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THE INFLUENCE OF THE SMARTPHONES ON THE DEVELOPMENT OF POSTURE AND MUSCLE DISORDERS IN THE HEAD AND NECK AREA BY CHILDREN AND YOUTH

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ABSTRACT

The rapid proliferation of smartphones has transformed the lifestyle of modern youth, offering constant access to communication, entertainment, and information. However, this convenience is accompanied by growing concerns about its negative effects on posture and musculoskeletal health. A growing body of research indicates that excessive smartphone use contributes to postural abnormalities, particularly forward head posture (FHP), rounded shoulders, and increased cervical muscle tension among children and adolescents (López-de-Uralde-Villanueva et al., 2023; Alotaibi & Alsaadi, 2022; Areeudomwong et al., 2021).

Systematic reviews and meta-analyses confirm that prolonged screen exposure and sedentary behavior are associated with neck and shoulder pain, muscle fatigue, and impaired postural control (López-de-Uralde-Villanueva et al., 2023; Hegazy et al., 2020). Biomechanical studies show that sustained head flexion during smartphone use increases cervical load exponentially — up to 27 kg of additional pressure on the spine when the neck is flexed at 60° (Kim & Kim, 2015).

These changes may contribute to the development of “text neck syndrome,” characterized by chronic neck pain, stiffness, and muscle imbalance (Damasceno et al., 2018; Xie et al., 2020). The problem intensified during the COVID-19 pandemic, when remote learning and restricted physical activity significantly increased screen time (Cakir et al., 2022).

This review summarizes current evidence on the impact of smartphone use on posture and musculoskeletal health in children and adolescents, exploring biomechanical mechanisms, behavioral risk factors, and possible preventive strategies.

KEYWORDS

Smartphone Use, Children And Adolescents, Forward Head Posture, Neck Pain, Musculoskeletal Disorders, Text Neck Syndrome

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Introduction

In recent years, smartphones have become an inseparable part of daily life, particularly among younger generations. According to global data, over 90% of adolescents own or have access to a smartphone, and their average daily use exceeds 3 to 5 hours (Shan et al., 2013). These devices are increasingly used not only for communication but also for education, gaming, and social media interaction — activities that often involve long periods of static posture.

Children and adolescents are especially vulnerable to the adverse biomechanical effects of prolonged smartphone use due to ongoing musculoskeletal development and lower postural stability compared to adults (Areeudomwong et al., 2021). The forward and downward head tilt typical of smartphone use places substantial stress on cervical muscles, intervertebral discs, and ligaments, potentially leading to structural adaptations and chronic discomfort (Hegazy et al., 2020; Kim & Kim, 2015).

The emergence of “text neck syndrome” — a condition characterized by neck pain, stiffness, and upper back discomfort linked to prolonged mobile device use — has been increasingly documented in pediatric populations (Damasceno et al., 2018; Xie et al., 2020). The objective of this review is to analyze current scientific evidence on the relationship between smartphone use and the development of postural and musculoskeletal disorders in children and adolescents.

Methodology

A narrative review incorporating elements of a systematic approach was conducted. The databases PubMed, Scopus, Web of Science, and Google Scholar were searched for publications from 2013 to 2025 using the keywords: *smartphone use, children, adolescents, posture, forward head posture, neck pain, musculoskeletal disorders, and text neck.*

Inclusion criteria:

- a) Studies involving participants aged 6–19 years
- b) Original research, systematic reviews, and meta-analyses.
- c) Assessment of posture, musculoskeletal symptoms, or cervical biomechanics related to smartphone use.

Exclusion criteria:

- a) Studies focusing exclusively on adults.
- b) Lack of objective postural or pain assessment.
- c) Non-peer-reviewed publications.

Data extracted included sample size, age, smartphone use duration, body posture metrics, pain intensity, and diagnostic methods. Study quality was assessed based on sample representativeness, methodological rigor, and control of confounding factors.

Results

Smartphone use duration and behavioral patterns

Multiple cross-sectional studies have demonstrated that daily smartphone use among children often exceeds 3 hours, with some adolescents reporting up to 8 hours of daily exposure (Cakir et al., 2022; Shan et al., 2013). Prolonged smartphone use is correlated with increased sedentary time and decreased physical activity, both of which are recognized risk factors for musculoskeletal discomfort (López-de-Uralde-Villanueva et al., 2023; Lee & Kang, 2020).

Behavioral analyses indicate that adolescents frequently use smartphones in non-ergonomic postures — sitting or lying with neck flexion exceeding 30°, often without regular breaks (Areedomwong et al., 2021; Kim & Kim, 2015). Younger children tend to hold devices lower, resulting in more pronounced cervical flexion angles, which amplify mechanical strain (Hegazy et al., 2020).

Postural deviations and biomechanical alterations

The most common postural changes observed include forward head posture (FHP), rounded shoulders, and increased thoracic kyphosis (Alotaibi & Alsaadi, 2022; Areedomwong et al., 2021; Kim & Kim, 2015). Experimental electromyographic studies reveal that sustained FHP leads to overactivation of the upper trapezius and levator scapulae muscles, accompanied by weakening of deep cervical flexors (Damasceno et al., 2018).

The mechanical load on the cervical spine increases exponentially with head flexion. When the head is tilted forward 15°, the load is approximately 12 kg; at 60°, it reaches 27 kg — nearly five times the natural load in a neutral posture (Kim & Kim, 2015). This chronic overload contributes to ligamentous strain, joint capsule stress, and disc degeneration, which may persist into adulthood (Hegazy et al., 2020).

Pain symptoms and musculoskeletal consequences

Children and adolescents with excessive smartphone use report significantly higher rates of neck and shoulder pain, stiffness, and headaches (Damasceno et al., 2018; Cakir et al., 2022; Shan et al., 2013). A meta-analysis of 16 studies found that adolescents using smartphones for more than 3 hours daily had a 2.5-fold higher risk of reporting neck pain compared to those with less than 1 hour of daily use (López-de-Uralde-Villanueva et al., 2023).

In addition to pain, prolonged device use may affect proprioceptive control and balance. Some studies have demonstrated altered head repositioning accuracy and reduced postural stability among heavy smartphone users (Lee & Kang, 2020). Chronic muscle imbalance may also lead to adaptive shortening of anterior cervical structures and compensatory thoracic hyperkyphosis (Areedomwong et al., 2021; Kim & Kim, 2015).

Discussion

The reviewed literature provides strong evidence of an association between smartphone overuse and postural as well as musculoskeletal disorders in children and adolescents. Although most studies are cross-sectional, making causal inference limited, the consistency across biomechanical, clinical, and longitudinal data suggests a plausible causal pathway.

The key pathophysiological mechanism involves sustained flexion of the cervical spine, leading to prolonged activation of the posterior neck muscles, reduced intervertebral space, and increased disc compression (Hegazy et al., 2020; Kim & Kim, 2015). Over time, these alterations may cause muscle fatigue, ischemia, and microtrauma, resulting in chronic pain and stiffness (Damasceno et al., 2018).

Psychological factors also play a role. Digital addiction and prolonged screen engagement reduce the frequency of posture changes and increase sedentary behavior, amplifying musculoskeletal strain (Cakir et al.,

2022; Quek et al., 2021). The COVID-19 pandemic further highlighted these issues by increasing remote learning and sedentary screen use among youth (Cakir et al., 2022).

Importantly, early postural deviations may persist and progress into adulthood. Research suggests that children with forward head posture at age 12 are more likely to exhibit spinal misalignments and chronic neck pain by late adolescence (Shan et al., 2013).

Conclusions

Excessive smartphone use among children and adolescents poses a significant threat to postural and musculoskeletal health. Prolonged neck flexion, static posture, and reduced physical activity contribute to forward head posture, cervical muscle imbalance, and neck pain.

Although definitive causal relationships require further longitudinal research, the existing evidence strongly supports the need for early preventive measures and education on proper ergonomics and active lifestyles. Addressing these habits early in life is crucial to safeguard the musculoskeletal health of future generations.

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