was 28.76. *Conclusion*: Based on the results of the pre-test and post-test, shows that ergonomics education can help improve ergonomic knowledge and reduce the risk of *musculoskeletal disorders* in workers.

**Keywords:** *Musculoskeletal Disorders, Worker, Ergonomic Knowledge, Manual Handling*

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## INTRODUCTION

Workers are mainly human resources with a significant influence on the production process, in particular manual work. Manual material handling is an activity or work in handling or moving materials carried out in a job manually. Activities in manual material handling include carrying, lifting, lowering, pushing, and pulling loads (Susanti et al., 2015). One example of manual material handling work is transport labor. Transport labor is one type of work that requires energy and great muscle strength and a strong physique to carry the load at work. This work uses human labor to lift and transport heavy loads such as rice, wood, cement, and other items in large quantities (Nurkayati, W., 2010).

Musculoskeletal Disorders (MSDs) are a group of pathological conditions that can affect the functional tissues of the musculoskeletal system which includes the nervous system, tendons, muscles, and supporting structures of body parts. MSDs are obstacles caused by incorrect or inappropriate work activities that affect the musculoskeletal system which includes nerves, tendons, and muscles. MSDs usually appear not directly but rather a buildup of minor impact trauma injuries that accumulate continuously over a long time due to increased load while working. Symptoms usually begin with pain, aches in the limbs. MSDs are generally not only caused by a single aspect of an event (such as falling, slipping or tripping) but work attitude and accumulation of ergonomic risk factors and other aspects that affect it (Restuputri, 2018).

Workers who are in an awkward position while working for a long time will increase the risk of musculoskeletal complaints because the muscles get static loads repeatedly and for a long time they can cause complaints in the muscles, ligaments, and joints. (Rahayu, et al., 2020) Musculoskeletal complaints generally occur due to excessive muscle contractions due to giving too heavy a workload for a long time. In general, musculoskeletal disorders are caused by excessive muscle contractions due to heavy workloads over a long period of time. If muscle contractions are only about 15-20% of the maximum muscle strength, then musculoskeletal disorders may not occur. If muscle contraction exceeds 20%, blood circulation to the muscles decreases, oxygen supply decreases, and results in inhibition of carbohydrate metabolism processes, it can cause lactic acid accumulation and cause muscle pain. (Tarwaka, et al., 2014)

Ergonomics is the science that studies human behavior in relation to their work. In short, it can be said that ergonomics is the adjustment of work tasks to the conditions of the human body to reduce the stress that will be faced. Unnatural work attitudes include a bent back, continuous hand movements, and so on. The farther the position of the body from the center of gravity of the body, the higher the risk of complaints of Musculoskeletal Disorders. (Wong, et al., 2010).

The main principle in ergonomics is to align the job with the worker or "Fitting The Job To The Worker". Ergonomics provides a comfortable and efficient design of work and equipment to suit the needs of workers. This ultimately creates a healthy work environment, because effective design can control or eliminate potential hazards (Mayasari & Saftarina, 2016). The purpose of ergonomics is to obtain an effective fit between the user and the workstation to improve work efficiency, health, safety, comfort, and convenience for the user. Neglect of ergonomic principles results in inefficiencies and pain in the workplace. (Sirajudeen MS et al, 2013).

Every job has its own risks, both risks in work and risks to health. Muscles that are used uncontrollably, work done repeatedly, and static work positions for a long time can cause complaints of Musculoskeletal Disorders (MSDs) (Soedirman et al, 2014). Musculoskeletal Disorders complaints are complaints in the muscular, and skeletal regions experienced by a person. Musculoskeletal Disorders complaints can be felt by someone in the skeletal muscles (skeletal), both mild complaints and even severe complaints. Static loads experienced during continuous work on muscles for a long time can

result in damage to ligaments, joints, tendons, muscles, nerves, cartilage, and discuss intervertebral. (Tarwaka, et al., 2014).

One of the jobs that uses manual handling is a salt packing worker. Participants in this activity are salt-packing workers. This worker has *manual material handling work carried out by these workers* including carrying, lifting, lowering, and pulling loads. So it is important to carry out ergonomic education which aims to get an effective fit between users and workstations to improve work efficiency, health, safety, comfort, and convenience for users. Neglect of ergonomic principles results in inefficiencies and pain in the workplace. (Sirajudeen MS et al, 2013)

## **METHODS**

This community service activity was carried out at the salt packing warehouse located in Gandus Musi II Palembang city, South Sumatra on May 22, 2023. Participants are workers in salt packers who run a production process that is manual handling. The number of participants was 21 workers. Ergonomics Education in this activity was not only in the form of increasing understanding carried out with counseling but was complemented by the provision of leaflets and demonstrations of ergonomic position practices, in addition to participants being given space to discuss in the question and answer session.

The participants were given 2 questionnaires, namely the ergonomics knowledge questionnaire to determine the level of ergonomic knowledge and also the Musculoskeletal complaint questionnaire using the Nordic Body Map to find out the body parts of workers who feel pain after doing work at the workstation.

## **RESULTS AND DISCUSSION**

This service activity was carried out in 2 days and attended by 21 participants. The first day will be held on May 22, 2023. After the activity was officially opened, the activities carried out on the first day began with a pretest, namely the distribution of ergonomic knowledge questionnaires and Musculoskeletal complaint questionnaires. The distribution of this questionnaire aims to measure the level of knowledge and complaints of Musculoskeletal body parts that feel pain, before the delivery of service material. The next activity was the distribution of leaflets and material delivery (Fig.1) as well as a demonstration of manual handling practices (Fig.2), then continued with discussion in a question and answer session to provide opportunities for participants to discuss. This aims to provide opportunities for participants to ask questions and exchange ideas about educational materials so that they are expected to increase their understanding of the material that has been given. The next stage is the provision of a post-test in the form of an ergonomics knowledge questionnaire

**Table.1** Participant Characteristics

Variable		Number (of people)	Presented
Age (years old)	≤ 30	7	33,33
	> 30	14	66,67
Total		21	100
Gender	Man	21	100
	Woman	0	0
Total		21	100

**Table.2** Level of Knowledge before and after provision of material

Variable		Good		Bad		N (%)	Mean
		F	%	f	%		
Knowledge	Pre test	9	24,86	12	75,14	21 (100%)	56,67
	Post test	17	80,96	4	19,04	21 (100%)	68,57

The second day of community service will be held on June 12, 2023. This activity is in the form of follow-up by evaluating whether participants apply ergonomic principles when working with the assessment of the Musculoskeletal complaint questionnaire post-test. This was done in the third week after ergonomics education was given to re-evaluate workers' musculoskeletal complaints

**Table.3** Musculoskeletal Disorders Complaints Before and After Ergonomics Education

Variable	Mean
Musculoskeletal	Pre test
Disorders	Post test



**Figure 1.** Delivery of ergonomic educational materials



**Figure 2.** Playback of demonstration videos and simulation of *manual handling practices*

Community service activities ran smoothly and were conducive with 21 participants. Participants seemed enthusiastic about paying attention and asking questions during the activity. The majority of participants in this activity were over 30 years old, amounting to 66.67% (table.1). In research conducted by Indriyani, et al (2022) Age is related to the risk of MSDs. Age is a risk factor for MSDs, because at that age there is a deterioration in the body's physiology such as tissue regeneration to scar tissue, decreased fluid, and tissue damage. This results in decreased stability in muscles and bones. The older the individual, the higher the risk of the individual experiencing a decrease in elasticity in the bone, triggering the appearance of symptoms of MSDs (Helmina et al., 2019).

In table.2 shows the increase in ergonomic knowledge in workers. The pretest results showed that participants who had good knowledge were 24.86% and during the post-test increased to 80.96% after the delivery of educational materials. This also seemed to have an impact on the Musculoskeletal complaints of participants, where the original mean pretest value of Musculoskeletal complaints was 30.05 and after follow-up in the third week to reassess Musculoskeletal complaints there was a decrease in complaints to 28.76 (table.3). This shows that participants can receive the material that has been delivered well. During the activity, participants also actively asked questions and showed the enthusiasm of participants in this service activity.

Knowledge can be gained from direct experience or through the experience of others. Knowledge can be increased through counseling, both individually and in groups to increase health knowledge aimed at achieving individual behavior change in an effort to realize optimal health status. Knowledge gained either directly or from the experience of others always has levels as it increases and develops. At the time of acquiring knowledge a person will begin his knowledge in the process of simply knowing, which then increases to understanding after obtaining enough information to develop that knowledge. And along with the process of interaction that takes place dynamically and continuously makes the knowledge gained into something that eventually merges with the individual and will more or less affect his behavior patterns (Notoatmodjo, 2012). Workers who better understand the

principles of work ergonomics are at lower risk of injury. If ergonomic knowledge, work attitudes and working period are well controlled, then the risk of complaints of musculoskeletal disorders can be reduced (Balaputra & Sutomo, 2017).

### **CONCLUSION AND SUGGESTION**

Based on the results of pre-test and post-test on both questionnaires that have been carried out in this community service activity, it shows that ergonomic education can help improve ergonomic knowledge and reduce the risk of musculoskeletal disorders of workers. So it is hoped that ergonomic principles can be practiced while working to reduce the risk of complaints of musculoskeletal disorders

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### **AUTHOR'S CONTRIBUTION**

All authors have equal contributions to this paper.

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