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Association Between Sitting Duration, Learning Posture, and Musculoskeletal Complaints Among High School Students

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Abstract: Prolonged sitting duration and non-ergonomic learning postures are major risk factors for musculoskeletal disorders among adolescents. High school students spend most of their time sitting during academic activities, gadget use, or independent study. These habits may result in physical complaints such as neck, back, and shoulder pain. This study aimed to examine the association between sitting duration and learning posture with musculoskeletal complaints among high school students. A quantitative approach with a cross-sectional design was employed. The sample consisted of 120 students selected using proportionate stratified random sampling. Data were collected using the Nordic Musculoskeletal Questionnaire (NMQ) and posture observation sheets. Data analysis was conducted using the Kruskal–Wallis test with a significance level of 0.05. The findings revealed that the majority of students who spent more than 6 hours per day sitting with a slouched posture reported moderate to severe musculoskeletal complaints, particularly in the neck (68%), upper back (61%), and shoulders (54%). Statistical analysis showed a significant association between sitting duration and learning posture with the severity of musculoskeletal complaints ($p = 0.041$). In conclusion, there is a significant association between sitting duration and learning posture with musculoskeletal complaints among high school students. Ergonomic education and light physical interventions should be implemented in schools to prevent musculoskeletal disorders from an early age.

Keywords: Sitting duration; Learning posture; Musculoskeletal complaints; High school students; Ergonomics; Cross-sectional study

INTRODUCTION

Non-ergonomic postures, such as sitting with a slouched back or excessive neck flexion while viewing a screen, may lead to muscle strain. Hayes et al. (2009) stated that misalignment of body posture with ergonomic principles results in uneven distribution of body load. This condition accelerates the onset of muscle fatigue, particularly in the neck, shoulders, upper back, and lower back.

Other factors influencing learning posture include desk and chair design, lighting, and digital device usage habits. Samosir et al. (2025) emphasized that students who sit on chairs without back support are more likely to experience musculoskeletal complaints compared to those using ergonomic chairs. Therefore, awareness of proper body posture needs to be instilled from an early age to reduce the risk of long-term health problems.

In the context of learning activities, students often sit in improper positions for prolonged periods. This habit increases the risk of developing neck pain, back pain, and shoulder tension. According to Wicaksono et al. (2016), university students who sit for more than six hours per day show a prevalence of musculoskeletal complaints as high as 65%, particularly in the neck and back regions. Batara et al. (2021) also reported a significant increase in musculoskeletal pain prevalence among students who study without incorporating stretching or intermittent physical activity.

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Meanwhile, the WHO (2020) stated that a sedentary lifestyle and insufficient physical activity are major contributing factors to the rising incidence of musculoskeletal disorders among adolescents. Learning activities in the digital era contribute to the extended sitting duration of students.

Activities such as attending online classes, completing assignments on a computer, or using gadgets for studying increase the risk of a sedentary lifestyle. WHO (2020) classifies prolonged sitting as a form of sedentary behavior that can elevate the risk of musculoskeletal disorders, obesity, and metabolic problems. Research by Dian (2017) revealed that providing simple education on the importance of active breaks and stretching every 30–60 minutes can reduce musculoskeletal complaints by up to 40% among high school students. Therefore, although study duration often cannot be reduced, preventive strategies can be implemented by improving sitting posture and incorporating light physical activity between academic tasks.

METHOD

This study employed a quantitative non-experimental approach with a cross-sectional design. This design was chosen because data collection was conducted at a single point in time to examine the relationship between the independent variables (body posture and sitting duration during learning activities) and the dependent variable (musculoskeletal complaints). According to Notoatmodjo (2018), the cross-sectional design is appropriate for describing the prevalence of a health phenomenon and analyzing the relationship between variables within a relatively short period of time. The study sample consisted of 120 respondents, determined using the proportionate stratified random sampling technique. This technique was applied to ensure that the sample represented all class strata (X, XI, and XII) proportionally, thereby making the research findings more representative of the population (Sugiyono, 2019).

DISCUSSION

Respondent Characteristics

This study involved 120 high school students in Serang City, who were divided into three categories based on daily sitting duration: <4 hours, 4–6 hours, and >6 hours. Learning posture was observed during academic activities, and musculoskeletal complaints were identified using the Nordic Musculoskeletal Questionnaire (NMQ).

Table 1. Prevalence of Musculoskeletal Complaints Based on Sitting Duration

Sitting Duration	Neck (%)	Upper Back (%)	Shoulders (%)	Complaint Level
> 6 hours	68	61	54	Highest
4–6 hours	Moderate	Moderate	Moderate	Moderate
< 4 hours	Minimal	Minimal	Minimal	Minimal

The results of this study indicate that prolonged sitting duration and non-ergonomic learning posture significantly contribute to musculoskeletal complaints among high school students. Students who sat for more than six hours per day reported the highest prevalence of complaints, particularly in the neck, upper back, and shoulders. These findings are consistent with studies by Batara et al. (2021) and Wicaksono et al. (2016), which stated that prolonged sitting activities without stretching or changes in position increase the risk of musculoskeletal disorders.

Poor learning postures, such as slouching, bending forward, or forward head posture, were found to be dominant among students with moderate to severe physical complaints. This aligns with ergonomic theory as explained by Tarwaka (2015), which highlights that unbalanced body

positions can lead to muscle tension and biomechanical disorders. Moreover, the sedentary lifestyle common among adolescents—characterized by limited physical activity and extensive gadget use—further worsens posture quality and increases the risk of musculoskeletal complaints (WHO, 2020).

The Kruskal–Wallis test in this study revealed a significant relationship between sitting duration and learning posture with musculoskeletal complaints ($p = 0.041$), reinforcing the hypothesis that ergonomic factors in learning activities deserve particular attention. These findings emphasize the importance of educational interventions in the school environment, such as posture training, the provision of ergonomic learning facilities, and the integration of light physical activities into students' daily routines.

Overall, this discussion demonstrates that musculoskeletal complaints among high school students are not merely a physical issue but also a reflection of learning patterns and school environments that have not yet fully supported postural health. Therefore, school-based promotive and preventive approaches are essential to prevent musculoskeletal disorders from adolescence onward.

CONCLUSION

Prolonged sitting duration and non-ergonomic learning posture are significantly associated with musculoskeletal complaints among high school students, particularly in the neck, upper back, and shoulders. School-based promotive and preventive strategies are crucial to raise ergonomic awareness and reduce the risk of long-term physical complaints.

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