

Investigating the Impact of Prolonged Sitting and Lack of Physical Activity on the Musculoskeletal Health of School Students

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Abstract

Background

Prolonged sitting and lack of physical activity have become very common issues among school students due to increased screen time and academic schedules. These sedentary behaviors can adversely affect musculoskeletal health, leading to conditions such as poor posture, back pain, and reduced physical fitness. Understanding these impacts is crucial for developing effective interventions to promote healthier lifestyles among these groups.

Aims

This study aims to investigate the effects of prolonged sitting and insufficient physical activity on the musculoskeletal health of school students. The objectives include identifying common musculoskeletal problems, analysing the correlation between sedentary behaviors and these issues

Setting

The research was conducted in various schools, encompassing a diverse population of students aged 12-17 years. The schools were selected to represent different socio-economic backgrounds and geographical locations to ensure a comprehensive analysis.

Design

A mixed-methods approach was employed, combining quantitative surveys and qualitative interviews. The quantitative component involved the administration of structured questionnaires to gather data on students' sitting habits, physical activity levels, and musculoskeletal complaints. The qualitative component included in-depth interviews with selected students, teachers, and health professionals to gain deeper insights into the causes and effects of sedentary behaviours.

Keywords: Prolonged Sitting, Physical Activity, Musculoskeletal Health, School Students, Sedentary Behaviour, Posture, Back Pain,

1. INTRODUCTION

In recent years, the impact of prolonged sitting and physical inactivity on musculoskeletal health has gathered significant attention, particularly in school students. With the increase in digital learning tools and an increased emphasis on academic performance, students spend large portions of their day seated, often in ergonomically compromised position. This sedentary lifestyle is concerning, as it causes various musculoskeletal disorders (MSDs) that can have long-term health implications.

The World Health Organization description of musculoskeletal health refers to: "the performance of the locomotor system, comprising intact muscles, bones, joints and adjacent connective tissues. Prolonged sitting, typically characterized by extended periods of inactivity and poor posture, has been linked to a range of MSDs, including lower back pain, neck pain, and shoulder discomfort. These conditions are not only prevalent among adults but are increasingly reported in children and adolescents. Approximately 50% of school-aged children experience back pain, which can significantly impact their quality of life and academic performance."⁽¹⁾

The sedentary behavior associated with prolonged sitting contributes to muscle imbalances and joint stiffness and increases the risk of developing chronic pain conditions. Lack of physical activity further increases this problem, as regular movement is crucial for maintaining musculoskeletal strength and flexibility. Physical inactivity is a major risk factor for developing chronic diseases, including MSDs, highlighting the necessity of incorporating regular physical activity into daily routines."⁽²⁾

School environments often lack adequate ergonomic furniture, which forces students into faulty postures. Moreover, the increasing use of digital devices for educational purposes has led to poor sitting habits, such as slouching and forward head posture, which are detrimental to spinal health. Use of laptops and tablets can lead to awkward postures and increased musculoskeletal discomfort among students⁽³⁾, this interplay between prolonged sitting, lack of physical activity, and musculoskeletal health in school students is a pressing issue that demands immediate attention. By understanding the underlying factors and implementing targeted interventions, it is possible to improve the musculoskeletal health outcomes of students, promoting a healthier and more active lifestyle.

2. SUBJECT AND METHOD SUBJECT AND METHOD

2.1 Participation:

Total 63 students participated in the research. Out of which 24 were males and 39 were females, between the age group of 12-17 years. Parental consent was taken before performing research. Students with pre-existing musculoskeletal conditions, recent injuries or physical limitations were excluded.

2.2 Study design and research setting:

This research will employ a mixed-methods approach, including quantitative surveys to assess sitting time, physical activity levels, and musculoskeletal health among school students. Additionally, qualitative interviews will be conducted to explore the factors influencing sedentary behaviours and identify potential interventions.

2.3 Instrumentation and study tool:

The tool used for the data collection of this study was a self-structured questionnaire. The questionnaire was validated beforehand by three experts in the field of physiotherapy before putting it in motion for the data collection. It was a single visit study where participants had to fill out a questionnaire containing few questions about their length of screen time for academic as well as leisure purpose, their physical activities and any musculoskeletal discomfort. Next participant should fill Teen Nordic Musculoskeletal

Screening Questionnaire (TNMQ-S) for detailed neuromuscular examination to pin point joint which is affected most by these habits

All participants are screened for eligibility by checking if they fit in the inclusion criteria. Eligible participants were asked to fill out the consent form to provide consent for taking part in this study voluntarily. They were asked to fill out the questionnaire providing a complete description containing the description of the study, consent form, and questionnaire. Data were collected by the method of convenience sampling. By the end of the study, all the responses were recorded

2.4 Results

The findings indicated that nearly 43% students spend 1-2 hours watching television on weekdays and their frequency of watching TV increases by nearly 27% during weekends. 76% students spent less than one hour on laptop or smartphone for academic projects and nearly 14% for leisure. However, on weekends use of laptop and smartphone increases by nearly 30% as compared to weekdays. 46% of students engage in less than 1 hour of physical activity in school and only 4% students walk or cycle to and from school for 1-2 hours. Physical activity of 38% is less than one hour on weekends. However 38% of parents always set a limit on screen time. In neuromuscular assessment nearly 44% students complain of neck pain, 35% shoulder pain, 35% upper back pain, 13% elbow pain, 64% wrist pain, 47% students complain of lower back pain, 26% hips and thigh pain, nearly 50% Knee pain and 40% ankle pain.

2.5 Results

2.5.1. Descriptive Analysis:

Demographic Variables:

1. Gender

Figure 1

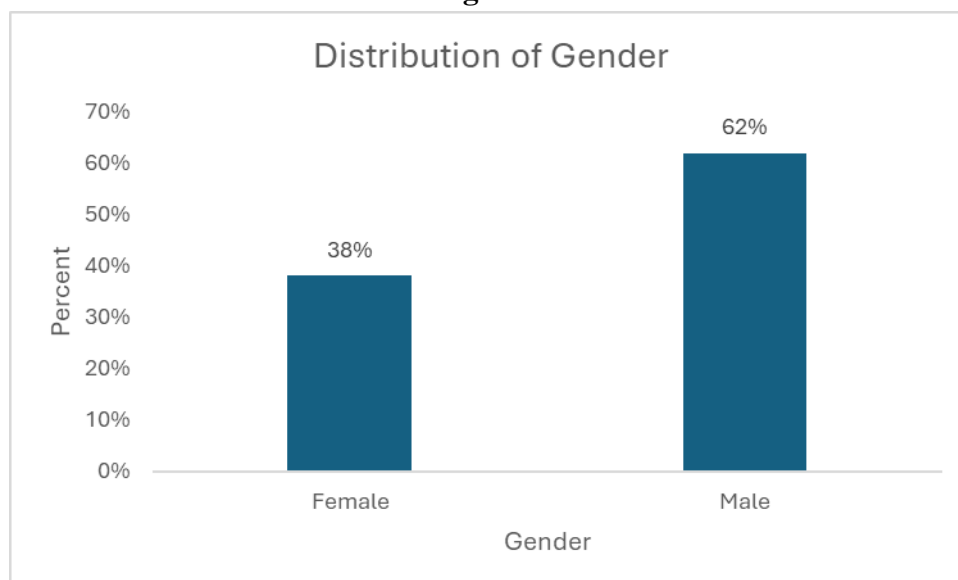


Figure 1 shows out of 63 respondents, 24 were female and remaining 39 male.

2. Age Figure 2

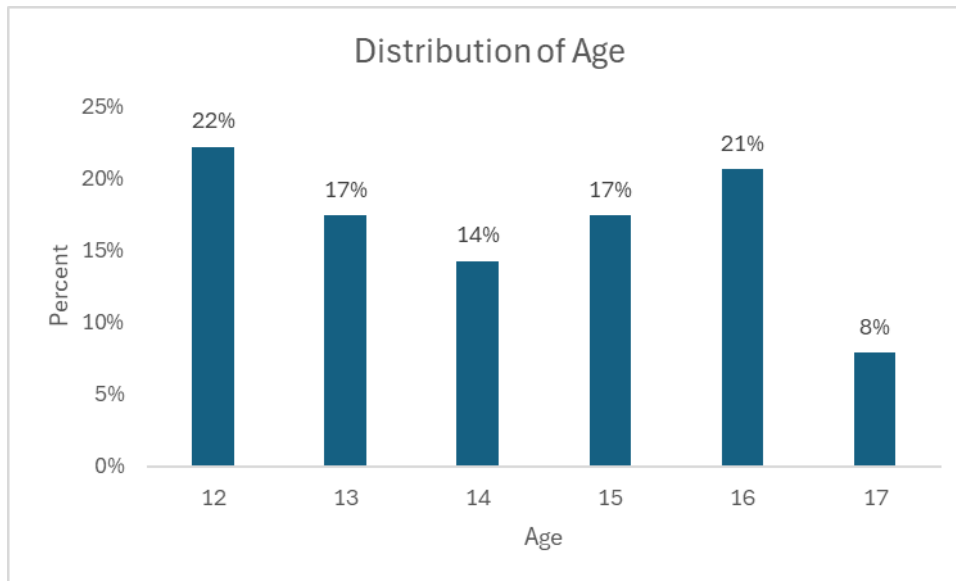


Figure 2 summarizes the percentage distribution of individuals across different age groups. The age distribution shows that the highest percentage of individuals are aged 12, followed closely by those aged 16. The smallest percentage of individuals are aged 17.

2.5.2. Inferential Analysis

H0_1: Prolonged sitting does not cause any impact on musculoskeletal health of school students.

Figure 3

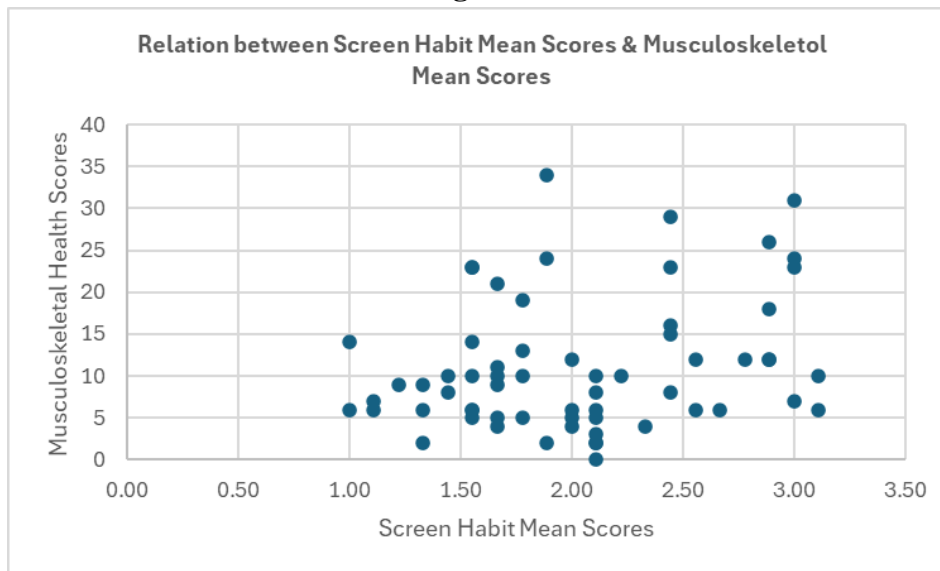


Table 1: Correlation t-test between Screen Habit Mean Scores & Musculoskeletal Health Scores

Variables	Karl Pearson's Coefficient of Correlation (r)	t-value	df	p-value
Screen Habit Mean Score	0.27	2.1932	61	0.03212
Musculoskeletal Health Score				

Table 1 shows the summarized results of Pearson’s product-moment correlation analysis, which measures the strength and direction of the linear relationship between Screen Habit Mean Scores & Musculoskeletal Health Scores. The p-value is 0.03212. Since this value is less than the typical significance level of 0.05, it suggests that the observed correlation is statistically significant, meaning there is a low probability that this correlation occurred by chance.

In summary, there is a statistically significant, positive, but weak linear relationship between screen habits and musculoskeletal health scores based on the sample data.

H0-2: Lack of physical activity does not cause any impact on musculoskeletal health of school students.

Figure 4

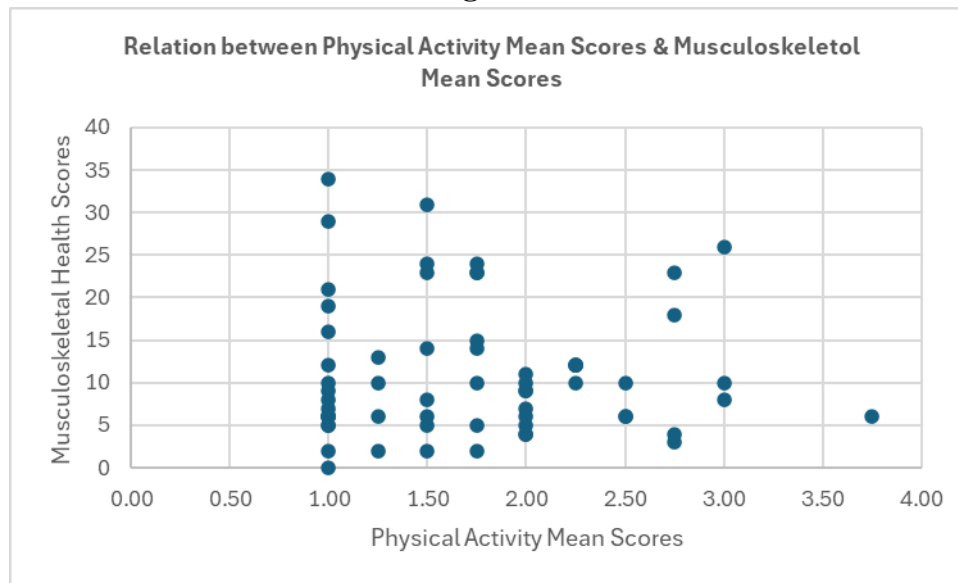


Table 2: Correlation t-test between Physical Activity Mean Scores & Musculoskeletal Health Scores

Variables	Karl Pearson’s Coefficient of Correlation (r)	t-value	df	p-value
Physical Activity Mean Score	-0.0287	0.22418	61	0.8234
Musculoskeletal Health Score				

Table 2 shows the summarized results of Pearson’s product-moment correlation analysis between "Physical Activity Mean Scores" and "Musculoskeletal Health Score". The p-value is 0.8234. Since this value is much greater than the typical significance level of 0.05, it suggests that the observed correlation is not statistically significant, meaning there is a high probability that this correlation occurred by chance.

In summary, there is no statistically significant linear relationship between physical activity mean scores and musculoskeletal health scores based on the sample data. The very weak negative correlation observed is likely due to random chance.

Activity	Mean
Hour Spent on TV	1.90
Hour Spent on Computer and Laptop for School work	1.38
Hour Spent on Computer and Laptop for Leisure	1.44
Hour Spent on smartphone/ tablet	2.70
Weekened time on Tv	2.67
weekned time on Computer for school work	1.33
weekned time on Computer Leisure	1.49
Use of smartphone or tablet at Weekend	2.92
Break From Screen Time	2.44
Screen Habits Mean Scores	2.03
Physical activity Such as Playing and Sports at school	1.81
Walking or Cycling to and from School	1.40
Physical Activity at Weekned as sports and excercise	2.19
Physical activity at weekend as cycling or Walking	1.56
Physical Activity Mean Scores	1.74
How often parent Set Limit on Screen Time	3.56
Do your Parent encourages you to Take Break	3.49
Parental Involvement Mean Score	3.52
Pain Or discomfort Experienced in last 6 month	0.46
During 6 Months Have u Missed A day of school Due to pain	0.14
During 6 month have you been forced to reduce your activity because of pain	0.21
Neck	0.81
Pain Or discomfort Experienced in last 6 month	0.35
During 6 Months Have u Missed A day of school Due to pain	0.08
During 6 month have you been forced to reduce your activity because of pain	0.13
Shoulder	0.56
Pain Or discomfort Experienced in last 6 month	0.37
During 6 Months Have u Missed A day of school Due to pain	0.08
During 6 month have you been forced to reduce your activity because of pain	0.17
Upper Back	0.62
Pain Or discomfort Experienced in last 6 month	0.35
During 6 Months Have u Missed A day of school Due to pain	0.03
During 6 month have you been forced to reduce your activity because of pain	0.06
Elbow	0.44
Pain Or discomfort Experienced in last 6 month	0.65
During 6 Months Have u Missed A day of school Due to pain	0.03

During 6 month have you been forced to reduce your activity because of pain	0.11
Wrist	0.79
Pain Or discomfort Experienced in last 6 month	0.48
During 6 Months Have u Missed A day of school Due to pain	0.10
During 6 month have you been forced to reduce your activity because of pain	0.14
Lower Back	0.71
Pain Or discomfort Experienced in last 6 month	0.27
During 6 Months Have u Missed A day of school Due to pain	0.08
During 6 month have you been forced to reduce your activity because of pain	0.08
Hips & Thighs	0.43
Pain Or discomfort Experienced in last 6 month	0.51
During 6 Months Have u Missed A day of school Due to pain	0.19
During 6 month have you been forced to reduce your activity because of pain	0.17
Knees	0.87
Pain Or discomfort Experienced in last 6 month	0.41
During 6 Months Have u Missed A day of school Due to pain	0.14
During 6 month have you been forced to reduce your activity because of pain	0.14
Ankle Feet	0.70
Musculoskeletal Health Score	11.17

3. DISCUSSION

This study provides a comprehensive analysis of The relationship between the impact of prolonged sitting and lack of physical activity on the musculoskeletal health of school students

3.1. Correlation between sedentary behavior and musculoskeletal problems: Table 1 shows the summarized results of Pearson’s product-moment correlation analysis, which measures the strength and direction of the linear relationship between Screen Habit Mean Scores & Musculoskeletal Health Scores. The p-value is 0.03212. Since this value is less than the typical significance level of 0.05, it suggests that the observed correlation is statistically significant, meaning there is a low probability that this correlation occurred by chance. In summary, there is a statistically significant, positive, but weak linear relationship between screen habits and musculoskeletal health scores based on the sample data.

3.2. Correlation between Physical activity and musculoskeletal problems Table 2 shows the summarized results of Pearson’s product-moment correlation analysis between "Physical Activity Mean Scores" and "Musculoskeletal Health Score". The p-value is 0.8234. Since this value is much greater than the typical significance level of 0.05, it suggests that the observed correlation is not statistically significant, meaning there is a high probability that this correlation occurred by chance. In summary, there is no statistically significant linear relationship between physical activity mean scores and musculoskeletal health scores based on the sample data. The very weak negative

correlation observed is likely due to random chance.

3.3. Musculoskeletal impact: Teen Nordic Musculoskeletal Screening Questionnaire (TNMQ-S) reveals that 44% student complain of neck pain 35% shoulder pain, 35% upper back pain, 13% elbow pain, 64% wrist pain 47% students complain of lower back pain, 26% hips and thigh pain, nearly 50% Knee pain and 40% ankle pain in past 6 months.

3.4. Implementation for Clinical Practice and Education Implement regular musculoskeletal screenings for school students to identify early signs of postural issues and musculoskeletal discomfort. This approach is supported by research suggesting early intervention can prevent long-term issues⁵. We have to develop individualized exercise programs that focus on strengthening weak muscles, stretching tight muscles, and improving overall posture². Overall education of parents and students are very necessary to protect adolescents from further hazardous effects of prolonged sitting and increased screen time.

3.5. Recommendations for Future Research There is a clear need for multifaceted interventions that include ergonomic improvements, physical activity promotion, and education on posture and health of school-going children. Schools play a crucial role in minimizing these risks through policies that encourage physical activity, such as incorporating regular breaks, promoting active play, and providing environments that support good posture. More longitudinal studies are needed to fully understand the long-term effects of prolonged sitting and inactivity on musculoskeletal health and to develop evidence-based interventions. By addressing these issues, we can improve the overall health and well-being of school students, ensuring they develop healthy habits that last a lifetime.

4. CONCLUSION

This research concludes that there is a statistically significant, positive, but weak linear relationship between screen habits and musculoskeletal health scores based on the sample data but there is no statistically significant linear relationship between physical activity mean scores and musculoskeletal health scores based on the sample data.

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