PERBEDAAN TINGKAT RISIKO MUSCULOSKELETAL DISORDER ANTARA MAHASISWA YANG MELAKUKAN PERKULIAHAN LURING DAN *HYBRID*

DIFFERENCES IN MUSCULOSKELETAL DISORDER RISK LEVELS BETWEEN STUDENTS WHO ATTEND OFFLINE AND HYBRID LECTURES

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ABSTRAK

Pendahuluan: Permasalahan muskuloskeletal disorder (MSD) menjadi penyebab utama kecacatan di seluruh dunia, kondisi MSDs dapat membatasi mobilitas dan ketangkasan, pernyebab pensiun dini dari pekerjaan, tingkat kesejahteraan yang rendah, dan berkurangnya kemampuan untuk berpartisipasi dalam masyarakat. Perkuliahan dengan duduk dalam waktu yang lama tanpa melakukan aktivitas fisik dan istirahat dapat berdampak pada kesehatan muskuloskeletal pada mahasiswa. **Tujuan penelitian**: adanya penelitian ini diharapkan dapat mengetahui Perbedaan Tingkat Risiko Musculoskeletal Disorder antara Mahasiswa yang melakukan Perkuliahan Offline dan Hybrid. **Metode:** Penelitian ini menggunakan desain penelitian cross-sectional dengan total responden sebanyak 81 mahasiswa sampel untuk kelompok mahasiswa offline 52 sampel dan kelompok mahasiswa hybrid sebanyak 29 sampel dengan analisis uji statistik chi-square. Metode pengumpulan data dengan menggunakan kuesioner untuk mendapatkan data mengenai tingkat risiko muskuloskeletal dan pengamatan secara langsung kepada responden untuk menilai postur duduk responden dengan menggunakan metode RULA (*Rapid Upper Limb Assesment*). **Hasil**: Berdasarkan uji statistik pearson chi-square dapat diketahui bahwa tidak ada perbedaan prevalensi muskuloskeletal disorder pada mahasiswa dengan metode perkuliahan hybrid dan offline, atau dapat dikatakan memiliki tingkat risiko MSDs yang relatif sama ($p=0,243)<\alpha = 0.05$". **Kesimpulan**: tidak ada perbedaan tingkat risiko keluhan muskuloskeletal disorder pada mahasiswa fakultas SIKIA (Sekolah Ilmu Kesehatan dan Ilmu Alam) Universitas Airlangga baik dengan pembelajaran hybrid maupun pembelajaran full offline. Tingkat risiko metode pembelajaran hybrid maupun full offline sama-sama memiliki tingkat risiko muskuloskeletal rendah.

Kata Kunci: musculoskeletal disorder, mahasiswa, pembelajaran hybrid, pembelajaran luring.

ABSTRACT

Background: The leading cause of disability globally is musculoskeletal disorders (MSD), which can lead to reduced mobility and dexterity, early retirement, low welfare, and a reduced capacity to participate in society. Lectures by sitting for a long time without doing physical activity and resting can have an impact on musculoskeletal health in students. **Purpose**: This research is expected to be able to find out the difference in the risk level of Musculoskeletal Disorder between students who attend offline and hybrid lectures. **Methods**: This study used a cross-sectional study design with a total sample of 81 students, 52 samples are the offline student group and 29 samples are the hybrid students group, using the chi-square statistical test analysis. The data collection method used a questionnaire to obtain data regarding the level of musculoskeletal risk and observation of respondents to assess the respondent's sitting posture using the RULA (Rapid Upper Limb Assessment) method. **Results**: Based on the Pearson chi-square statistical test, it can be seen that there is no difference in the prevalence of musculoskeletal disorders in students attending hybrid and offline lecture methods, or it can be said that they have relatively the same risk level of MSDs ($p=0.243) <\alpha = 0.05$". **Conclusion**: there is no difference in the risk level of musculoskeletal disorder complaints in SIKIA (School of Health and Life Sciences) faculty at Universitas Airlangga students with either hybrid learning or full offline learning. The risk level of both hybrid and full offline learning methods has a low musculoskeletal risk level.

Keywords: musculoskeletal disorder, student, hybrid learning, offline learning

INTRODUCTION

Currently, the majority of higher education institutions have conducted limited face-to-face lectures while still implementing strict health protocols. Even still, it is not as simple as one might think. Dynamics and polemics in society have emerged as a result of the implementation of offline lectures, particularly among students and parents. This is a new problem that has arisen, where habits that have been carried out online, and now switching to offline make students and parents need to readjust.

Supported by the Ministry of Education and Culture which has given vaccines to educators, university staffs and students. However, until now, there are also periodic implementation of online learning (hybrid) conducted by several higher education institutions. One of them is at the Airlangga University School of Health and Natural Sciences in Banyuwangi or SIKIA Faculty.

Hybrid and offline lectures are unknowingly carried out for a long period of time with too many idle frequencies without doing physical activity, which can have a negative impact such as increasing the risk of musculoskeletal disorders, causing stress, fatigue, and boredom due to carrying out various activities online. (Dampati et al., 2020)

According to World Health Organization (WHO) data, 1,71 billion people worldwide are thought to suffer musculoskeletal issues. Additionally, according to information from the Indonesian Health Ministry's 2018 Basic Health Research (Riskesdas) Report, 7,3% of Indonesian citizens suffer from musculoskeletal issues. The primary cause of disability worldwide may be MSD issues. The MSDs disease can result in reduced mobility and dexterity, early retirement, low welfare, and a reduced capacity to engage in social activities (WHO, 2022).

Musculoskeletal disorders not only in adult workers, but also in university students causes according to the activities carried out (Jacobs et al., 2009). The prevalence of musculoskeletal disorders is 83.1% in the student population (Izhar et al., 2022). In college students, musculoskeletal disorders can occur due to several reasons. According to research, there is a relationship between prolonged sitting and musculoskeletal disorder complaints in medical students

(Darmayanti, 2020).

The students who conduct hybrid lectures are required to conduct distance learning using a laptop or a smartphone. Non-ergonomic laptop use can result in musculoskeletal diseases by causing complaints about the shoulder, neck, back, and other organs (Tanzila et al., 2021). More than four hours spent using a laptop while working doubles the chance of developing a musculoskeletal disorder (Chang et al., 2007).

Musculoskeletal disorders not only in adult workers, but also in university students causes according to the activities carried out (Jacobs et al., 2009). In college students, musculoskeletal disorders can occur due to several reasons. According to research, there is a relationship between prolonged sitting and musculoskeletal disorder complaints in medical students (Darmayanti, 2020). Another study with dentistry student respondents stated that there was a relationship between sitting position in college and the incidence of musculoskeletal disorders (Khan & Yee Chew, 2013).

Offline and hybrid lectures have been held at Airlangga University's School of Health and Natural Sciences in Banyuwangi or SIKIA. Students' musculoskeletal health would suffer as a result of sitting for hours without performing any physical activity. Therefore, the goal of this study is to find out whether students who attend hybrid lectures have a lower prevalence of developing musculoskeletal disorders than those who attend offline lectures.

This study intends to provide input to universities in order for them to implement good learning methods, as well as to contribute to the importance of ergonomic interventions not only in schools but also in the home environment, how it can positively affect the physical well-being of students, and whether the study of ergonomics should be suggested as valuable learning for students and parents to participate in.

METHOD

This research has a proper ethical certificate (No: 183/EA/KEPK/2022). This study used a cross-sectional research design with research subjects from School of Health and Natural Sciences Faculty or SIKIA Airlangga University students in Banyuwangi with a total population of 632 students.

The researcher first gathered a name list of current SIKIA students at Airlangga University in order to determine the

number of samples. The researcher then divided the name list into two groups: those who had hybrid lectures and those who had full online lectures.

Calculation of the number of samples in this study using the Lemeshow formula to determine the minimum sample size for survey research (using alpha 5%, precision 10%, proportion 20%, with a confidence level of 95%) obtained as many as 81 samples. Then, these results were divided by using *the Proportionate Stratified Random Sampling method*, because there were two non-homogeneous categories in this population: students who attended offline lectures and students who attended hybrid lectures. The offline student group had 52 samples, whereas the hybrid student group had 29 samples. The students that conducted offline lectures used learning curricula that involved practical or laboratory activity. The lecturers from the Surabaya main campus were outside of Banyuwangi, and the students who typically participated in hybrid lectures had only theory classes, so they were more frequently needed to take online lessons. If there were debriefing activities related to gathering data for the community, they were also needed to take offline classes once or twice.

In this study, all students who took offline or hybrid lectures were included, but students who had a history of musculoskeletal injuries and a history of neurological injuries were excluded. The researcher obtained information on injury history by adding the questions to the questionnaire filled out by respondents.

There were 5 variables examined in this study, namely age, gender, posture during lectures, duration of lectures and level of risk of musculoskeletal disorder complaints. The independent variables consisted of age, gender, posture during lectures, duration of lectures, while the dependent variable was the level of risk of musculoskeletal disorder (MSD) complaints.

Data collection was carried out for 7 days using the Nordic Body Map instrument to measure the level of risk of musculoskeletal disorder complaints and posture can be evaluated ergonomically presented using the Rapid Upper Limb Assessment (RULA) (Ciccarelli et al., 2015). Data analysis used the chi-square test because researchers wanted to prove whether there were differences in the risk levels of musculoskeletal disorders between students who attend offline and

hybrid lecture

RESULT AND DISCUSSION

The characteristics of the respondents from this study included gender, study program, year of class, lecturing methods of SIKIA students.Table 1 Characteristics of Respondents Based on Gender, Study Program, Year of Class, and History of Injury

Characteristics	Frequency	Percentage (%)
Gender		
Male	18	22,2
Female	63	77,8
Study Program		
Accounting	17	21,0
Veterinary Medicine	10	12,3
Public Health	41	50,6
Aquaculture	13	16,0
Batch Years		
2019	22	27,2
2020	29	35,8
2021	15	18,5
2022	15	18,5
History of Injury		
Yes	0	0
No	81	100
Total	81	100,0

Based on table 1, there were 18 male respondents (22.2%) and 63 female respondents (77.8%) out of 81 total respondents. All responders were students from the School of Health and Natural Sciences (SIKIA), which consists of four study programs. 17 students or 21% of those questioned were accounting students, 10 students or 12.3% were veterinary medicine students, 41 students or 50.6% were public health students, and 13 students or 16% were aquaculture students. SIKIA's lecture technique is a combination of online and offline instruction. The total number of responders or students who attended hybrid lectures was 29 (35.8%), while students who attended offline lectures were 52 (64.2%). The students come from 4 different batches. 22 students or 27.2% respondents were the 2019 students, 29 students or 35.8% respondents were the 2020 students, 15 students or 18.5% respondents were the 2021 students, and 15 students or 18.5% respondents were the 2022 students**Univariate analysis**

The independent variables in this study consisted of body posture, lecture duration, gender and lecture methods. The risk level of musculoskeletal disorders complaints is the dependent

variable in this study.

The body posture variable was measured using the Rapid Upper Limb Assessment (RULA) table by assessing the student's body posture when sitting attending lectures. RULA scores are categorized into 4, they are; acceptable posture (1-2), further investigation change may be needed (3-4), further investigation change soon (5-6), investigate and implement change (7)

Table 2 Frequency Distribution of Rapid Upper Limb Assessment (RULA) Results

Variable	Quantity	
	n	%
Skor RULA (Body Postures)		
Acceptable Posture	1	1,2
Further investigation and change may be needed	31	38,3
Further investigation, change soon	30	37
Investigate and implement change	19	23,5

According to the table above, as many as 19 or 23.5% of SIKIA students attending lectures had very risky postures that needed to be changed, while 30 or 37% had moderate risk but needed to be treated further and needed immediate changes. Only 1 student has a posture that is not at risk and does not require treatment. The MSDs assessment was carried out by distributing the Google form online to 81 SIKIA students using the Nordic Body Map questionnaire with 28 complaints, with a level of complaints using a 4 Linkert scale. The results were then analysed using descriptive statistics. Complaints of musculoskeletal disorders in this study consisted of 3 categories namely 28 to 49 (low), 50 - 70 (moderate), 71 - 91 (high).

Table 3 Frequency Distribution of Musculoskeletal Disorder (MSD) Risk Levels

Variable	Quantity	
	n	%
Musculoskeletal Disorder		
Low (28-49)	58	62,4
Moderate (50-70)	17	18,3
High (71-91)	6	6,5

From the table above it can be seen that there are 6 or 6.5% students who had a high MSDs risk level. While most students, 58 or 62.4% students, had a low MSDs risk level.

Table 4 Cross tabulation of Risk Levels of Musculoskeletal Disorder by Gender and Study Duration

Variable	Risk Levels of Musculoskeletal Disorder						TOTAL		*p-value*
	Low		Moderate		High				
	n	%	n	%	n	%	N	%	
Gender									
Male	15	83,3	1	5,6	2	11,1	18	100	0,174
Female	43	68,3	16	25,4	4	6,3	63	100	
Duration of Lectures									
2-8 hour	52	71,2	17	23,3	4	5,5	73	100	0,061
>8 hour	6	75	0	0	2	25	8	100	

Based on statistical tests, the Pearson chi-square test, it can be seen that there is no difference between the risk levels of male and female students' MSDs (p = 0.174). Lecture duration is the average time needed by students in one day to attend lectures with good posture. From table 4, it can be seen that for the variable duration of lectures, there is no difference between the risk level of MSDs for students with a lecture duration of 2-8 hours with a duration of >8 hours (p = 0.061)

Table 5 Cross-tabulation of Lecture Methods with Rapid Upper Limb Assessment (RULA) Results and Risk Level for Musculoskeletal Disorder (MSD) Complaints

Variable	Lecture Method				TOTAL		*p-value*
	Hybrid		Offline				
	n	%	n	%	N	%	
Musculoskeletal Disorder							
Low	20	34,5	38	65,5	58	100	0,243
Moderate	5	29,4	12	70,6	17	100	
High	4	66,7	2	33,3	6	100	
Rapid Upper Limb Assessment							
Acceptable Posture	0	0	1	100	1	100	0,025
Further investigation and change may be needed	17	56,7	13	43,3	30	100	
Further investigation, change soon	7	22,6	24	77,4	31	100	
Investigate and implement change	5	26,3	14	73,7	19	100	

Based on the Pearson chi-square statistical test, it can be seen that there is no difference in the level of risk of musculoskeletal disorders in students with hybrid and offline lecture methods, or it can be said that they have relatively the same risk level of MSDs (p=0.243). Meanwhile, for the statistical test on the variables of student body posture during lectures using RULA, the results obtained were p-value = 0.025, meaning that there was a significant difference in the level of risk of musculoskeletal disorders in students with hybrid and offline methods.

Table 6 Physical Activity of Respondents

Learning Categories	Do Physical Activity				TOTAL	
	Yes		No			
	n	%	n	%	N	%
Offline	32	62	20	38	52	64
Hybrid	15	52	14	48	29	36
Total	**47**	**58**	**34**	**42**	**81**	**100**

As shown in Table 6, 62% of respondents who used the offline method of learning participated in physical activity, while 38% of respondents did not. In contrast, 52% of respondents who used the hybrid method of learning engaged in physical activity, while 48% did not. The physical activity category of this study refers to activities that participants engage in for 30 minutes, three or five days a week, to improve their physical health.

Discussion

The students involved in this study met the inclusion criteria, namely SIKIA students who had never had a history of injury. A history of musculoskeletal injuries and neurological injuries can be a confounding part of the pain that is caused not from the result of posture when attending lectures. All respondents involved in the research were students of the SIKIA Faculty of Airlangga University with 4 majors including Public Health, Aquaculture, Veterinary Medicine and Accounting. The SIKIA Faculty uses a variety of lecture formats that are tailored to the regulations of each study program/department. The lecture method applied by SIKIA in the 2022 odd learning semester is hybrid and offline based on the policies from the Joint Ministerial Decree (SKB) of the Four Ministers, November 20 2020.

The hybrid method itself is a combination of face-to-face learning

methods and online learning. Because of the trend of the Covid-19 case, there are still limitations on the number of students who can participate in online learning. The departments that have carried out face-to-face lectures include the veterinary department where there are practicum courses that require them to be on campus. The Department of Public Health uses lectures in a hybrid format because the majority of courses are non-practicum, therefore students do not need to be on campus and can attend the lectures online.

Students studying veterinary medicine and fisheries can attend offline classes at the SIKIA faculty. Each student in both study programs sits in a chair without a backrest during lectures, which are held in a lab setting. Students are also required to stand up and down regularly when participating in practica on various topics. Students in public health and accounting attend hybrid lectures, where the majority of the methods of learning are purely theoretical, with occasionally community visits to gather test data to aid learning. According to the study's findings, students who use hybrid methods typically sit in front of a table or on a bed to listen to lectures.

Body posture during online learning from home is usually not a good posture such as excessive flexion of the cervical or too bent, tilted position, and others (Multazam & Irawan, 2022). According to the findings of a study conducted on students in the Philippines during the Covid-19 outbreak, the home environment was not comfortable or ergonomic. As a result, there are evident posture risks and physical discomfort. As a result, risks in musculoskeletal conditions are possible (Vallespin & Tri Prasetyo, 2020)

According to the findings of this study, SIKIA students who use the hybrid learning technique typically use laptops and smartphones to support their learning. Based on the results of the body posture assessment obtained using RULA (Rapid Limb Upper Assessment), the majority of students (56.67%) had a posture with moderate risk but changes were needed. While as many as 37% students had moderate risk but must be treated further and needed immediate changes. In addition, 26.3% of students exhibited very dangerous postures that needed to be changed. Students and face-to-face lecture activities allow each individual to sit or stand for an extended period of time. The results showed that 43.3% of students using the face-to-face

lecture method had a moderate risk posture, but changes were required. While 77.4% of students were at moderate risk, they needed to be treated further and needed quick improvements. And there were 73.7% students who had very risky postures and posture changes must be made.

This is in line with a study of 709 Public Health students at the University of Indonesia, which discovered that the majority of students use smartphones in a variety of postures, including sitting, standing, supine, and prone. According to this study, using a smartphone while leaning on a table is highly associated to the appearance of musculoskeletal disorders in the elbows, knees, and ankles. Similarly, holding a cell phone with both hands can have an impact on musculoskeletal issues (Hasiholan, 2022)

The time required for SIKIA students to attend lectures in one day, both sitting and standing, is specified as lecture duration. According to the findings of the study, SIKIA students have a lecture duration of 2-8 hours each day, for both hybrid and offline students. Some students get more than 8 hours of lecture time because they have direct practice in the field. While attending the lectures, the results of the questionnaire showed that SIKIA students felt uncomfortable when they sat for too long both in front of the computer and in the classroom for a long duration without taking a break. Another study demonstrates the findings of research on computer-using student groups, where the prevalence of musculoskeletal problems is very high (Chang et al., 2007)

According to research conducted on medical students in Manado, sitting for 8 hours a day is a risk factor for low back discomfort and causes muscle fatigue. Sitting at a computer for 2-4 hours while studying or working is enough to develop lower back pain (Hutasuhut et al., 2021)

The effect of gender on the risk of skeletal muscle complaints significantly indicates that gender greatly influences the level of risk of muscle complaints (Tarwaka & Sudiajeng, 2004). In addition, there is research on public health students in Brazil, female students are 6 times more at risk of experiencing musculoskeletal disorders complaints compared to men (Morais et al., 2019). This happens because physiologically, women's muscle abilities are indeed lower than men's. However, in this study, the proportion of respondents were

mostly women, so differences in risk factors based on gender could not be seen in this study.

The results of this study indicate that SIKIA students with both hybrid and full offline learning methods have a low level of musculoskeletal risk. Nonetheless, the results of the Nordic Body Map questionnaire showed that the majority of students felt pain in several parts of the body including pain in the upper neck (73.03%), waist (71.79%), back (65.38%), shoulders (50%) and lower neck (43.5%).

Based on the study's findings, physical exercise was known to be done 3-5 times per week by SIKIA students who used offline or hybrid lecture methods. The majority of the exercises performed by SIKIA students were walking, followed by jogging, barbell lifts, cycling, running, and household duties (sweeping, mopping, and laundry).

Walking and stretching exercises were discovered to be students' most frequent physical activity, according to research done at King Saud University in Riyadh. The use of ergonomics, consistent exercise, stress-relieving methods (such as yoga, meditation, and biofeedback), and a healthy diet may reduce stress and boost job productivity, which ultimately improves comfort and the quality of a lengthy career path (Alyahya et al., 2018).

Despite the low MSDs scores of SIKIA students, the Nordic Body Map survey findings reveal that the majority of students experience discomfort in a number of body regions, including the upper neck (73.03%), waist (71.79%), back (65.38%), shoulders (50%) and lower neck (43.5%).

Previous research discovered that public health students at Udayana University experienced musculoskeletal issues on their backs (59.72%), neck (48.61%), nape (50.00%), right shoulder (44.44%), waist (44.44%), hips (44.44%), and buttocks (43.06%) (Prawira et al., 2017). There is study on online lecture students, the majority of whom had symptoms of musculoskeletal issues in the left and right shoulders (95%), upper neck (82.14%), and back (72.62%). Visual fatigue affects up to 86% of students. Headaches (71.55%), painful eyes (68%), and dry eyes (60.34%) were the most common complaints (Fathimahhayati et al., 2020).

CONCLUSION

Based on the findings of this study, it is possible to conclude that there is no

difference in the prevalence of musculoskeletal disorder complaints in SIKIA students who receive hybrid or full offline instruction. The musculoskeletal prevalence is low for both the hybrid and full offline learning methods. The prevention, however, necessitates a knowledge of ergonomics at home, as well as engaging in physical activity like cycling, walking, and running. Stretching in between breaks and sitting on a chair with a backrest are additional ways to practice preventing musculoskeletal problems on campus.

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