

Risk Analysis of Work Posture and Body Mass Index to Musculoskeletal Disorders among Librarians at Universitas Airlangga

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ABSTRACT

Introduction: Potential ergonomic hazards at work can lead to complaints of musculoskeletal disorders (MSDs). The Global Burden of Disease estimated that, by 2019, there were about 1.71 billion people in the world living with musculoskeletal problems. One of the jobs that has this risk is librarians because their jobs are dominated by static postures. This study aims to determine the correlation between work posture and body mass index (BMI) with MSDs complaints among librarians at Universitas Airlangga. **Methods:** This study is an analytical observational research with a cross-sectional design. The sample of this study consists of the total population of librarians at Universitas Airlangga that met the inclusion criteria, totaling 28 librarians. Primary data were obtained through the direct distribution of questionnaires to librarians, observations of work posture and musculoskeletal complaints in librarians. The data in this study were analyzed using the Spearman rank correlation test. **Results:** The research results showed that the level of mild MSDs complaints was reported by 7 librarians (25.0%), moderate complaints by 13 librarians (46.4%), and severe complaints by 8 librarians (28.6%). The statistical test results indicate a strong and positive correlation between work posture and MSDs complaints ($r = 0.444$), while a weak and positive correlation was found between BMI ($r = 0.222$) and years of service ($r = 0.158$) with musculoskeletal disorders complaints. **Conclusion:** This study concludes that librarians in high-risk work postures may experience musculoskeletal disorders complaints, especially in the neck, shoulders, and back areas.

Keywords: body mass index, librarians, MSDs, work posture

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INTRODUCTION

Health problems that can occur during the work process are Work-Related Musculoskeletal Disorders (WMSDs). An examination of the data from the Global Burden of Disease (GBD) 2019 revealed that around 1.71 billion individuals worldwide were affected by musculoskeletal disorders. These conditions encompass low back pain, neck pain, fractures, other injuries, osteoarthritis, amputation,

and rheumatoid arthritis (WHO, 2022). These problems are very commonly experienced by most workers in the workplace. Extensive studies on musculoskeletal disorders reveal that issues related to skeletal muscles are the most commonly experienced by workers (Laksana and Srisantyorini, 2020). These disorders are chronic, primarily due to muscles enduring static loads over an extended period. This continuous stress can lead to damage to tendons, muscles, ligaments, joints, nerves, cartilage, or spinal discs (Wicaksono and Adiputra, 2021). The resulting effects include discomfort, pain, itching, and functional weakness. Moreover, these conditions have the potential to cause serious injuries.

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The results of the European Occupational Diseases Statistic on Work-Related Diseases also explain that the prevalence of musculoskeletal disorders is 38.1%, with the remaining being neurological disorders (20.9%) and sensory organ disorders (12.8%) (de Kok, 2019). A statistics analysis titled "Work-related ill health and occupational disease in Great Britain" states that, from 2022 to 2023, there were almost 500,000 cases of MSDs (Health and Safety Executive, 2023). The most common work-related diseases among workers are musculoskeletal disorders, cardiovascular diseases, digestive disorders, as well as disorders caused by a lack of physical activity (Golinko *et al.*, 2020).

As per the information provided by the Centers for Disease Control and Prevention, musculoskeletal problems arise from various risk factors, including sudden or prolonged exposure to repetitive movements, vibrations, force, awkward positions, and, frequently, overexertion (CDC, 2022). These factors can significantly impact a worker's capacity to carry out various tasks, such as lifting, pushing, pulling, and enduring torque reactions and vibrations from machinery and tools. These factors are often found in the workplace, especially among office workers whose work is mostly static.

One of the most risky jobs is librarians. The work of librarians is often done behind tables in static work positions for a long time. Besides, librarians also perform administrative services, procurement of library collections, and dissemination of the library collection to potentially form awkward postures such as lowering, raising, pushing, and rotating. Therefore, the risk of musculoskeletal disorders in librarians is quite high.

According to previous research findings regarding ergonomic risk factors associated with musculoskeletal disorders in office employees, 44.2% of the respondents reported experiencing moderate-severe MSDs complaints (Cormita, 2023). A previous study also found a positive correlation between ergonomic factors and MSDs complaints, so the higher the risk of ergonomic factors, the more severe the MSDs complaints will be (Prabarukmi and Widajati, 2020).

Ergonomic factors related to MSDs symptoms include work posture and years of service. Job-related factors include awkward working postures, prolonged sitting, and chair design. Jobs performed with unnatural body postures can lead to musculoskeletal disorders complaints. The research

results on the correlation between individual factors and work posture with musculoskeletal disorders complaints conclude that the librarian's work posture during tasks poses a high risk of MSDs complaints (Treesyanova, 2018). Previous research (Wardana *et al.*, 2023) shows a significant correlation between body mass index and complaints of lower back pain. This can occur because individuals with excess weight have a high amount of adipose tissue around muscles and joints, exerting pressure on musculoskeletal tissues that may lead to pain.

Years of service are one of the factors that contribute to muscle problems. The longer someone works, the higher the risk of experiencing muscle problems. Considering the librarian's job involves prolonged periods of sitting, this undoubtedly has negative consequences. This statement is supported by previous research results that showed that the majority of shelving book librarians (40.74%) had musculoskeletal disorders complaints with severe levels of risk (Treesyanova, 2018). Extended periods of work lead to muscle and bone fatigue, affecting the endurance of muscles as one works over time.

Based on the background above, it is known that the incidence of musculoskeletal disorders in the world is quite large and anyone is at risk of experiencing it, without exception, including librarians. Moreover, librarians do a lot of static work and tend to form an awkward posture. However, research into these librarians is still rare.

Based on the preliminary study, it is known that Universitas Airlangga has three central libraries with different locations. During the pandemic alone, the number of visits from October 2020 to November 2021 was 2,739. This is much less than the years before the pandemic. The work carried out by the librarians includes writing books, processing, and administration processes that require working in front of a computer, sitting for long periods of time, and standing with hands reached up and legs shaken. Such positions, when performed daily with long durations of work, will result in disturbances in soft tissues such as muscles, tendons, ligaments, joints, and the nervous system. Based on observations and brief interviews with librarians, some librarians complain about the lack of leg movement, so the legs are in a suspended condition.

Due to some of those factors, the researchers conducted research into the risk factors for musculoskeletal complaints in the Universitas Airlangga library. Some of the things that distinguish this research from previous research are the use of

different methods, subjects, and times of research, so it is expected that this research can be a reference for updating previous research.

METHODS

This study was an analytical observational research. Observational research was chosen because it only collects facts without intervening or treating the research object. Meanwhile, analytical research was employed because the researcher aimed to analyze the correlation and strength of the exposure and its consequences. The research design used is a cross-sectional study where the data collection of dependent and independent variables is conducted at one point in time (point time approach). In terms of data analysis, this study falls under descriptive research.

This study consisted of a total sample of all the librarians in the Universitas Airlangga library, totaling 28 respondents. The inclusion criteria for respondents were employees who have a minimum of one year of work experience, were aged between 17 and 55 years, were in good physical and mental health, were employed at Universitas Airlangga Library in Surabaya, and were willing to be interviewed. Data collection was conducted in May 2023.

This research underwent an ethical review process and obtained ethical clearance with No. 48/EA/KEPK/2022, ensuring that the data collection process adhered to the applicable ethical standards. Furthermore, the dependent variable in this study was the level of musculoskeletal disorders complaints among librarians during work. Meanwhile, the independent variables in this study consist of body mass index (BMI), work posture, and years of service.

Primary data were collected using questionnaires and instruments through direct interviews. The instrument used to assess work postures was the Quick Exposure Checklist (QEC). The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was employed to determine which parts of the body experienced pain or discomfort, and the individual characteristics questionnaire contained questions related to individual factors, including age, years of service, and body mass index. In previous research, the Quick Exposure Checklist (QEC) and CMDQ questionnaire were declared valid and reliable for use. Meanwhile, secondary data were obtained from

the institution to determine the number of librarians, their duties, and librarian placements.

The obtained data were then statistically analyzed both univariately and bivariately. Univariate analysis is an analysis conducted on each variable used in the research. The analysis of the research results was carried out descriptively, producing frequency distribution tables and percentages used to understand the overview of BMI, work posture, and years of service.

In this research, the BMI was divided into three categories: normal, overweight, and obesity. Work posture was categorized into low risk, medium risk, and high risk. The years of service was categorized into three categories: less than 6 years, 6 to 10 years, and more than 10 years. Meanwhile, the dependent variable, musculoskeletal disorders complaints, was divided into three categories, namely mild, moderate, and severe.

Bivariate analysis was conducted using the Rank Spearman correlation test to observe and illustrate the correlation and strength of the correlation between independent variables (body mass index, work posture, and years of service) and the dependent variable (musculoskeletal disorders complaints). In the last step, the author also used a program with artificial intelligence (AI) technology to do a grammatical check on this article. The AI program used is QuillBot, which helps authors detect grammatical errors in their writing.

RESULTS

The study was conducted on 28 librarians at Universitas Airlangga to find out the correlation between BMI, work posture, and years of service with musculoskeletal disorders complaints. The results of the univariate analysis of all variables can be seen in Table 1.

Body Mass Index

Body mass index is a calculation of weight divided by height. The distribution of respondents based on BMI is shown in Table 1. The result indicated that the majority of librarians at Universitas Airlangga have a normal BMI, specifically 15 librarians or 53.6%. Meanwhile, three librarians or 10.7% fall under the overweight category and 10 librarians or 35.7% were categorized as obese, among the total number of librarians at Universitas Airlangga.

Work Posture

The results of observations and research conducted on 28 librarians at Universitas Airlangga Library obtained documentation of work posture images in Figure 1, the back posture; Figure 2, the shoulder-arm posture; and Figure 3, the hand posture.

The risk factors in four body parts, namely the back, neck, shoulders/arms, and wrists, considering elements that can influence musculoskeletal disorders complaints such as duration, frequency, and load, were analyzed using the Quick Exposure Checklist (QEC) instrument. There are two questions that will be combined in one table so that the final value of the body component can be obtained. Exposure scores obtained from the spreader sheet were then converted using the QEC-level exposure

formula to find out what to do. Exposure levels are classified as low (safe), moderate (need further research), high (need further research and change), and very high (research and change are carried out promptly). Meanwhile, the results of the exposure levels for body positions are presented in Table 2.

Table 1. Univariate Analysis of all Variables of Respondents Working as Librarians at Universitas Airlangga Library in 2023

Variable	Frequency (n)	Percentage (%)
Body Mass Index		
Normal	15	53.6%
Overweight	3	10.7%
Obese	10	35.7%
Work Posture		
Low Risk	7	25%
Medium Risk	2	7.1%
High Risk	19	67.9%
Years of Service		
< 6 Tahun	3	10.7%
6 – 10 Tahun	2	7.1%
> 10 Tahun	23	82.1%
MSDs Complaints		
Mild	7	25%
Moderate	13	46.4%
Severe	8	28.6%



Figure 1. Back Posture



Figure 2. Arm-Shoulder Posture

Table 2. Distribution of Complaint Levels in the Body Parts of Respondents Working as Librarians at Universitas Airlangga Library in 2023

Body Parts	Exposure Levels							
	Low		Medium		High		Very High	
	n	%	n	%	n	%	n	%
Back (Static)	7	25	19	67.9	2	7.1	0	0
Arm / Shoulder	8	28.6	19	67.9	1	3.6	0	0
Wrist	10	35.7	15	53.6	3	10.7	0	0
Neck	3	10.7	5	17.9	8	28.6	12	42.9

In terms of back category, seven librarians or 25% were in low exposure level, 19 librarians or 67.9% were in medium level, and two librarians or 7.1% were in the high level. Meanwhile, in the shoulder/arm category, eight librarians or 28.6% fall into the low category, while 19 librarians or 67.9% fall into the medium category. Furthermore, in terms of the exposure level in the wrist category found that 15 librarians or 53.6% were in the medium category, with the remaining 10 librarians or 35.7%, and three librarians or 10.7% were in the low and high levels, respectively. In addition, the exposure level for the neck region shows that 12 librarians or 42.9% fall

into the very high level, while eight librarians or 28.6% fall into the high level.

Based on observations on the above body parts, taking into account the position, duration, frequency and workload as a librarian at Airlangga University, Table 1 shows the result of the risk distribution on the work posture was as follows: seven employees (25%) have low risk, two employees (7.1%) have medium risk, and 19 employees (67.9%) have high risk. Therefore, it can be concluded that the majority of work postures pose a high risk. Therefore, further investigation and changes in the librarian's work postures are needed.

Years of Service

The respondents' years of service was calculated based on the duration from when the librarians initially started working at Universitas Airlangga Library until the implementation of the research. The result of this research in Table 1 shows that the majority of librarians at Universitas Airlangga have been working for 10 years, with 23 librarians or 82.1% of the total librarians. Meanwhile, librarians with less than six years of service are three librarians or 10.7% of the total, and two librarians or 7.1% have 6-10 years of service.

Musculoskeletal Disorders (MSDs) Complaints

Table 1 showed the results of the assessment using the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) instrument. This questionnaire was used to identify diseased parts of

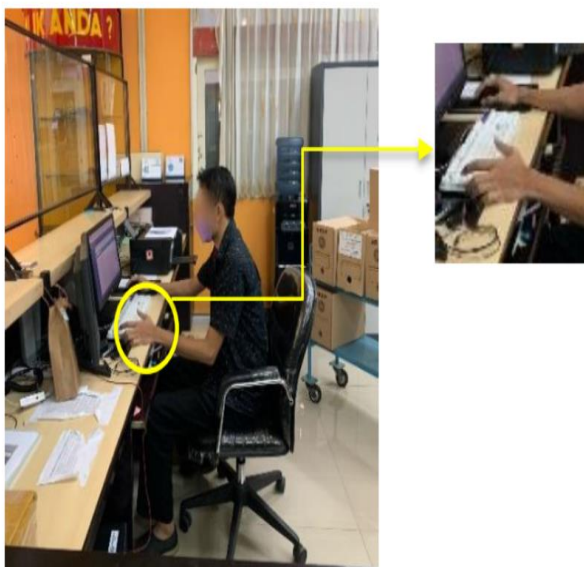


Figure 3. Hand Posture

Table 3. Cross-tabulation between Body Mass Index and Musculoskeletal Disorders Complaints in Librarians at Universitas Airlangga in 2023

Body Mass Index	Severity of Musculoskeletal Disorders Complaints						Total	Correlation Coefficient	
	Mild		Moderate		Severe				
	n	%	n	%	n	%	N		%
Normal	6	40.0	5	33.3	4	26.7	15	100	0.222
Overweight	0	0.0	2	66.7	1	33.3	3	100	
Obese	1	10.0	6	60.0	3	30.0	10	100	

Table 4. Cross-tabulation between Work posture and Musculoskeletal Disorder Complaints in Librarians at Universitas Airlangga in 2023

Work Posture	Severity of Musculoskeletal Disorders Complaints						Total	Correlation Coefficient	
	Mild		Moderate		Severe				
	n	%	n	%	n	%	N		%
Low Risk	3	42.9	4	57.1	0	0.0	7	100	0.444
Medium Risk	1	50.0	1	50.0	0	0.0	2	100	
High Risk	3	15.8	8	42.1	8	42.1	19	100	

the body. As for this method, there were additional questions about the prevalence of musculoskeletal pain, whether it impedes the respondents' performance at work and its severity. The obtained results indicate mild musculoskeletal disorders complaints in seven librarians, accounting for 25%. Thirteen librarians experienced moderate musculoskeletal disorders complaints, constituting 46.4%. Meanwhile, eight librarians reported severe musculoskeletal disorders complaints, accounting for 28.6%.

The Correlation between Body Mass Index with Musculoskeletal Disorder Complaints

Table 3 shows the results that 15 librarians with normal BMI were dominated by those who experienced mild-level musculoskeletal disorders complaints, specifically six librarians or 40%. Meanwhile, of librarians with overweight (66.7%) and obese (60%) BMI, the majority experience moderate-level musculoskeletal disorders complaints. It can be concluded that librarians with a normal BMI tend to experience mild musculoskeletal disorders complaints.

The results of data analysis using the Spearman rank correlation test yielded a correlation coefficient value of 0.222. The level of correlation between the independent variable and the dependent variable indicates a weak correlation between BMI and musculoskeletal disorders complaints. Meanwhile, the direction of the correlation was positive because the value of r was positive. This means that as the BMI increases, the complaints of musculoskeletal disorders among librarians at Universitas Airlangga also increase.

The Correlation between Work Posture with Musculoskeletal Disorders (MSDs)

Table 4 shows that out of eight librarians with a severe level of musculoskeletal disorders complaints, all or 100% of them are librarians whose work

postures are at high risk. Similarly, librarians with a moderate category of musculoskeletal disorders complaints mostly come from librarians whose work postures are at high risk. Thus, it can be concluded that the more unsafe the librarian's work posture, the greater the impact on musculoskeletal complaints among librarians. The results of the data analysis using the Spearman rank correlation test produced a correlation coefficient value of 0.444.

The level of correlation between the independent variable and the dependent variable indicates a fairly strong correlation between work posture and musculoskeletal disorders complaints. Meanwhile, the direction of the correlation is positive because the value of r is positive. This means that the more at risk the librarian's work posture, the higher the level of musculoskeletal complaints will be.

The Correlation between Years of Service and Musculoskeletal Disorder Complaints

Table 5 indicates that eight librarians experienced severe MSDs complaints, of which seven librarians have work experience exceeding 10 years, while only one librarian has work experience of 6-10 years. Similarly, librarians with moderate MSDs complaints amount to 13 librarians, where the majority have work experience exceeding 10 years, and two librarians have work experience of less than six years. This implies that the longer the years of service, the more it influences the level of MSDs complaints among librarians.

The results of the data analysis using the Spearman rank correlation test yielded a correlation coefficient value of 0.158. The level of correlation between the independent variable and the dependent variable indicated a weak correlation between years of service and musculoskeletal disorders complaints. Meanwhile, the direction of the correlation was positive because the value of (r) is positive. This means that the longer the years of service, the higher the complaints of musculoskeletal disorders among librarians at Universitas Airlangga.

Table 5. Cross-tabulation between Years of Service and Musculoskeletal Disorders Complaints in Librarians at Universitas Airlangga in 2023

Years of Service	Severity of Musculoskeletal Disorders Complaints						Total	Correlation Coefficient	
	Mild		Moderate		Severe				
	n	%	n	%	n	%			
< 6 years	1	33.3	2	66.7	0	0.0	3	100	0.158
6-10 years	1	50.0	0	0.0	1	50.0	2	100	
> 10 years	5	21.7	11	47.8	7	30.4	23	100	

DISCUSSION

Body Mass Index

Body mass index may be related to MSDs because the heavier a person's body mass, the higher the risk of experiencing MSDs. This statement is supported by one study that mentions that workers need to maintain a normal nutritional status because nutrition status is related to a person's resistance to disease (Widajati *et al.*, 2023). This can occur because the body will try to support the weight by contracting the muscles of the lower back. Musculoskeletal complaints were common in respondents who had abnormal body mass and statistical test results showed that there was a significant relationship between body weight and musculoskeletal complaint (Wardani and Pasa, 2023). The higher someone's BMI, the greater the potential for experiencing musculoskeletal disorders complaints because there is an imbalance in the body's skeletal structure in bearing the load (Rika and Dwiyanti, 2022). Weight and height that are not ideal or exceed normal standards, indicate that the body's load has surpassed its supporting capacity, thereby increasing the risk of musculoskeletal disorder complaints.

Work Posture

Musculoskeletal disorders complaints can arise, among other factors, due to unnatural working postures that cause parts of the body to move away from their natural positions. The farther a body part is from the center of gravity, the higher the risk of complaints in skeletal muscles (Danur, Wahyu and Thamrin, 2022). Awkward working positions experienced daily and over a long period can increase the risk of MSDs because muscles undergo repetitive static loading, leading to damage to joints, ligaments, and muscles (Rahayu, Arbitera and Amrullah, 2020). Body balance is determined by the extent of the supporting area or floor and the height from the center of gravity. Deviating positions can exert excessive pressure on local muscles, leading to injuries.

In the role of a librarian, various activities including operating computers, are found. Risky postures found in librarians include overly bent positions, rotating bodies, overly lowered necks, and jinking during shelving book activities. Field observations revealed that librarians most

frequently and for prolonged periods engage in sitting and operating computers. Prolonged computer use without sufficient breaks increases the risk of musculoskeletal disorders complaints (Kumalapatni, Muliarta and Dinata, 2020). This aligns with the opinion expressed by Suma'mur (2014), stating that improper computer use can lead to several complaints, including neck and back pain, headaches, eye irritation, and fatigue. Hence, librarians can use ergonomic computer usage techniques to lower the risk of musculoskeletal complaints. These techniques include keeping the thighs horizontal, paws evenly bent on the floor or footrest, and adjusting the distance between the screen and the eyes to be between 45 and 60 cm. They can also adjust the distance between the table and the seat so that the back and waist do not bend (Haritsah, 2023).

Years of Service

Years of service refers to the duration of an individual's employment in a company. Musculoskeletal disorders complaints are chronic diseases that take a long time to develop and manifest. Thus, the longer an individual works, the greater the risk of experiencing MSDs. Years of service is a risk factor that can increase the likelihood of musculoskeletal complaints, especially in jobs with high exposure to lifting loads. Years of service is a combination of factors that cause musculoskeletal complaints and the results of the Fisher Exact Test showed a p-value of 0.015, which means that there is a significant correlation between the years of service variable and the musculoskeletal complaint (Thamrin *et al.*, 2021). Based on statements in one of the studies, when muscles are subjected to excessive repetitive work over an extended period, complaints arising from joint, ligament, and tendon damage may occur. These complaints are referred to as musculoskeletal complaints (Saleh, 2018). According to one study, it is known that long periods of work can lead to worsening health, also known as chronic fatigue in the muscles and lead to musculoskeletal disorders because the pressures will accumulate every day over a long period. The results of this research also state that there is a correlation between working experience and musculoskeletal complaints (Meruntu, Kawatu and Rumayar, 2019).

The Correlation between Body Mass Index and Musculoskeletal Disorder Complaints

This study indicated a weak but positive correlation between body mass index and musculoskeletal disorders complaints among librarians at Universitas Airlangga. This statement is supported by similar research, which also obtained results indicating that demographic factors such as age, BMI, gender, and smoking habits are contributing factors to the occurrence of musculoskeletal complaints (Shaikh, Mandal and Mangalavalli, 2022). Furthermore, based on one study conducted on 55 respondents at PT. X in 2019, it was found that there is a correlation between BMI and exercise habits with musculoskeletal complaints (Laksana and Srisantyorini, 2020). However, this is in contrast to the study conducted by Dyana, Rusni and Sukmawati (2023), which states that no significant correlation was found between age, BMI, years of service, and duration of work with musculoskeletal disorders complaints.

Although a weak correlation was identified, cross-tabulation results revealed that librarians classified as obese tended to experience moderate and severe musculoskeletal disorders complaints. Thus, as the BMI of librarians increases, the risk of musculoskeletal complaints also increases. The weak correlation between BMI and musculoskeletal complaints may occur because the majority of librarians have an average BMI within the normal range (53.6%). Additionally, the nature of the librarian's job does not require strong physical effort to lift weights, as the loads lifted do not exceed 5 kg, remaining within the normal limits. This is consistent with Tarwaka (2015), who stated that musculoskeletal complaints related to body size are more often caused by the balance of the skeletal structure in bearing the body's weight or other additional loads.

The Correlation between Work Posture and Musculoskeletal Disorder Complaints

This study indicated a moderately strong and positive correlation between work posture and musculoskeletal disorders complaints among librarians. Thus, it can be concluded that the riskier the work posture, the higher the complaints of musculoskeletal disorders among librarians. The analysis also revealed that the majority of

librarians have high-risk work postures, accounting for 67.9%. Based on the Quick Exposure Check method's exposure level scores, high-risk work postures require further investigation and changes in workstation design to be more ergonomic.

This research is in line with a study stating a significant correlation between work posture and musculoskeletal disorders complaints among employees of PT. Control System Arena Para Nusa, with an analysis result showing a p-value of 0.008. An employee with a risky work posture has a 4.2 times higher chance of experiencing MSDs complaints compared to those in a non-risky work posture (Djaali and Utami., 2019).

From the research conducted on librarians at Universitas Airlangga, it was found that the majority of respondents experienced complaints in the neck and shoulder area, while the rest had complaints in the back area. These findings align with research on computer users, where 58% experienced neck complaints, 56% in the back and waist area, and 38% in the shoulder, upper arm, and wrist areas (Mardiyanti, 2021). Similar results were also found in another study where 57.7% of computer users have complaints and the majority of complaints are in the upper parts of the body, like the shoulders, necks, and waist (Hastuti, Yuliati and Sulolipu, 2023).

The emergence of complaints among librarians, especially in the neck, shoulder, and back areas, is due to the non-ergonomic workstations in the Universitas Airlangga Library. Some areas, including chair conditions and desk height, are not suitable, causing the monitor to be misaligned with the eyes. Additionally, typewriters or keyboards are positioned at chest height, increasing the risk of complaints in the wrists or arms. Some librarians tend to sit slightly hunched due to inappropriate chair height, causing their feet not to fully touch the floor, leading to a forward-leaning position. This position causes the back not to be fully supported by the chair backrest. The lack of footrests under the table increases the likelihood of librarians experiencing muscle complaints. High-risk work posture can occur due to several factors, one of which is non-ergonomic work postures.

From the body position score calculation using the QEC method, it is known that most librarians at Universitas Airlangga have high-risk work postures, requiring further investigation and workstation

design changes to be more ergonomic and reduce the risk of skeletal muscle complaints.

The Correlation between Years of Service and Musculoskeletal Disorders Complaints

The result of the study indicated a weak but positive correlation between years of service and musculoskeletal disorders complaints among librarians at Universitas Airlangga. Although a weak correlation was identified, cross-tabulation results revealed that librarians with more than 10 years of service tended to experience moderate and severe musculoskeletal disorders complaints. Thus, the longer the years of service for librarians, the higher the risk of experiencing musculoskeletal disorders complaints. This statement is in accordance with the results of research on 162 respondents, 87.8% of whom had a work period at risk (> 4 years), the results found that there was a significant correlation between work experience and musculoskeletal complaints (Sophia, Cahyati and Koesyanto, 2022)

The weak correlation between years of service and MSD complaints may be due to habitual factors. According to the information provided by librarians, the flexible rest periods in the librarian's job allow for breaks of approximately 10 minutes to recharge energy when feeling tired or fatigued. The use of rest periods during working hours has proven effective in reducing the risk of musculoskeletal disorders complaints. Additionally, the adaptation process to the job can have positive effects, reducing tension and increasing work activity or performance. Therefore, it can be assumed that librarians at Universitas Airlangga have adapted to their work and work environment.

The findings of this study are consistent with one of the research on the employees of Bank Mandiri Tebet Supomo, which showed no correlation between years of service and musculoskeletal complaints (Salsabila and Wartono, 2020). Similar results were found in research on fish lifting workers which indicated no correlation between years of service and musculoskeletal disorders complaints (Dyana, Rusni and Sukmawati, 2023). A similar study conducted on 96 respondents, with the majority having work experience exceeding 10 years, found results indicating a relationship between work tenure and musculoskeletal complaints, with a p-value of 0.017 and an r-value of 0.244. This signifies a weak strength of association but still maintains a positive direction indicating that the longer the years

of service, the higher the level of musculoskeletal complaints (Kattang, Kawatu and Tucunan, 2018).

This phenomenon may occur due to the body's adaptation to continuous work activities over a long period, resulting in the body's resilience to pain or discomfort. Workers who have adapted to their jobs may not complain much about the usual discomforts, assuming that these complaints will naturally occur sooner or later. As a result, workers enjoy the process without paying much attention to the complaints. Thus, to reduce the risk of musculoskeletal complaints, librarians can rest and stretch muscles for 10-15 minutes after working about 1-2 hours in a sitting position.

CONCLUSION

There was a moderately strong and positively correlated correlation between work posture and MSDs complaints, while there is a weak and positively correlated correlation between body mass index (BMI) and years of service with musculoskeletal disorders complaints. Librarians in high-risk work postures can experience musculoskeletal disorder complaints, especially in the neck, shoulder, and back areas. The library is recommended to redesign workstations to be more ergonomic, considering anthropometric aspects and the type of work performed.

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REFERENCES

- CDC (2022) 'Musculoskeletal Health Program _ NIOSH _ CDC'.
- Danur, S.M.B., Wahyu, A. and Thamrin, Y. (2022) 'Hubungan Postur Kerja Dan Masa Kerja Terhadap Keluhan Muskuloskeletal Pada Pengemudi Bus', *Hasanuddin Journal of Public Health*, 3(2), pp. 166–178. <https://doi.org/10.30597/hjph.v3i2.21894>.
- de Kok, J., *et al.* (2019) Work-related Musculoskeletal Disorders: Prevalence, Costs and Demographics in the EU. Luxembourg: Publications Office of the European Union. <https://doi.org/10.2802/66947>.

- Djaali, N.A. and Utami, M.P. (2019) 'Analisis Keluhan Musculoskeletal Disorders (MSDs) Pada Karyawan PT. Control System Arena Para Nusa', *Jurnal Ilmiah Kesehatan*, 11(1), pp. 80–87 <https://doi.org/10.37012/jik.v11i1.71>.
- Dyana, I.P.N.A., Rusni, N.W. and Sukmawati, N.M.H. (2023) 'Faktor-Faktor yang Berhubungan dengan Keluhan Muskuloskeletal Disorders pada Pekerja Pengangkat Ikan di Usaha Dagang Mina Karya Karangasem', *Aesculapius Medical Journal*, 3(1), pp. 93–100.
- Golinko, V., et al. (2020) 'Assessment of the Risks of Occupational Diseases of the Passenger Bus Drivers', *Safety and Health at Work*, 11(4), pp. 543–549. <https://doi.org/10.1016/j.shaw.2020.07.005>.
- Haritsah, F. I. (2023) *Mengenali Sikap Ergonomis dalam Bekerja*. Jakarta: Direktorat Jendral Pelayanan Kesehatan Kementerian Kesehatan.
- Hastuti, A., Yuliati and Sulolipu, A.M. (2023) 'Faktor Yang Berhubungan Dengan Keluhan Musculoskeletal Disorders (Msd) Pada Pegawai Yang Menggunakan Komputer Di RSUP Dr. Tadjuddin Chalid Kota Makassar', *Window of Public Health Journal*, 4(3), pp. 492–504.
- Health and Safety Executive (2023) *Work-related Ill Health and Occupational Disease in Great Britain Percentages do not sum to 100% due to rounding. Source: Estimates from epidemiological information including burden of occupational cancer research*.
- Kattang, S.G.P., Kawatu, P.A.T. and Tucunan, A.A.T. (2018) 'Hubungan antara Masa Kerja dan Beban Kerja dengan Keluhan Muskuloskeletal pada Pengrajin Gerabah di Desa Pulutan Kecamatan Remboken Kabupaten Minahasa', *KESMAS: Jurnal Kesehatan Masyarakat Universitas Sam Ratulangi*, 7(4), pp. 1–10.
- Kumalapatni, N.W.S., Muliarta, I.M. and Dinata, I.M.K. (2020) 'Gambaran Keluhan Muskuloskeletal dan Analisis Postur Tubuh pada Siswa Pengguna Komputer di SMK "G" Denpasar Bali', *Jurnal Medika Udayana*, 9(2), pp. 15–20.
- Laksana, A. and Srisantyorini, T. (2020) 'Analisis Risiko Musculoskeletal Disorders (MSDs) pada Operator Pengelasan (Welding) Bagian Manufaktur di PT X Tahun 2019', *Jurnal Kajian dan Pengembangan Kesehatan Masyarakat*, 1(1), pp. 64–73.
- Manidiriinhealth (2023) *Mengenali Sikap Ergonomis dalam Bekerja*. Available at: <https://www.mandiriinhealth.co.id/assets/collections/doc/sikap-ergonomis-dalam-bekerja-654c3ca7e875b.pdf> (Accessed: 16 February 2024).
- Mardiyanti, F. (2021) 'Pengukuran Risiko Kerja dan Keluhan Muskuloskeletal Pada Pekerja Pengguna Komputer', *Journal of Innovation Research and Knowledge*, 1(3), pp. 333–346.
- Meruntu, V.V.V.V., Kawatu, P.A.T. and Rumayar, A.A. (2019) 'Hubungan antara Umur dan Masa Kerja dengan Keluhan Musculoskeletal pada Pekerja Petani di Desa Kanonang Dua Kecamatan Kawangkoan Barat Kabupaten Minahasa', *KESMAS: Jurnal Kesehatan Masyarakat Universitas Sam Ratulangi*, 8(7), pp. 1–7.
- Prabarukmi, G.S. and Widajati, N. (2020) 'The Correlation of Ergonomic Risk Factor with Musculoskeletal Complaints in Batik Workers', *Indonesian Journal of Occupational Safety and Health*, 9(3), pp. 279–288. <https://doi.org/10.20473/ijosh.v9i3.2020.269-278>
- Rahayu, P.T., Arbiera, C. and Amrullah, A.A. (2020) 'Hubungan Faktor Individu dan Faktor Pekerjaan terhadap Keluhan Musculoskeletal Disorders pada Pegawai', *Jurnal Kesehatan*, 11(3), pp. 449–456.
- Rika, A.K.M. and Dwiyaniti, E. (2022) 'Hubungan Antara Indeks Masa Tubuh Dengan Keluhan Muskuloskeletal Disorders (Studi Kasus pada Pekerja Operator Container Crane PT. X Surabaya)', *Media Gizi Kesmas*, 11(2), pp. 365–370. <https://doi.org/10.20473/mgk.v11i2.2022.365-370>
- Cormita, R. D. (2023) *Hubungan Postur Kerja, Masa Kerja, Dan Kesesuaian Stasiun Kerja Dengan Keluhan Muskuloskeletal (Pekerja Area Office PT. Japfa Comfeed Indonesia Tbk. Plant Margomulyo)*. Undergraduate Thesis. Surabaya: Faculty of Public Health Universitas Airlangga.
- Saleh, L.M. (2018) *Man Behind The Scene Aviation Safety*. Yogyakarta: Deepublish.
- Salsabila, Q.R. and Wartono, M. (2020) 'Hubungan Sikap Tubuh saat Bekerja dengan Keluhan Muskuloskeletal akibat Kerja pada Karyawan', *Jurnal Biomedika dan Kesehatan*, 3(4), pp. 169–175. <https://doi.org/10.18051/JBiomedKes.2020.v3.169-175>
- Shaikh, A.M., Mandal, B.B. and Mangalavalli, S.M. (2022) 'Causative and Risk Factors of Musculoskeletal Disorders among Mine Workers : A Systematic Review and Meta-Analysis', *Safety Science*, 155, pp. 1–20. <https://doi.org/10.1016/j.ssci.2022.105868>.

- Sophia, F., Cahyati, W.H. and Koesyanto, H. (2022) 'Hubungan Umur, IMT, dan Masa Kerja dengan Keluhan Muskuloskeletal Disorders (MSDs) pada Sales Promotion Girl (SPG)', *Jurnal Penelitian dan Pengembangan Kesehatan Masyarakat Indonesia*, 3(1), pp. 62–70.
- Suma'mur (2014) *Higiene Perusahaan dan Kesehatan Kerja (HIPERKES)*. Jakarta: Sagung Seto.
- Tarwaka (2015) *Ergonomi Industri: Dasar-Dasar Pengetahuan Ergonomi dan Aplikasi Di Tempat Kerja*. 2nd edn. Surakarta: Harapan Press.
- Thamrin, Y., *et al.* (2021) 'Musculoskeletal Disorders Problems and its Relation to Age, Working Periods, and Smoking Habit among Fishermen', *Gaceta Sanitaria*, 35, pp. S417–S420. <https://doi.org/10.1016/j.gaceta.2021.10.065>.
- Treesyanova, Y. (2018) *Hubungan Antara Faktor Individu dan Posisi Kerja dengan Keluhan Muskuloskeletal Disorders (MSDs) Pada Pustakawan Bagian Shelving Book Di Perpustakaan Universitas Airlangga Surabaya*. Undergraduate Thesis. Surabaya: Faculty of Public Health Universitas Airlangga.
- Wardana, I.W., *et al.* (2023) 'Analysis of Individual and Occupational Factors with Complaints of Musculoskeletal Disorders in Swallow Nest Cleaning', *The Indonesian Journal of Occupational Safety and Health*, 12(1), pp. 104–114. <https://doi.org/10.20473/ijosh.v12i1.2023.104-114>
- Wardani I and Pasa I.T. (2023) 'Korelasi Indeks Massa Tubuh dan Beban Kerja terhadap Musculoskeletal Disorders pada Operator Ground Handling', *Warta Ardhia Journal*, 49(2), pp. 69–76.
- WHO (2022) Musculoskeletal Health. Available at: <https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions> (Accessed:).
- Wicaksono and Adiputra (2021) 'Gambaran Keluhan Muskuloskeletal dan Kelelahan Sebelum dan Setelah Bekerja pada Pekerja di UD. Batu Bukit', *Jurnal Keperawatan Suaka Insan (JKSI)*, 6(1), pp. 40–45.
- Widajati, N., *et al.* (2023) 'Lung Function Analysis of Marble Home Industry Workers in Tulungagung Regency', *Pertanika Journal of Science and Technology*, 31(2), pp. 947–960. <https://doi.org/10.47836/pjst.31.2.15>