



Relationship between daily screen time and Neck Disability Index among school-going children aged 10–14 years

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Abstract

Background: Screen-based activities have become integral to children's daily routines, raising concerns about musculoskeletal health.

Objective: To assess the relationship between daily screen time and neck disability among school-going children aged 10–14 years.

Methods: A cross-sectional study was conducted among 120 children. Screen time exposure was recorded in hours per day, and neck disability was assessed using the Neck Disability Index (NDI). Statistical analysis was performed to evaluate correlations between screen time and NDI scores.

Results: Children reporting >3 hours/day of screen use demonstrated significantly higher NDI scores compared to those with ≤2 hours/day ($p < 0.05$). The most affected domains were pain intensity, concentration, and recreational activities.

Conclusion: Prolonged screen time is associated with increased neck disability among school-going children. Preventive strategies such as ergonomic education and regulated screen use are recommended.

Keywords: Screen time, neck disability, children, musculoskeletal health, Neck Disability Index, school-going children, ergonomics, pediatric health, posture

Introduction

Children's increasing reliance on digital devices has altered both educational and leisure activities. Long-term usage of smartphones, tablets, laptops, and televisions has raised concerns regarding musculoskeletal health, despite the fact that these gadgets are becoming an indispensable part of daily life. During screen-based activities, prolonged postures such as slouching, forward head orientation, and unsupported sitting are typical. These positions can cause discomfort and disability by placing a great deal of tension on the cervical spine^[1].

Because they are in a crucial developmental stage marked by fast physical growth, changing postural habits, and rising academic demands, children between the ages of 10 and 14 are especially vulnerable. Because musculoskeletal adaptations are still forming during this time, individuals may be at risk for different pathologies.

Children between the ages of 10 and 14 are particularly vulnerable because they are in a critical developmental stage characterized by rapid physical growth, shifting postural habits, and increasing academic demands. Inappropriate ergonomic practices may expose people to long-term health issues because musculoskeletal adaptations are still developing during this time. Its use in adolescent cohorts provides significant new insights into the ways that lifestyle factors, such as screen time, impact functional health outcomes, despite its historical use in adult populations^[4].

A systematic review has highlighted the increasing need to understand the association between screen use and musculoskeletal neck pain in children, despite the fact that research in this area is currently lacking^[5]. According to studies, school-age children's screen usage is strongly associated with shoulder and neck pain, and the prevalence is higher for those who use screens more frequently than the daily suggested limits^[2].

Since musculoskeletal neck discomfort is one of the most prevalent disorders worldwide, affecting people of all ages, including children who are not yet adolescent, it is becoming more widely acknowledged that neck pain is a common complaint among kids and teens^[3]. A validated instrument that is frequently used to evaluate how neck pain affects daily activities such as personal hygiene, concentration, reading, leisure, and sleep is the Neck Disability Index (NDI).

This study aims to investigate the relationship between daily screen usage and neck disability in school-age children between the ages of 10 and 14, using the Neck Disability Index as the primary outcome measure. The findings of this study can be utilized to inform ergonomic therapies, preventative measures, and family and school-based awareness initiatives that safeguard children's musculoskeletal health.

Methodology

This study employed a cross-sectional observational design to investigate the relationship between daily screen time and neck disability among school-going children. A total of 120 children aged 10–14 years were recruited from local schools through stratified random sampling.

Children between the ages of 10 and 14 who regularly use digital gadgets for recreational or instructional purposes and who are willing to engage were included. A history of musculoskeletal issues, a recent neck or spinal injury, or long-term medical conditions that impair posture were excluded.

Data collection was conducted using a structured questionnaire. Screen time was self-reported in hours per day and categorized into three groups: ≤2 hours, 2–3 hours, and >3 hours. The Neck Disability Index (NDI) was administered to assess neck-related functional disability.

The NDI consists of 10 items covering pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation, each scored on a 0–5 scale, with higher scores indicating greater disability^[1]. Statistical analysis was performed using SPSS version 22. Descriptive statistics summarized demographic data, screen time distribution, and NDI scores. One-way ANOVA was used to compare mean NDI scores across screen time categories, and Pearson’s correlation coefficient was calculated to assess the relationship between daily screen time and NDI scores. A p-value <0.05 was considered statistically significant.

Results

The study included 120 children (mean age = 12.1 ± 1.4 years; 52% male, 48% female). The majority of participants reported screen use exceeding 3 hours per day. Children with >3 hours/day of screen time demonstrated significantly higher mean NDI scores compared to those with ≤2 hours/day (p < 0.05). The most affected domains were pain intensity, concentration, and recreation. A positive correlation was observed between screen time and NDI scores (r = 0.41, p < 0.01), indicating that increased screen exposure was associated with greater neck disability.

Table 1: Demographic Characteristics of Participants

Variable	Value
Mean Age (years)	12.1 ± 1.4
Gender – Male	62 (52%)
Gender – Female	58 (48%)
Screen Time > 3 hours/day	Majority of participants
Screen Time ≤ 2 hours/day	Remaining participants

Table 2: Distribution of Screen Time among Children (N = 120)

Screen Time Category	Number of Children	Percentage (%)
≤ 2 hours/day	28	23.3%
2–3 hours/day	34	28.3%
> 3 hours/day	58	48.4%

Table 3: Mean NDI Scores across Screen Time Categories

Screen Time Category	Mean NDI Score ± SD	p-value
≤ 2 hours/day	6.2 ± 2.1	< 0.05*
2–3 hours/day	9.4 ± 2.8	< 0.05*
> 3 hours/day	13.1 ± 3.6	< 0.05*

Discussion

This study showed that among school-age children between the ages of 10 and 14, daily screen use was significantly associated with neck impairment. Children who spent more than three hours a day in front of a screen had higher NDI scores, which is indicative of more functional impairment. The domains that are most impacted—pain intensity, attention, and recreation—indicate that excessive screen time affects social and intellectual activities in addition to causing physical discomfort.

These findings are consistent with recent studies that indicate teens who spend a lot of time in front of screens had a higher frequency of neck and shoulder pain^[2,3]. While Hakala *et al.*^[2] found that frequent computer-related activities significantly increased the incidence of musculoskeletal pain in teenagers, Straker and Mathiassen^[3] highlighted the ergonomic repercussions of extended screen use. It has been recognized that neck pain is a major global public health issue and that chronic illnesses in adulthood may arise from early childhood onset^[4]. Consistently tilting

the head down to view phones or laptops increases the gravitational load on the posterior cervical musculature, leading to fatigue and chronic pain. It maintains a fixed position for extended periods prevents muscle recovery, leading to muscle imbalance, reduced blood flow, and accumulation of metabolic by-products.

By providing a validated measure of functional disability, the Neck Disability Index (NDI) was used in this study, strengthening its application in paediatric populations^[1]. As preventive strategies, our findings emphasize the importance of regular breaks, physical activity, and ergonomic education. Collaboration between schools and parents is necessary to regulate screen time and promote proper posture.

Conclusion

This study demonstrated a substantial correlation between neck disability and daily screen use in school-age children (10–14 years old). Children who spent more than three hours a day on screens had higher Neck Disability Index (NDI) scores, indicating greater functional impairment in areas like pain severity, concentration, and leisure. These findings highlight the growing risks that excessive screen time poses to children's musculoskeletal health. Preventive strategies including ergonomic education, screen time limits, and physical activity promotion are essential to safeguarding kids' health and academic achievement.

Limitations

There are a few limits to be aware of. Initially, screen time was self-reported, which could lead to inaccurate daily exposure estimates and recall bias. Second, because it is impossible to fully establish the temporal link between screen time and neck impairment, the cross-sectional methodology limits the capacity to draw conclusions about causality. Third, the study only looked at one age group (10–14 years old) and a small geographic area, which could have an impact on generalizability. Furthermore, although though the Neck Disability Index has been validated, it was first created for adults, and although it can be used with children, some of its dimensions might not adequately represent experiences unique to children.

Future Recommendations

Future research examining the long-term impacts of screen usage on the musculoskeletal health of children and adolescents should employ longitudinal approaches. Accuracy could be increased and the bias associated with self-reporting reduced with the use of device usage tracking and other objective measures of screen time. Expanding the study to include more age groups and demographics might improve its generalizability. Additionally, intervention-based studies assessing the effectiveness of ergonomic education, scheduled screen breaks, and physical activity programs may provide evidence-based preventative strategies. Finally, further validation of the paediatric adaptations of the Neck Disability Index may enhance its applicability in younger groups.

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