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RESEARCH ARTICLE

The Influence of Physical Workload and Work Fatigue on Musculoskeletal Disorder Complaints Among Employees of the South Sulawesi Education Quality Assurance Center Office

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ABSTRACT

Musculoskeletal is one of the complaints in the skeletal muscle area that can be felt by someone ranging from mild complaints to very painful. This can happen if the muscles often receive static loads repeatedly and for a long time. Factors that can cause musculoskeletal complaints include excessive stretching, repetitive activities, unnatural attitudes.

This study aim to determine the effect of physical workload and work fatigue on musculoskeletal disorder complaints

An observational method combined with a cross-sectional approach was the research methodology used. 87 respondents make up the sample size that is determined using the Lemeshow formula. Then tested using the chi-square test by applying the SPSS application.

Based on the outcomes of statistical analyses, it seems that Work Posture (P=0.001) and Work Fatigue (P=0.007) are related, but Body Mass Index (P=0.073) and Physical Workload (P=0.989) are unrelated

Physical Workload affects Musculoskeletal Disorder Complaints, while Work Fatigue has no effect.

INTRODUCTION

Fatigue is a contributing factor to various work-related ailments. A physical state brought on by fatigue is typified by sensations of exhaustion and a loss of focus. It is possible to view fatigue as the body's defense mechanism against additional harm, allowing for healing following rest. (Susoko and Zetli, 2023). Work fatigue can result in a decrease in a person's efficiency and endurance at work. This term refers to a condition where the workforce is weakened in carrying out an activity, which can result in a reduction in work capacity and body endurance (Gaol et al, 2018).

Work fatigue can result in injuries, work accidents and even death, especially in high-risk jobs. Severe fatigue can make someone stop working because that person is no longer able to continue working. Workers who are constantly forced to work can have a negative impact on body health which can result in a decrease in physical fitness which is characterized by weakened breathing, dizziness, thirst, hoarseness, bad mood, headaches, stiff shoulders, and can even experience back pain or regular called Musculoskeletal disorders (MSDs) (Susoko and Zetli, 2023).

According to the most recent data published by the International Labor Organization (ILO) in 2018, 2.78% of workers died annually as a result of work-related illnesses and accidents (Patandung and Widowati, 2022). Musculoskeletal disorders are the second most common cause of disability

worldwide, according to the Global Burden of Disease 2019 report. This ranking is based on the number of Years Lived with Disabilities (YLWDs). Around 1.71 billion people experience complaints of MSDs worldwide. As many as 427 million people in the West Pacific region and Southeast Asia, 369 million people have MSDs complaints. MSDs are the world's largest contributor to years lived and disability and are estimated at around 149 million (WHO, 2022).

In Indonesia, musculoskeletal prevalence based on doctor's diagnosis was 7.3% in 2018. Aceh province was the highest at 13.3% and the lowest was West Sulawesi province at 3.2%. Meanwhile, based on population age ≥15 years, the profession is farmer/farm laborer (9.90%), civil servant/TNI/BUMN profession (7.50%), fisherman (7.40%), laborer/driver/domestic helper (6, 10%). Prevalence is related to location in rural (7.8%) and urban (6.9%). Based on Riskesdas data, musculoskeletal complaints are highest experienced by informal sector workers (RISKESDAS, 2018).

In addition to individual characteristics (age, length of service, smoking habits, BMI, and gender), musculoskeletal diseases (MSDs) are disorders of the musculoskeletal system brought on by job and worker performance, such as abnormal body posture, load, duration, and frequency. Muscle-related problems from MSDs include tingling, numbness, cramping, stiffness, swelling, brief motions or contractions, and decreased flexibility. According to Ferusgel et al. (2019), prolonged exposure to repetitive static pressures on muscles can result in joint, ligament, and tendon injury. Workers experience a range of musculoskeletal symptoms in their skeletal muscles, from extremely slight to excruciating (Tarwaka, 2015).

Numerous variables contribute to MSD problems, one of which is the work period factor that is, repeated work that is done daily. Therefore, it is necessary to identify employee work activities by measuring workload and work fatigue. South Sulawesi Education Quality Assurance Center (BBPMP) office is an institution established in the education sector in order to improve the quality of primary, secondary and community education in the province. BPMP employees work 8 hours per day from 08.00 to 16.30. While working, the employee is in a sitting position while operating the computer. The process is carried out continuously on a chair, causing musculoskeletal complaints. The purpose of the study was to determine the influence of physical workload and work fatigue on musculoskeletal disorder complaints in employees of the South Sulawesi Education Quality Assurance Center.

MATERIAL AND METHODS

This type of research is observational with a cross-sectional approach, based on information from interviews and the results of questionnaire measuring instruments. The research sample consisted of 87 respondents who met the inclusion criteria. The measuring tools in this study were measurements of physical workload in the form of Cardiovascular Load (%CVL), Questionnaire for Measuring Feelings of Work Fatigue and Nordic Body Map Questionnaire.

DATA ANALYSIS

The data obtained is primary data in the form of physical workload, work fatigue and musculoskeletal disorder complaints. Data analysis used SPSS (Statiscal Program for Social Science) version 25.0, univariate, bivariate and multivariate with the statistical techniques Chi-square Test and Logistic Regression Test.

RESULT

The sample in this study was 87 respondents who worked at the Center for Education Quality Assurance. Based on Table 1, the gender of the respondents consisted of 45 (51.7%) male respondents and 42 (48.3%) female respondents. The largest number of respondents were respondents in the 41-50 year age range, 41 (47.1%) respondents, and the fewest respondents were respondents in the 21-30 year age range, 6 (6.9%) respondents.

Based on the results of Table 1, it can be seen that of the 87 respondents who work at BBPMP, the most respondents are respondents in the age range 41-50 years as many as 41 (47.1%) respondents, and the fewest respondents are respondents in the age range 21-30 years as many as 6 (6.9%) respondents. With male gender, there were 44 (50.6%) respondents and female respondents were 43 (49.4%) respondents. Regarding D3 education, there were 5 (5.7%) respondents, 40 (46.0%) respondents with a bachelor's degree, 38 (43.7%) respondents with a master's degree, and 38 (43.7%) respondents with a doctoral degree. as many as 4 (4.6%) respondents.

Based on the table above, respondents with a working period of <6 years were 18 (20.7%) respondents, respondents with a working period of 6-10 years were 43 (49.4%) respondents and respondents with a working period of >10 years were 26 (29 .9%) respondents. The working hours of respondents were <8 hours/day as many as 46 (52.9%) respondents and respondents with working hours >8 hours/day were 41 (47.1%) respondents.

Table1. Distribution of Respondents

Distribution of Respondents		**Frequency**	
		n	**%**
Age	21-30 years old	6	6.9
	31-40 years old	14	16.1
	41-50 years old	41	47.1
	51-60 years old	26	29.9
Gender	Man	44	50.6
	Woman	43	49.4
Last education	Diploma 3 (D3)	5	5.7
	Bachelor degree	40	46.0
	Master (S2)	38	43.7
	Doctoral (S3)	4	4.6
Years of service	<6 years	18	20.7
	6-10 years	43	49.4
	>10 years	26	29.9
Length of working	<8 hours/day	46	52.9
	>8 hours/day	41	47.1

Source: Primary Data, 2024

Table 2 shows that the chi-square test analysis yielded a p value of 0.073, indicating that the p value is larger than 0.05 (0.073>0.05), hence rejecting Ha and accepting Ho. This demonstrates that among employees of the Office of the Center for Education Quality Assurance, there is no discernible correlation between body mass index and musculoskeletal problems. The chi-square test yielded a p value of 0.001, indicating that Ha is accepted and Ho is rejected because the p value is less than 0.05 (0.001<0.05). This indicates that among Center for Education Quality Assurance (BBPMP) personnel, musculoskeletal problems and work attitudes are significantly correlated. Ha is rejected and Ho is accepted based on the chi-square test findings, which showed a p value of 0.989, meaning the p value is more than 0.05 (0.989>0.05). This indicates that musculoskeletal symptoms among Center for Education Quality Assurance personnel are not significantly correlated with physical workload. The chi-square test yielded a p value of 0.007, meaning that Ha is accepted and Ho is rejected because the p value is bigger than 0.05 (0.007<0.05). This indicates that among Center for Education Quality Assurance personnel, musculoskeletal problems and work tiredness are significantly correlated.

Table 2. Analysis of independent variables with musculoskeletal complaints among employees of the Center for Education Quality Assurance (BBPMP).

Body mass index	Musculoskeletal Complaints						P Value
	Low		Tall		Amount		
	n	%	n	%	n	%	
Normal	33	67.3	16	32.7	49	100	0.073
Obesity	32	84.2	6	15.8	38	100	
Total	65	74.7	22	25.3	87	100	
Work Posture/Work Attitude	Musculoskeletal Complaints						P Value
	Low		Tall		Amount		
	n	%	n	%	n	%	
Not Ergonomic	36	63.2	21	36.8	57	100	0.001
Ergonomic	29	96.7	1	3.3	30	100	
Total	65	74.7	22	25.3	87	100	
Physical Workload	Musculoskeletal Complaints						P Value
	Low		Tall		Amount		
	n	%	n	%	n	%	
Light	62	74.7	21	25.3	83	100	0.989
Heavy	3	75	1	25	4	100	
Total	65	74.7	22	25.3	87	100	
Work Fatigue	Musculoskeletal Complaints						P Value
	Low		Tall		Amount		
	n	%	n	%	n	%	
Often	35	64.8	19	35.2	54	100	0.007
Never	30	90.9	3	9.1	33	100	
Total	65	74.7	22	25.3	87	100	

Source: Primary Data, 2024

According to Table 3, the logistic regression analysis revealed that two variables : work posture (0.020) with an Exp value (B) of 12.294 and work fatigue (0.27) with an Exp value (B) of 5.017 had an impact on musculoskeletal complaints (<0.05). According to the results of the variable test, musculoskeletal disorder complaints were influenced by the variables of work posture and job weariness.

Table 3. Logistic regression results of physical workload and work fatigue on musculoskeletal complaints

Variables In The Equation					
Variable	**B**	**S.E**	**Wald**	**Sig.**	**Exp(B)**
Body Mass Index	-1,145	,616	3,461	,063	,318
Work Posture	2,509	1,076	5,439	,020	12,294
Physical workload	-,563	1,334	,178	,673	,570
Work Fatigue	1,613	,729	4,899	,027	5,017
Constant	-6,246	2,816	4,921	,027	,002

Source: Primary Data, 2024

DISCUSSIONS

In research conducted at the office of the Center for Education Quality Assurance located at Jl. AP Pettarani, Banta-Bantaeng, District. Rappocini, Makassar City, South Sulawesi. Work in the field of education quality assurance involves a variety of critical tasks to ensure the quality and high

standards of education. Professional employees in this field are responsible for designing and implementing quality policies, developing evaluation instruments, and conducting regular audits to improve children's education. In general, employees work in front of a computer to analyze evaluation data and create performance reports, and prepare recommendations for improvement with a working time of eight hours a day. This task requires precision, strong analytical skills, and effective communication skills. Workers in education quality assurance can help educational institutions achieve and maintain quality standards in the education sector in South Sulawesi Province.

Length of service is often a factor in influencing employee well-being. Employeeswork eight hours a day for five days a week, with some who may have flexible schedulesor work longer hours depending on their roles and responsibilities. The length of a good working day is generally between six and ten hours. The rest is spent on family and community life, rest, sleep and so on. Extending working hours beyond one's capabilitiesusually leads to inefficiency, ineffectiveness and unproductiveness. Physical workloads in offices are usually lighter than those in the field, but being in a workplace with monotonous movements and the same work attitude can lead to complaints related to musculoskeletal disorders (Gede et al, 2023). In addition, the pressure to complete targeted tasks within a certain deadline can add to mental and emotional stress. Work fatigue in the office often results from a combination of high workload and lack of adequate rest time (Nurdiawati, 2020). To combat this, it is important for employees to organize regular breaks, exercise lightly, ensure ergonomic work postures. With the right approach, employees can maintain a balance between productivity and health, so they can work more efficiently and feel better in the long run (Sudirman, 2021).

The results of statistical tests conducted found no relationship between body mass index and musculoskeletal complaints. Height and weight are factors that can cause musculoskeletal complaints. The size of a person's body causes the condition of the balance of the skeletal structure in receiving loads, both body weight loads. The fatter a person is, the greater the musculoskeletal complaints will be, because the majority of respondents have a normal body mass index. Although there is no relationship between body mass index, respondents should still maintain their nutritional intake so that the bodydoes not easily experience fatigue.

Based on research conducted by Komalig et al, (2018) related to the relationship between body mass index and musculoskeletal complaints in Aviation Security workers at Sam Ratulangi International Airport Manado, the results obtained from the data show that of the 38 respondents five respondents with obese BMI 40.0% experienced moderate musculoskeletal complaints. Judging from the significance value of 0.652 with a significance greater than 0.05, there is no relationship between BMI and musculoskeletal complaints. The parallel research conducted by Rika and Dwiyanti (2019) obtained research results as much as (59%) of respondents have a body mass index of fat (overweight). Based on the Spearmen correlation test, there is no relationship between the body mass index of container crane operators and musculoskeletal disorder complaints experienced with a significance value (p=0.585).

Based on the results of statistical tests, it is found that there is a significant relationship between work posture/work attitude and musculoskeletal disorder complaints. This study shows that the higher the risk of work attitudes, the higher the musculoskeletal disorder complaints. Work attitudes that are not ergonomic over a long period of time can cause MSDs complaints. Poor posture becomes a problem in the skeletalmuscles. Efforts should be made to stretch between work in front of the computer to reduce the accumulation of lactic acid due to prolonged unergonomic work attitudes.

The most common complaint is felt in the neck, this tends to be affected by office workers (Presti et al, 2019). Another study obtained the results of discomfort in the upperback and lower back then other pain areas followed by neck pain (Riyahi et al, 2019). Many factors can cause differences in

examination results such as the work environment (Taib et al, 2021). Meliani et al.'s (2022) parallel investigation revealed a substantial correlation between Komodo wholesale freight workers' work attitudes and their complaints of musculoskeletal problems, with a p-value of less than 0.001 and an r-value of 0.85. There was a correlation between work attitudes and musculoskeletal disorder complaints (p value 0.011 <0.05) and a r value of 0.346, according to the findings of a parallel study by Maulina et al. (2024) about the relationship between work attitudes and the incidence of musculoskeletal complaints among hospital nurses.

Physical workload refers to the physical demands placed on a person during certainactivities or work. Based on the results of statistical tests there is no relationship betweenphysical workload and musculoskeletal complaints. This is due to muscle fatigue due to work in the metabolism for the muscles to work and recover because the recovery time isfulfilled so that there is no overload at work. As well as several factors such as adequatenutritional intake, working in front of a computer with adequate rest hours can prevent excessive workload. The pulse rate changes according to changes in loading. Thelightness of the workload received by a person can be used to determine how long a person's ability to perform their work activities. If not done ergonomically, it can cause complaints in certain muscles. BBPMP employees have a good fitness level. The body does physical work there will be changes in heart rate and oxygen consumption. When aperson starts working, heart rate and oxygen levels increase to meet optimal needs. The increase that occurs is not sudden, so this need is met first by the energy stored in the muscles. While resting, heart rate and oxygen consumption will decrease slowly to normalconditions.

The findings of this study are consistent with a study by Laksono et al. (2023) that revealed no correlation between janitors' complaints of musculoskeletal problems and workload (Chi Square test p>0.05) at Dr. Moewardi Solo Hospital. In accordance with this study, Khofiyya et al. (2019) investigated the relationship among workload, work climate, and work posture among airport baggage handling service workers. The chi square test results showed that there was no correlation between physical workload and musculoskeletal complaints, but there was a correlation between work climate and work posture and musculoskeletal complaints (p value of 0.101 greater than 0.05).

According to the findings of this study's statistical tests, there is no correlation between work fatigue and complaints of musculoskeletal disorders because each employee works at a different intensity, allowing them to rest and lowering the factors that trigger skeletal muscle complaints. Lethargy is a state of low energy brought on by lack of sleep or rest, whereas the tiredness in issue is caused by excessive physical activity and is distinct from exhaustion brought on by mental and emotional stress. There are two forms of fatigue: central and peripheral (neuromuscular); the former regulates the joints of the lower limbs and the likelihood of harm. Fatigue can also make it harder for muscles to contract and relax. Consequently, weariness will raise the chance of developing MSDs (Sani and Widajati, 2021).

The study's findings are consistent with those of Hastuti et al. (2023), which found that the following factors are unrelated to complaints of musculoskeletal disorders among computer-using employees: age (p value = 0.080 or p value <0.05), working period (p value = 0.226 or p value <0.05), workload (p value = 0.240 or p value <0.05), work fatigue (p value = 0.423 or p value <0.05), exercise habits (p value = 1.000 or p value<0.05), and work attitude (p value = 0.253 or p value<0.05). Research on the relationship between work posture and work period to musculoskeletal complaints in bus drivers was carried out by Danur et al. in 2022. The findings indicated that work posture has a relationship with musculoskeletal disorder complaints (p=0.024) and work fatigue (p=0.000). Working hours are associated with weariness but not with symptoms of musculoskeletal disorders (p=0.714). Musculoskeletal diseases and work weariness are unrelated (p=0.953). With values of 0.42 and 0.007, work posture affects musculoskeletal problems through fatigue. Musculoskeletal problems are influenced by working hours, with values of 0.20 and 0.007.

However, to maintain the body rather than fatigue, BBPMP employees should stretch at least 15 minutes and maintain posture so that it remains ergonomic and does noteasily experience fatigue. Fatigue is a form of body defense so that the body does not experience further damage, and recovery can occur after resting. Prolonged fatigue can cause musculoskeletal disorder complaints. And work positions that are carried out monotonously can affect skeletal muscles. Adequate sleep is a form of prevention of occupational fatigue.

CONCLUSION

Work fatigue and work attitude/posture have a significant effect on musculoskeletal problems. While physical workload and body mass index, do not have a significant effect on the appearance of musculoskeletal complaints in employees of the South Sulawesi Office of Education Quality Assurance Center.

Ethical approval by the Public Health Faculty, Hasanuddin University (Number: 973/UN4.14.1/TAPI.01.02/2024). Before data collection and interviews, the researcher explained the research objectives, methods and written consent.

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