Quasi-Experimental Study on the Use of Ergonomic Tools among Seaweed Workers in Takalar District

Yahya Thamrin[1], Iin Karmila Yusri[2], Masyitha Muis[3], Nurul Mawaddah Syafitri[4]

[1*,3,4]Department of Occupational Safety and Health, Faculty of Public Health, Hasanuddin University, Indonesia,
[2]Computer and Networking Engineering Study Program, Politeknik Negeri Ujung Pandang, Indonesia.
Corresponding Author: Yahya Thamrin

Abstract

The agricultural sector has many activities that are not standardized but vary according to daily and seasonal work needs. Musculoskeletal Disorders (MSDs) are the highest case experienced by seaweed farmers in Takalar Regency. Generally work positions that are not ergonomic causing MSDs. This study aimed to see the effect of musculoskeletal disorders before and after giving ergonomic work tools to seaweed farmers in Takalar Regency. This type of research uses a quasi-experimental Pretest Posttest Nonequivalent Control Group Design. The sample in this study was 72 seaweed workers, divided into 36 people in the intervention group and 36 in the control group. The research location is in Mangarabombang District, Takalar Regency. The research instrument also uses a Nordic body map to measure musculoskeletal disorders in seaweed workers. Data were analyzed using SPSS 24 software with the Wilcoxon test. This study concludes that there is a difference in the intervention group's average pre and posttest scores after being given ergonomic work tools. This also shows that providing ergonomic work tools reduces the complaints of MSDs in seaweed farmers in Takalar Regency. Further research is needed to examine other factors that can reduce the risk of MSDs in seaweed workers, such as medical history, working hours, and years of service.

Key Words: Seaweed Farmers, MSDS, Quasi-Eksperimental Study, Ergonomic Tools, Takalar

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Introduction

The ASEAN economy is mainly engaged in the service sector (50.6%), manufacturing (35.8%), and agriculture (10.5%). The agricultural industry contributes the most to informal employment in the ASEAN Region, followed by services, then drive (The ASEAN Secretariat, 2021). This is evidenced by data from the Indonesian Central Statistics Agency that as many as 28.33% of Indonesian workers are engaged in the agricultural sector (Badan Pusat Statistik, 2021).

Indonesia is the largest country in ASEAN, with a workforce of 140.15 million people in 2021 (Badan Pusat Statistik, 2021). In addition to formal workers, the contribution of labor is also dominated by informal workers. Millions of casual workers who work are often unprotected, for example, in the agricultural sector (The ASEAN, 2021). The risks and vulnerabilities of informal workers include limited labor rights and the absence of labor protection, such as decent working hours; minimum wage; protection against unpaid wages, unreasonable termination of employment, discrimination, and a work environment that does not meet standards or is unsafe. Moreover, it will be difficult for non-regular workers to access social security, including health care and maternity benefits. Support in case of unemployment, accident at work, disability or illness. retirement and retirement (The ASEAN Secretariat, 2019; International Labour Organization, 2019).

One of the dangers to informal workers in the agricultural sector is the danger of ergonomics. Ergonomics hazards with movement system disorders are the highest contributor to workplace-related disease morbidity (EU-OSHA-European Agency for Safety and Health at Work, 2020a). This is because the agricultural sector has many activities that are not standardized but change based on daily and seasonal work requirements. Agricultural activities also depend on environmental conditions and the type of equipment used (EU-OSHA- European Agency for

Safety and Health at Work, 2020a; EU-OSHA-European Agency for Safety and Health at Work, 2019). Although agricultural activities are characterized by extensive machinery and technical systems. Many manual tasks are still associated with movement. Repetitive movements of the limbs, such as carrying a load, pulling, pushing, and maintaining posture, can affect different areas of the body's joints (EU-OSHA- European Agency for Safety and Health at Work, 2020b).

Takalar Regency is one of the seaweed farming centers in South Sulawesi. Precisely in the Mangarabombang sub-district, most people depend on their lives by working as seaweed farmers. Secondary data from the Takalar District Health Center in 2019 found that the health problems felt by informal workers were dominated by the incidence of musculoskeletal disorders (18%), cardiovascular (10%), neurological disorders (7%), and ear, nose and throat disorders (2 %). MSDs is the highest case experienced by seaweed farmers in Takalar Regency. Work positions that are not ergonomic are the cause of MSDs (Mallapiang & Muis, 2021). The need for ergonomic work tools to control the incidence of MSDs in seaweed farmers (Thamrin et al., 2020).

For this reason, this study aimed to examine the effect of musculoskeletal disorders before and after providing ergonomic work tools to seaweed farmers in Takalar Regency.

Methods

This type of study uses a quasi-experimental pre-test post-test nonequivalent control group design. Respondents were divided into intervention and control groups. Each group underwent a pretest at the beginning of the study. Then the intervention was delivered. Namely, the intervention group was assigned ergonomic work tools, and the control group was given non-ergonomic work tools. Finally, at the end of the study, both groups were given a posttest. The sample for this study consisted of 72 seawed workers, divided into an intervention group of 36 and a control group of 36. The study design used is a non-equivalent control group design, so the experimental and control groups are not randomly selected. The research location is in Mangarabombang District, Takalar Regency. The research instrument also uses a Nordic body map to measure musculoskeletal disorders in seaweed workers. Data were analyzed using SPSS 24 software with the Wilcoxon test.

Results and Discussion

The characteristics in this study were measured by age, body mass index, and educational status. The following characteristics of respondents are shown in table 1.

Table 1. Characteristics of respondents

Characteristics	Intervention Groups		Control Groups	
	n	%	n	%
Age (Year)				
Young (<30)	6	16,7	6	16,7
Old (>30)	30	83,35	30	83,35
Body Mass Index				
Normal (< 25.00)	19	52,8	19	52,8
Fat (> 25.01)	17	47,2	17	47,2
Education				
Not completed in primary school	14	38,9	14	38,9
Graduated from elementary school	11	30,6	11	30,6
Graduated from junior high school	6	16,7	6	16,7
Graduated from high school	5	13,9	5	13,9

Source: Primary Data, 2021

Table 1 shows that the characteristics of respondents in both the intervention and control groups are dominated by old age (>30 years), which are 83.35% each. Then the body mass index of respondents in the two groups was mainly in the normal category, each of which was 52.8%, and those who were overweight were also 47.2% of the two groups. Finally, the characteristics of respondents in the Education category did not finish elementary school in the intervention and control groups, namely 38.9%, respectively.

The effect of ergonomic work tools on the intervention group and non-ergonomic work tools on the control group were analyzed using the Wilcoxon test. The following is described in table 2.

Table 2. Distribution of differences in the mean scores of Musculoskeletal Disorders pre and post test

Variable	Intervention Groups		Control Groups	
	mean	p-value	mean	p-value
MSDs				
Pre test	0,86	0,000	0,86	0,000
Post test	0,22		0,22	

Source: Primary Data, 2021

Table 2. shows the results of the Wilcoxon test that there is a difference in the average value of pre- and posttest MSDs after being given ergonomic work tools (p = 0.000 <0.05). So the study results indicate that the provision of ergonomic work aids can significantly reduce musculoskeletal disorders in seaweed farmers in Takalar Regency.

Musculoskeletal disorders can affect muscles, joints and tendons in any part of the body. Most work-related MSDs develop over time. They may be temporary or chronic and may be the result of work-related injuries. In addition, they may progress from mild to severe disability (HSE, 2021). The results showed that most respondents were in the old age category (83.35%). Musculoskeletal disorders are debilitating conditions that have a significant impact on health, especially in older people (Minetto et al., 2020). With age, musculoskeletal tissue becomes more fragile in bones, the cartilage becomes less elastic, ligaments become less elastic, muscle strength is lost, fat redistribution occurs, and tissues perform their normal functions. diminished ability (Minetto et al., 2020; Grote et al., 2019). This shows that the age of the seaweed farmers can cause musculoskeletal disorders.

Body mass index data on respondents in both the intervention and control groups showed the most in the normal category (52.8%). Body mass index (BMI), which is used to define overweight and obesity, has been associated with musculoskeletal disorders (WHO, 2020). Another study found that the body mass index of transport workers at the Perm BULOG warehouse in the Pematangsiantar subdivision was mostly in the normal category with up to 18 workers at a rate of 60% (Rosa et al., 2021). Another study by Rosa (2021) also found that 466 patients with an average body mass index of 42.77 kg/m2 had musculoskeletal disorders (Limbong & Widajati, 2021). This explains that body mass index can also cause musculoskeletal disorders.

Another respondent characteristic is the last education. The findings showed that most respondents were included in the category of not completing elementary school (38.9%) in both the intervention and control groups. Education affects one's knowledge. Factors that influence the occurrence of MSDs are lack of knowledge of ergonomic principles and their non-application in the workplace (Mohammad et al., 2019). Other studies have shown a relationship between knowledge of ergonomics and the incidence of MSDs (Zakerian et al., 2012).

Working as a seaweed farmer can cause musculoskeletal diso because the activities are carried out repeatedly and do not use ergonomic work tools. This study has conducted experiments on providing ergonomic work tools in the intervention group and non-ergonomic work tools in the control group. There was a difference in means with a p-value of 0.000. This means that there is an influence from the pre and posttest after being given a work tool. Ergonomic tools can help prevent soft tissue injuries and musculoskeletal disorders (MSDs) caused by sudden or sustained forces, vibrations, repetitive movements and awkward postures (NIOSH, 2018). So, it is necessary to design tasks, workspaces, controls, and equipment to suit workers' abilities and physical limitations (NIOSH, 2018; OSHA, 2016). Because there is an effect of ergonomic equipment for the prevention of musculoskeletal disorders, especially in workers' upper extremities and neck (Tort et al., 2020).

Conclusion

This study concludes that there is a difference in the intervention group's average pre and posttest scores after being given ergonomic work tools. This also shows that providing ergonomic work tools reduces the complaints of MSDs in seaweed farmers in Takalar Regency. However, more research is needed to examine other factors that may reduce MSD risk among seaweed workers, such as: Medical history, hours worked, and years of service.

Author Contributions

Y.T. conceived, designed the experiments, and analyzed the data; I.K.Y. and M.M performed the experiments and prepared analysis tools; N.M.S wrote the paper.

Conflicts of Interest

The authors declare no conflict of interest.

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