INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 14, Issue 10, (2024) E-ISSN: 2222-6990

Optimising Posture: An Experimental Study of Posture Support for Comfort among University Students

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To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v14-i10/23315 DOI:10.6007/IJARBSS/v14-i10/23315

Published Date: 20 October 2024

Abstract

Introduction: Long periods of sitting contribute to musculoskeletal disorders (MSD), which can lead to occupational injuries. Introducing posture support is one of the strategies targeted at alleviating discomfort caused by prolonged sitting. The purpose of this study is to determine the effectiveness of posture support in improving muscle comfort during prolonged sitting among university students. Methods: An experimental study was conducted with 32 participants, evenly divided into control and experimental groups of 16 each. The experimental group received posture support during the two-hour simulation, but the control group did not. The Short-Form McGill Pain Questionnaire and Visual Analogue Scale were used to assess the subjects' level of discomfort every 15 minutes. Results: The control group's mean discomfort ratings for several body areas, including the neck, shoulders, arms and hands, upper back, lower back, buttocks, thighs, knees, feet, and ankles, were substantially higher than the experimental group's ($p<0.05$). Conclusion: Posture support effectively alleviates discomfort in students' sitting posture, as indicated by the experimental group's reduced discomfort. To better understand this phenomenon, future research should include larger sample sizes, longer study periods, and real settings in university's lecture hall.

Keywords: Experimental, Posture Support, Sitting Posture, Comfort, Ergonomics

Introduction

Musculoskeletal disorders (MSDs) are considered work-related if they are caused by occupational variables such as poor and uncomfortable working conditions, extended working hours, increased workload, and poor body posture while at work (Violante, 2020).

Work-related musculoskeletal diseases (WMSDs) are injuries and discomfort caused by repetitive work and extended physical activity, which increase the risk of these ailments. The lower back is the most often afflicted location, with the greatest MSD prevalence recorded in 134 of the 204 countries studied (Ceiza et al., 2020). WMSDs include a variety of inflammatory and degenerative illnesses. The World Health Organization (WHO) describes these illnesses as those that affect muscles, ligaments, tendons, joints, nerves, and bones but are not caused by acute occurrences such as slips or falls. WMSDs are characterized by discomfort, disability, impairment, or chronic pain in the musculoskeletal system. They are classed as job-related when the work environment promotes or exacerbates their development (World Health Organization, 2022; Suganthirababu et al., 2022).

University students spend a large amount of their day (5-8 hours) in school, where they accomplish most tasks, such as reading and writing, while seated on school furniture. Given the amount of time they spend sitting, they are especially prone to the negative impacts of poorly designed furniture. Using ill-fitting furniture increases the chance of acquiring musculoskeletal diseases (Kahya, 2019). MSDs can impair an individual's aptitude, efficiency, effectiveness, well-being, productivity, work attendance, job quality, and overall performance. They can also limit students' regular activities. University life is a period of tremendous transition, which might raise the risk of MSDs among undergraduates. These problems can cause discomfort in the neck, shoulders, arms, wrists, hands, upper and lower back, hips, knees, and feet (Senarath et al., 2021).

Prolonged sitting has been shown to have a negative impact on student posture and comfort, particularly for those who spend extended periods seated in a classroom. Consequently, discomfort, pain, and poor posture may manifest (Brink et al., 2015). Samoladas et al. (2018), assert that this issue is becoming increasingly prevalent as technology and sedentary lifestyles gain prominence, resulting in more extensive sitting durations for both children and adults. Jabeen and Hussain (2022), suggest that the adverse effects of unsuitable furniture can give rise to musculoskeletal disorders, such as back pain and various bone deformities, in students from a young age. Doty et al (2022), discovered that students who spend substantial amounts of time sitting experienced higher discomfort and soreness in their backs, necks, and shoulders in their study. This can result in chronic pain and a reduced ability to concentrate and be productive in class. Furthermore, prolonged sitting might cause poor circulation and muscle weakness. The leg and core muscles stay inactive during prolonged sitting, resulting in diminished muscle tone and strength. According to Plotnikoff et al. (2015), this can make it difficult for students to engage in physical activity and may contribute to weight gain and obesity.

Sedentary lifestyles among students have become increasingly common in recent years, primarily due to their heavy reliance on technology (Priya and Subramaniyam, 2022; Sahu et al., 2021). The burden of carrying heavy backpacks and the use of improper furniture significantly contribute to postural abnormalities and persistent bodily pain in students (Jabeen and Hussain, 2022). Prolonged sitting can lead to backaches and discomfort, as demonstrated in a study by Isapka and Omorodion (2019), which established a clear link between extended sitting and the experience of pain, poor posture, and discomfort in school-aged students.

Parvez et al (2019), also examined the relationship between prolonged sitting and student discomfort, pain, and poor posture, with a specific focus on students in a classroom context. Their research aimed to determine the extent to which prolonged sitting affected students' posture and comfort levels. The data indicates that prolonged sitting does indeed alter students' posture and comfort levels in the classroom. Given how much time students spend in sedentary activities, they are especially vulnerable to the negative impacts of poorly designed furniture. Using ill-fitting furniture increases the likelihood of getting musculoskeletal diseases. In contrast, well-designed furniture that suits students' anthropometric dimensions encourages proper sitting posture and minimizes the prevalence of these illnesses (Kahya, 2019). One of the primary solutions under consideration in this study is the implementation of posture support systems, with the goal of efficiently alleviating the discomfort caused by prolonged periods of sitting. The purpose of this study is to determine the effectiveness of posture support in improving muscle comfort during prolonged sitting among university students.

Methods

This research involved an experimental investigation aimed at assessing the impact of posture support on enhancing muscle comfort during extended periods of sitting among university students. The study was conducted in a controlled laboratory setting, and research subjects were chosen based on predetermined inclusion and exclusion criteria from Universiti Putra Malaysia (UPM) student population. The study employed a purposive sampling technique to select participants based on predefined criteria. These criteria were used to identify eligible individuals who met specific requirements. The initial pool of potential respondents was drawn from the Students Affairs Division and Dean's Office of the Faculty of Medicine and Health Sciences at Universiti Putra Malaysia (UPM) using simple random sampling. The sample size was determined through calculations, resulting in the recruitment of 32 participants, accounting for a 20% margin of error due to potential dropouts.

The chosen participants were contacted beforehand and asked whether they would be willing to participate in the study in exchange for their informed consent. The study focused on individuals between the ages of 18 and 35, including graduate and undergraduate students, since they were more likely to sit for extended periods of time and had trouble with keeping good posture. Participants were limited to those who met the following inclusion criteria: i) Belonged to the age range of 18 to 35; ii) Represented both genders; and iii) Had not engaged in physically demanding activities for a minimum of three days prior to the experiment, as high levels of physical activity may increase pain during the ensuing sitting assessment. On the other hand, those who met the following exclusion criteria were not eligible: i) Had a history of musculoskeletal diseases during the previous 12 months; ii) Had experienced any injuries in the past 12 months.

Data Collection

Questionnaire

The research took place in specific classrooms within the Faculty of Medicine and Health Sciences. A total of 32 students, 16 of whom were placed in the experimental group and 16 of whom were placed in the control group, participated in the study. The participants included both male and female students. The self-administered questionnaire was divided into four key sections. The first section aimed to capture socio-demographic information about the participants involved in the research, including details such as age, gender, weight, and height. The second section delved into the daily activities of the respondents, focusing on their average daily sitting, sleeping, and studying hours. Additionally, this section included an assessment of the mental well-being of the respondents. The third segment of the questionnaire introduced a chart to assess discomfort, employing the Short-Form McGill Pain Questionnaire. This chart evaluated the level of discomfort experienced while sitting for specific durations and included five perceived types of discomfort: "stabbing," "shooting," "cramping," "aching," and "heavy tiring-exhausting," each graded on a scale ranging from "none" to "mild," "moderate," and "severe."

The final section of the questionnaire employed the Visual Analog Scale (VAS) to gauge the respondents' direct experiences of discomfort in various body parts, using a scale from 1 to 10, where 10 represented the most intense discomfort. This questionnaire package also included a brief description of the research topic, a consent form, and a statement on the protection of personal data. To safeguard the privacy of participants, the collected data were anonymized and encrypted before being stored on a computer.

Posture Support

Participants in the experimental groups were provided with a VOKKA Posture Corrector (Figure 1), a wearable back support device. This posture corrector is designed to offer long-lasting back support and is constructed from breathable, durable, and machine-washable high-quality fabrics. Before the simulation phase, participants were given a demonstration on how to correctly wear the VOKKA Posture Corrector. To ensure ethical considerations were met, participants were asked for their consent before engaging in the research activities.

Figure 1: VOKKA Posture Support

Data Collection Technique

During the posture assessment, respondents were asked to sit on a chair in the classroom for the period of 2 hours. The respondents in experimental group were wearing the posture support inside while the control group will be given none during the assessment. Before the sitting simulation, the questionnaire was given to each respondent to obtain their respondent’s personal information, daily activities, and health information data. For every 15-minute interval process, the overall body discomfort and body parts discomfort rating questionnaire were given as they experience while sitting to rate their discomfort. All the data obtained from questionnaires were analyzed by using Statistical Analysis Software.

Ethical Consideration

The Ethics Committee of the Faculty of Medicine and Health Sciences at the University Putra Malaysia granted the study involving human subjects the required ethical permission prior to the start of data collection, as shown by approval reference, JKEUPM-2022-436.

Result

The result for the sociodemographic is presented in Table 1 comparing both control and experimental group. There are respondents with different ethnicities background who are undergraduate and foundation students and from Universiti Putra Malaysia. The study shows the respondents' age were in the range of 18 to 23 years old with average age of 20.97 ± 1.78 years old. Majority of the respondents are 22 years old (68.8%), followed by aged of 18 years old (25.0%) and the rest of them are 20 and 23 years old (6.2%). All 32 respondents also have a normal Body Mass Index (BMI) category which is within a range of 18.5 to 24.9 kg/m^2. The mean BMI of the respondents was 23.24 ± 3.9 kg/m^2.

Based on the table below, the mean duration of sitting hours among the respondents were 7.31 ± 1.49 hours in a day. The result showed that majority of the respondent which is 50.0% spend more than and equal to 6 hours of sitting in a day. While only 9.4% of the respondents spend at least 5 hours daily. As for studying duration, 43.8.% of the respondents spend more than and equal to 5 hours of their studying period. Another 56.3% of the respondents had less and equal to 4 hours.

Table 1
Sociodemographic Distribution

Variable	**N (32)**	**%**
Age		
18	8	25.0
20	1	3.1
22	22	68.8
23	1	3.1
Gender		
Male	16	50
Female	16	50
Studying per day (hours)		
2	6	18.8
3	5	15.6
4	7	21.9
5	12	37.5
6	2	6.3
Sitting per day (hours)		
5	3	9.4
6	8	25.0
7	7	21.9
8	8	25.0
9	2	6.3
10	4	12.5

Sleeping per day (hours)		
4	6	18.8
5	12	37.5
6	10	31.3
7	3	9.4
8	1	3.1

Data Distribution of Discomfort Rating between Experimental and Control Groups
Further analysis performed to determine the distribution of discomfort ratings between experimental and control groups found that there was a significance between the two groups in the prolonged sitting position as presented in Figure 2.

Overall Discomfort Rating in the Prolonged Sitting Position
The results of the adapted version of Short Form McGill Pain Questionnaire on overall discomfort rating by the respondents are presented in Figure 2 and Figure 3. The bar graph represents the mean rating of discomfort level experienced by the respondents as perceived descriptors based on the discomfort during 120 minutes of sitting period with and without the posture support between experimental and control group. Based on the result, the mean difference in control group shows higher discomfort level compared to the mean differences in experimental group. There is a gradual increase of discomfort rating of "None" to "Severe" from 0th minute to 120th minute in every 15-minute intervals. The results of this study also revealed that majority of the respondents experienced higher discomfort on several descriptors as the mean rating of the discomfort is more than 2 (moderate). Among control group, the descriptor of "Tiring-Exhausting" has the highest mean of discomfort (2.25 ± 0.88) at the 120th minute, followed by the discomfort in "Heavy" (2.16 ± 0.808). High discomfort mean rating also found in "Aching" (1.91 ± 0.78). In comparison, experimental group for "Tiring-Exhausting" found to have lower mean rating, (1.50 ± 0.5.6) at the 120th minute. Meanwhile, "Cramping" rating remained constant with every 15 minutes in the experimental groups.

Figure 2: Discomfort Rating of Control Group based on Short-Form McGill Pain Questionnaire

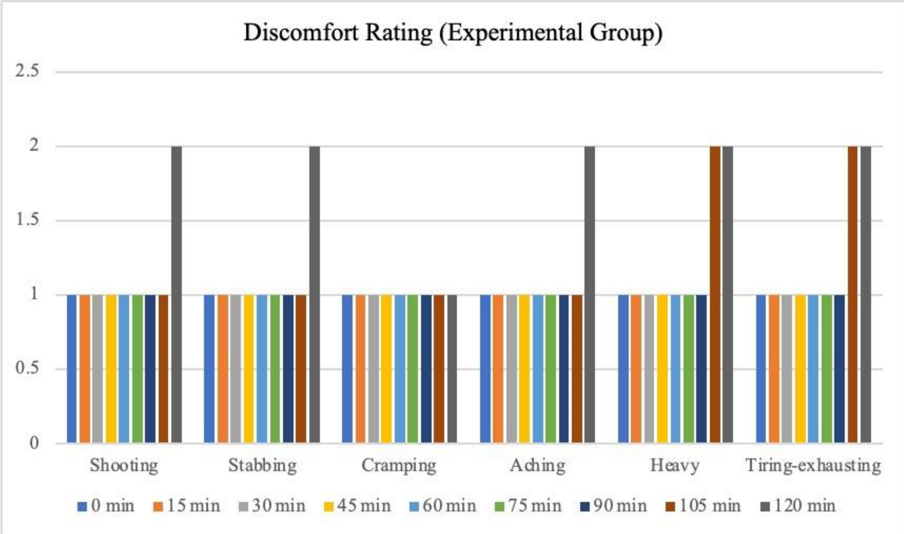

Figure 3: Discomfort Rating of Experimental Group based on Short-Form McGill Pain Questionnaire

Body Parts Discomfort Ratings in the Prolonged Sitting Position

The distribution of discomfort ratings between experimental and control groups were further analysed based on body parts using Visual Analog Scale rating of (0-10). Each body parts discomfort ratings between control and experimental groups are presented in Figure 4 and Figure 5. There is a significant difference between each body parts between control and experimental groups in the 2 hours simulation. The highest mean discomfort rating found from lower back in the control group at the 120th minute (6.38 ± 1.59) compared to experimental group (2.63 ± 0.62), which is significantly lower from using posture support feature. Lower back mean rating was only evident after 105th minute and meanwhile, neck, shoulder, upper back and arms and hands found to have higher discomfort rating in the control group (4.56 ± 1.15), (3.88 ± 1.20), (4.31 ± 0.88), and (3.69 ± 1.08) respectively. In the experimental group, there is a gradual increase in the discomfort at the neck (3.50 ± 1.10). However, it is still lower compared to the control group's neck discomfort rating.

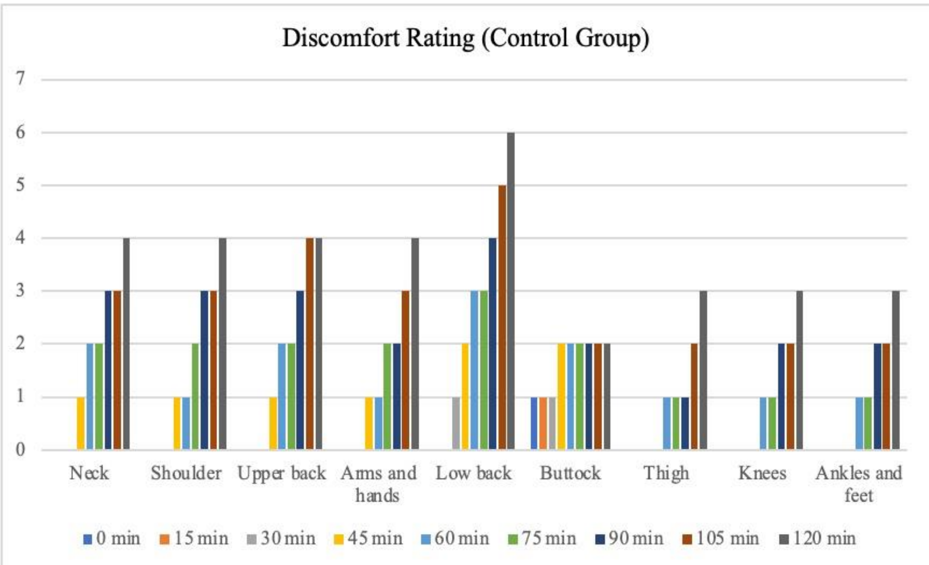

Figure 4: Discomfort Rating of Control Group Based on Visual Analog Scale (VAS)

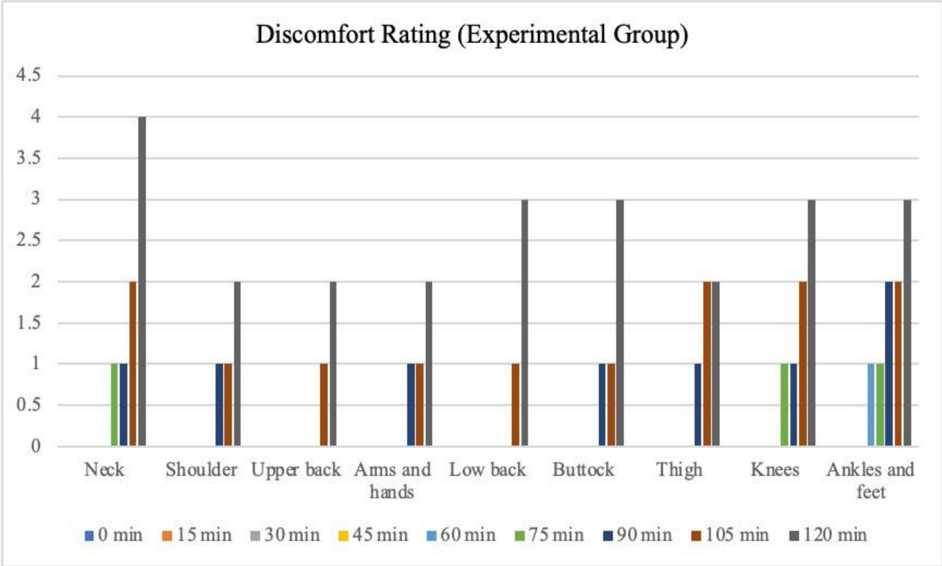

Figure 5: Discomfort Rating of Experimental Group based on Visual Analog Scale (VAS)

Correlation of Discomfort Rating and Risk Factors (BMI, Sitting Hours Per Day and Studying Duration Per Day) among Respondents.

Table 3 and table 4 show the correlation of mean rating of discomfort of body part and risk factor for BMI, sitting hours per day and studying duration per day. Based on the tables below, there were significant correlation between mean rating of discomfort and risk factors (BMI, sitting duration and studying duration) for certain part of body. Based on upper body table, there was a significant positive correlation between discomfort of upper back with BMI of respondents ($p<0.001$). Moreover, for lower part of the body, there was a significant positive correlation between mean rating discomfort of buttock, thigh and ankles and feet with BMI and studying duration of respondents ($p<0.05$) and additionally, there was a significant negative correlation between mean of rating discomfort of buttock, knee and ankles and feet with sitting duration and studying duration ($p<0.05$).

Table 2
The Upper Body Correlation between Body Parts Discomfort Ratings and Risk Factors BMI, Sitting Hours Per Day and Studying Duration Per Day

Body Regions	Body parts	Time (min)	BMI		Sitting duration		Studying duration	
			Correlation coefficient, r	p-value	Correlation coefficient, r	p-value	Correlation coefficient, r	p-value
	Neck	0	.	.	.	.	.	.

		15	.	.	.	.	.	.
		30	0.238	0.190	-0.316	0.078	-0.120	0.513
		45	0.209	0.252	-0.252	0.164	-0.265	0.143
		60	0.104	0.570	-0.226	0.214	-0.104	0.571
		75	0.018	0.920	-0.135	0.463	-0.075	0.681
		90	0.060	0.745	-0.157	0.390	-0.089	0.626
		105	0.156	0.394	-0.172	0.346	-0.270	0.136
Upper body		120	0.184	0.315	-0.074	0.687	-0.270	0.482
	Shoulder	0	.	.	.	.	.	.
		15	.	.	.	.	.	.
		30	-0.260	0.151	-0.097	0.597	-0.052	0.776
		45	-0.031	0.866	-0.146	0.426	0.006	0.975
		60	0.190	0.298	-0.147	0.422	-0.184	0.314
		75	0.090	0.626	-0.162	0.375	-0.042	0.819
		90	0.148	0.419	-0.048	0.792	-0.174	0.340
		105	0.062	0.737	-0.011	0.953	-0.204	0.264
		120	0.081	0.660	-0.019	0.918	-0.250	0.167
	Upper back	0	.	.	.	.	.	.
		15	.	.	.	.	.	.
		30	0.243	0.180	0.083	0.653	0.027	0.883
		45	0.150	0.412	-0.159	0.386	-0.196	0.281
		60	0.211	0.246	-0.159	0.386	-0.033	0.857
		75	0.110	0.547	-0.231	0.204	-0.141	0.442
		90	0.124	0.500	-0.165	0.366	-0.259	0.153
		105	**0.947****	P<0.001	-0.190	0.298	-0.232	0.201
		120	**0.775****	P<0.001	-0.248	0.172	-0.104	0.570

	Arms and hands	0	.	.	.	.	.	.
		15	.	.	.	.	.	.
		30	0.188	0.303	0.251	0.166	-0.099	0.588
		45	0.172	0.347	-0.014	0.941	0.110	0.549
		60	0.053	0.775	-0.237	0.191	-0.113	0.539
		75	0.137	0.455	-0.191	0.294	-0.139	0.449
		90	0.037	0.839	-0.194	0.288	-0.106	0.563
		105	-0.004	0.984	-0.156	0.395	-0.004	0.982
		120	-0.049	0.788	-0.115	0.532	0.109	0.554

Table 3
The Lower Body Correlation between Body Parts Discomfort Ratings and Risk Factors BMI, Sitting Hours Per Day and Studying Duration Per Day

Body Regions	**Body parts**	**Time (min)**	**BMI**		**Sitting duration**		**Studying duration**	
			Correlation coefficient,r	**p-value**	**Correlation coefficient,r**	**p-value**	**Correlation coefficient,r**	**p-value**
	Low back	0	.	.	.	.	.	.
		15	-0.282	0.118	-0.179	0.327	0.303	0.092
		30	0.007	0.969	-0.140	0.444	0.015	0.937
		45	-0.008	0.967	-0.174	0.337	-0.163	0.372
		60	-0.008	0.967	-0.175	0.270	-0.069	0.706
		75	0.047	0.800	-0.201	0.171	-0.172	0.345
		90	-0.055	0.766	-0.248	0.063	-0.120	0.513
		105	-0.153	0.402	-0.332	0.112	-0.76	0.678
		120	0.009	0.960	-0.287	0.452	-0.76	0.679
	Buttocks	0	.	.	.	.	.	.
		15	.	.	.	.	.	.
		30	0.098	0.594	0.172	0.348	-0.211	0.247
		45	0.277	0.125	0.124	0.498	-0.218	0.231
		60	0.220	0.227	0.004	0.981	-0.274	0.128
		75	**0.369***	0.038	0.098	0.594	-0.187	0.305
		90	0.273	0.130	-0.069	0.709	-0.349	0.050
		105	0.287	0.112	-0.046	0.803	**-0.614****	P<0.001
		120	0.251	0.166	0.026	0.889	**-0.418***	0.020
	Thighs	0	.	.	.	.	.	.
Lower body		15	.	.	.	.	.	.
		30	0.110	0.548	0.131	0.476	**0.374***	0.035
		45	0.054	0.767	-0.088	0.633	0.243	0.180
		60	0.111	0.545	-0.168	0.357	0.114	0.535

	75	0.245	0.176	0.009	0.959	-0.093	0.611
	90	0.094	0.609	0.127	0.448	0.232	0.202
	105	0.331	0.64	0.321	0.073	-0.034	0.854
	120	0.254	0.160	0.229	0.207	-0.043	0.813
Knees	0	.	.	.	.	.	.
	15	.	.	.	.	.	.
	30	-0.308	0.087	-0.208	0.254	0.259	0.152
	45	-0.154	0.402	-0.120	0.512	0.314	0.081
	60	-0.076	0.679	-0.056	0.763	0.270	0.135
	75	-0.123	0.503	-0.160	0.381	0.042	0.820
	90	-0.112	0.540	-0.056	0.760	-0.288	0.109
	105	-0.156	0.392	0.001	0.996	**-0.410***	0.020
	120	-0.002	0.990	-0.180	0.323	-0.054	0.770
Ankles and feet	0	.	.	.	.	.	.
	15	.	.	.	.	.	-
	30	-0.184	0.313	-0.120	0.512	0.090	0.623
	45	-0.095	0.605	-0.052	0.776	0.023	0.902
	60	0.238	0.191	-0.160	0.381	0.048	0.795
	75	**0.426***	0.015	-0.043	0.817	-0.159	0.386
	90	0.103	0.573	-0.125	0.496	-0.156	0.394
	105	0.006	0.973	-0.241	0.184	-0.022	0.904
	120	0.093	0.614	**-0.384***	0.030	-0.003	0.988

Discussion

This study is conducted to determine the effectiveness of posture support in improving muscle comfort during prolonged sitting among university students. Total participants who were involved in this study were males consist of 32 participants (16 participants for experimental group and 16 participants for control group). All the participants were in healthy condition, and they also had enough rest before started the sitting assessment. The total mean body mass index (BMI) of the participants was 23.24 ± 3.9. In this study, the BMI was not controlled as it was used to determine the correlation between mean rating of discomfort and BMI of respondent as risk factor. However, previous studies have shown that even those with normal BMIs or well-proportioned bodies may acquire musculoskeletal diseases as a result of uneven muscle function if they sit with poor posture for prolonged periods of time (Cardoso et al., 2022; Jain et al., 2021). The mean of sitting duration per day of the participants was 7.31 ± 1.49 hour. This duration included the time taken that they spend time on sitting throughout the whole day.

The long time spent sitting and the absence of physical activity causes a loss of muscular strength, endurance, and flexibility, leading to feelings of fatigue, soreness, and pain in the muscles after long periods spent working (Shariat, 2016). The mean of studying hours per day of the participants was 3.97 ± 1.26. Studying hours was measured in terms of the hour's students spend doing their school work after class. Due to long study hours, high stress levels, and extensive laptop use, university students frequently maintain static or infrequent postures. As a result, they are greatly afflicted by musculoskeletal issues. Given the incidence and difficulties of musculoskeletal diseases in young, educated people, it is critical to focus on preventing and treating these conditions. Addressing musculoskeletal issues, particularly musculoskeletal diseases, is critical for preventing chronic pain and improving activity, efficiency, and quality of life (Yang et al., 2019; Can and Karaca, 2019).

The findings in this study also showed that the mean difference in control group shows higher discomfort level compared to the mean differences in experimental group with posture support while sitting. Numerous research studies have concentrated on the support of lumbar lordotic curves during prolonged periods of sitting to alleviate discomfort and preserve mobility in the lumbar spine area (Prommanon et al., 2015; Kompayak et al., 2016). In a study conducted by Prommanon et al (2015), two interventions were compared, and the findings revealed that using back pillows made of foam material was more effective than physical therapy in diminishing pain and improving the range of motion in the lumbar region. Similarly, Kompayak et al (2016), reported that the use of foam-based back pillows could significantly reduce pain intensity, enhance the quality of life, increase lumbar range of motion, reduce functional impairment, and boost patient satisfaction when contrasted with lumbar support devices in individuals suffering from chronic lower back pain (LBP). Additionally, recent study employing a support feature for traffic police riders, the usage of lumbar support with a built-in massager system resulted in a smaller deviation angle than the non-intervention group. This is because an unsupported upright stance causes the rider's spine to bend unnaturally. The prototype improves riders' ability to maintain a proper, upright spinal posture over the lack of lumbar support. Traffic policemen are subjected to protracted static postures, resulting in substantial musculoskeletal angular deviation, especially the lumbar angle (L1-L5). This postural change adds to poor posture, musculoskeletal illnesses, and spinal damage, particularly in the lower back, which is one of the most serious contemporary diseases (Yusof et al., 2021).

According to results from Visual Analog Scale rating of (0-10), there is a significant difference between each body parts between control and experimental groups in the 2 hours simulation. The highest mean discomfort rating found from lower back in the control group at the 120th minute (6.38 ± 1.59) compared to experimental group (2.63 ± 0.62), which is significantly lower from using posture support feature. Study have shown that undergraduate students frequently experience musculoskeletal problems, especially LBP. For example, a Saudi Arabian study (Algarni et al., 2017) revealed that 40.5% of participants had reported having LBP in the previous week, and 67.0% had reported having LBP in the previous year. Prolonged, uninterrupted sitting during a conventional 2.5-hour university lecture is associated with greater physical pain and tiredness in students. Significant pain occurs after 75 minutes, whereas drowsiness begins after just 15 minutes. Students with a history of pain report greater discomfort upon starting class and severe suffering after 60 minutes. However, neither preceding pain nor sitting duration influence reported alertness levels (Hosteng et al., 2019). According to an Indian study, students who study for more than five hours a day are more likely to experience LBP, which can lead to a sedentary lifestyle (Ganesan et al., 2017). The length of their academic courses is a major aspect leading to these prolonged sitting times. According to a Saudi Arabian study, extended daily sitting for more than three hours was linked to 61.5% of cases of LBP (Lucky et al., 2016).

Findings in this study also examined that there was significant correlation between mean rating of discomfort of lower and upper body parts and risk factors such as BMI (upper back, buttock, thigh and ankles and feet), sitting duration (buttock, knee and ankles and feet) and studying duration (buttock, thigh, knee and ankles and feet). Prolonged sitting frequently results in common side effects such soreness, exhaustion, and musculoskeletal and postural issues. According to Badi et al. (2022), students who sit for extended periods of time in class are likely to experience discomfort and reduced concentration throughout their studies. Thus, it's critical to assess how prolonged sitting affects students' comfort and posture and to find treatments or other options that could be used to lessen these impacts (Buchman-Pearle et al., 2022).

The prevalent trend of prolonged sitting has seen a consistent rise in the modern era. Students sometimes have to sit in classrooms for extended periods of time, especially in educational contexts. Students usually spend 75% of their time in the classroom, according to a study by Pronk et al (2016), and a large amount of that time is spent sitting down and not moving around (Lakshmi and Bindu, 2021). Kounter (2019), explores how extended sitting might affect students' bodies, causing pain, exhaustion, musculoskeletal problems, and even anatomical anomalies. These consequences can at times be so severe that they become irreversible (Nicola, 2021). Students that perform poorly in school frequently display traits of boredom, sluggishness, and inactivity. They also typically lack enthusiasm for physical activity. According to Glapa et al (2018), a number of reasons contribute to their poor health, which in turn causes them to engage in this sedentary behaviour. However, studies have repeatedly demonstrated that keeping good posture is essential to avoiding physical discomfort and exhaustion. Students' academic performance is a direct reflection of the well-established relationship between a healthy body and a healthy mind (Shutova et al., 2020).

In a study on the negative effects of extended sitting, Braun et al. (2016) found that students who avoid physical activity are more likely to experience health problems, exhibit a chronic loss of interest in their studies, and receive poor exam scores. These students' unwillingness to engage in physical activity has a negative effect on their academic achievement and raises the absence rate. Young students' lives have changed dramatically since COVID-19 became a problem; they now frequently choose technological gadgets over face-to-face social interactions. As a result, in the post-COVID-19 era, their inaction and sluggishness have given rise to a number of difficulties. In response to these worries, Jabeen and Hussain (2022) fervently support the implementation of active ergonomic practices by teachers, parents, and school administrators with the goal of revitalising students and encouraging physical exercise and attentiveness. Schools must implement health-promoting practises to solve this problem, like encouraging physical activity during extended academic sessions and minimising students' sitting time by implementing activity-based teaching methodologies (Podrekar et al., 2020).

Conclusion

In conclusion, the impact of back support intervention among university students reveals a promising trend towards alleviating discomfort and enhancing ergonomic conditions. This study highlighted the comfort by providing back support to students, particularly in mitigating musculoskeletal disorders (MSDs) and reducing the prevalence of associated issues. As a result, it is imperative for educational institutions to consider the implementation of proactive measures, including the provision of ergonomic solutions, to address the issue of discomfort and MSDs among their student population. Universities should prioritize implementing ergonomic chairs, lumbar support cushions, and promoting proper posture through education and adjustable workstation layouts. Additionally, collaborating with health services to offer consultations or ergonomic assessments for students experiencing discomfort or pain related to their study habits is crucial. Undoubtedly, this study has several limitations. This study assessed only a limited number of variables related to sitting posture and body part discomfort rating, which might have left out other important elements. Furthermore, the study used self-reported data that could not be clinically confirmed, raising concerns regarding the accuracy and reliability of the responses.

Acknowledgements
We are grateful to the university students who willingly participated in the data collection session for this research. We value their time, participation, and dedication, without which this research would not have been achievable.

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