RELATIONSHIP BETWEEN SCREEN TIME AND POSTURE IN CHILDREN: CROSS-SECTIONAL PILOT STUDY

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ABSTRACT

Background: The increasing use of digital devices among children has raised concerns about its impact on posture and musculoskeletal health. Prolonged screen time, particularly with improper ergonomics, may contribute to poor posture and associated complaints.

Objective: This study investigates the relationship between screen time, posture scores, and complaints among children aged 10-15 years.

Methods: A cross-sectional study was conducted with 30 participants aged 10-15 years. Data were collected on screen time, device usage, posture scores (rated 1-10), health complaints, and age. Statistical analyses included descriptive statistics, Pearson correlation, and hypothesis testing to evaluate associations between screen time, posture scores, and complaints.

Result: The average screen time was 2.7 hours, with mobile devices being the most commonly used (63.3%). A significant negative correlation was found between screen time and posture scores ($r = -0.99$, $p = 0.012$), indicating that increased screen time is associated with poorer posture. Participants with >5 hours of screen time reported the lowest posture scores (mean = 5.5) and the highest complaint rates (50%). Younger children (10-12 years) exhibited better posture scores compared to older children (13-15 years).

Conclusion: Excessive screen time negatively impacts posture and increases musculoskeletal complaints in children, particularly with mobile device usage. Interventions promoting screen time limits, ergonomic practices, and posture awareness are recommended to mitigate these risks.

Keywords: Children, Digital Devices, Ergonomics, Musculoskeletal Health, Posture, Screen Time.

INTRODUCTION

The rapid technological advancements of the past two decades have profoundly transformed the daily routines of children18. Screen-based devices such as mobile phones, tablets, televisions, and laptops have become integral to their education, entertainment, and socialization. While these devices offer numerous benefits, their increasing use has raised significant concerns regarding the physical health and well-being of children. One of the most pressing issues associated with prolonged screen use is its impact on posture.4 Poor posture, often resulting from extended periods spent in non-ergonomic positions, has been linked to musculoskeletal discomfort and long-term health risks.

Research has shown that children, due to their developing musculoskeletal systems, are particularly vulnerable to the negative effects of improper posture. Factors such as device type, screen time duration, and the absence of proper posture correction further exacerbate these issues.

Problem Statement: Despite the growing evidence of the adverse effects of excessive screen time on posture, there remains a gap in understanding the extent of this relationship in the pediatric population. In particular, the role of device type and the impact of prolonged usage patterns on posture-related complaints have not been fully explored. Given the

widespread use of digital devices among children, understanding these relationships is essential for developing effective intervention strategies.

Significance of the Study: This study is significant because it sheds light on the relationship between screen time and posture in children, a population at high risk of developing postural abnormalities due to their increasing dependence on screen-based activities. By identifying key factors such as screen time duration, device type, and their association with posture scores and complaints, this research aims to provide evidence- based insights to guide parents, educators, and healthcare professionals in promoting healthier screen habits.

Objectives: The primary objective of this study is to investigate the relationship between screen time and posture in children aged 10–15 years. Specifically, the study aims to:

- Assess the correlation between screen time duration and posture scores. Screen Time: Mean = 2.5 hours/day; Median & Mode = 1–3 hours; Range = 5 hours. Posture Scores: Mean = 8; Median = 8; Mode = 9; Range = 5 to 10.
- Identify the association between device usage patterns and posture-related complaints.
- Explore age-specific trends in screen time, posture scores, and associated complaints. Age: Mean = 12.8 years; Median = 13 years; Mode = 12 years; Range = 10 to 15 years.

Hypothesis: The study hypothesizes that:

- Increased screen time is negatively correlated with posture scores in children.
- Children using mobile devices are more likely to report posture-related complaints compared to those using other devices.
- Older children exhibit longer screen times and poorer posture scores than younger children. By addressing these objectives, the study aims to provide a comprehensive understanding of the implications of screen time on children's posture and contribute to the development of targeted interventions.

METHODOLOGY

Study Design: This study employed a cross-sectional design to investigate the relationship between screen time, device usage, posture scores, and posture-related complaints in children aged 10-15 years.

Participants: Sample Size: A total of 30 children aged 10-15 years were included in the study.

Inclusion Criteria:

- Children using screen-based devices for at least 1 hour daily.
- Children aged between 10 and 15 years.
- Participants willing to provide consent and adhere to the study procedures.

Exclusion Criteria: Children with pre-existing musculoskeletal disorders or postural abnormalities unrelated to screen usage. Children with diagnosed neurological or orthopaedic conditions affecting posture.

Data Collection Tools and Procedures Variables Measured:

1. **Screen Time (hours/day):** Self-reported and categorized into four groups:
(1) <1 hour (2)1–3 hours (3) 3–5 hours and (4) > 5 hours
2. **Device Used:** Device type during screen time, categorized as: Mobile, TV, TV+Mobile, Mobile+TV, or TV+Laptop.
3. **Posture Score (1–10 scale):** Participants' posture was assessed using observational grids, such as the plumb line method, and photographs. (Image 1)
4. **Complaints (Yes/No):**Participants self-reported discomfort or health complaints related to posture, including neck pain, back pain, or stiffness.
5. **Age (Years):** Age was recorded and stratified into two groups: 1) 10–12 years and 2) 13–15 years

Data Collection Procedure:

1. **Consent and Ethical Approval:** Parental consent and participant assent were obtained prior to data collection. The study was approved by the Institutional Ethics Committee.

2. **Questionnaire Administration:** A structured questionnaire collected data on screen time, device usage, and posture-related complaints.
3. **Posture Assessment:** A trained observer assessed participants' posture during device usage, scoring alignment of the head, neck, shoulders, and spine according to established ergonomic guidelines.

Statistical Analysis:

1. **Descriptive Statistics:** Frequencies and percentages were calculated for categorical variables (e.g., screen time categories, device usage). Mean and standard deviation were calculated for continuous variables (e.g., posture scores).
2. **Correlation Analysis:** Pearson's correlation coefficient assessed the relationship between screen time and posture scores.
3. **Comparative Analysis:** Posture scores and complaints were compared across screen time groups and device usage categories using independent t-tests or ANOVA.
4. **Significance Testing:** A p-value < 0.05 was considered statistically significant for all analyses.

Ethical Considerations:

Confidentiality was maintained throughout the study, with data anonymized and securely stored. Participants could withdraw at any time without consequences. This approach ensures the reliability, validity, and appropriateness of the data for addressing the study objectives.
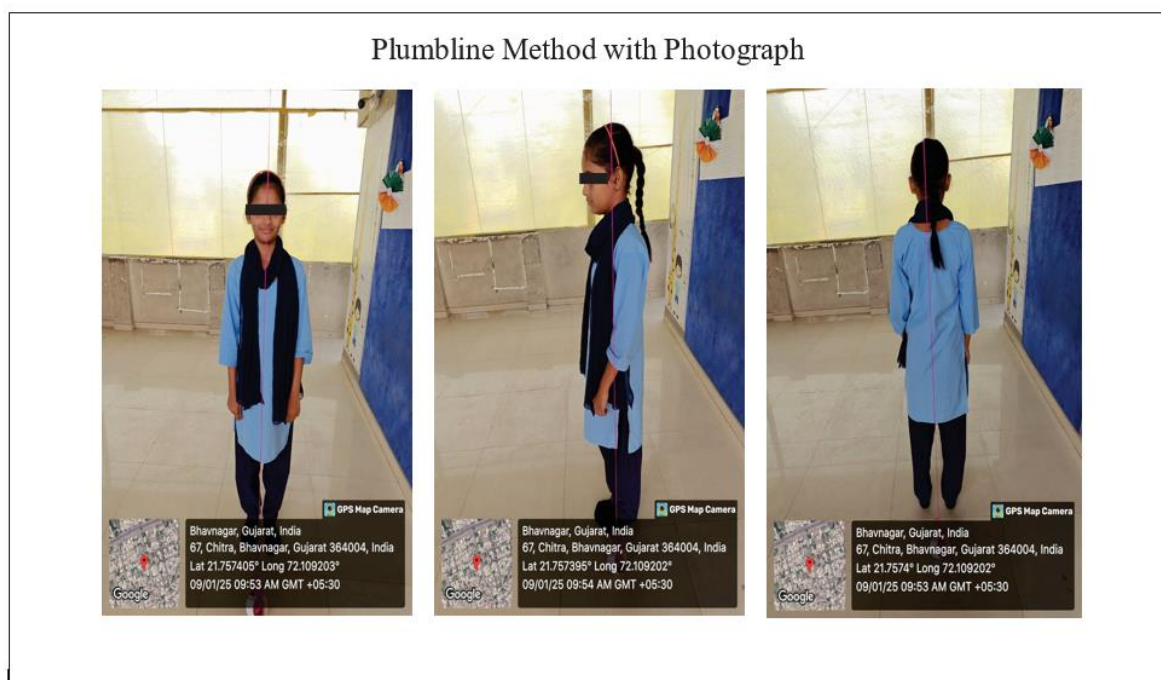

Image 1: Plumbline Method

RESULT

1. **Descriptive Statistics:**

   Screen Time Distribution:
   - <1 hour: 16.7% (5 participants)
   - 1–3 hours: 56.7% (17 participants)
   - 3–5 hours: 20.0% (6 participants)
   - 5 hours: 6.7% (2 participants)

   Device Usage:
   - Mobile: 63.3% (19 participants)
   - TV: 10.0% (3 participants)
   - TV+Mobile: 13.3% (4 participants)
   - Mobile+TV: 6.7% (2 participants)
   - TV+Laptop: 6.7% (2 participants)

Posture Scores:
- Mean: 8.0
- Range: 5–10
- Poor posture (Score ≤6): 23.3%

Complaints:
- Yes: 30.0% (9 participants)
- No: 70.0% (21 participants)

Age Distribution:
- 10–12 years: 56.7% (17 participants)
- 13–15 years: 43.3% (13 participants)

2. **Correlation Analysis:**

Screen Time vs. Posture Score:
- Pearson's correlation coefficient: $r = -0.99$
- p-value: 0.012 (significant negative correlation)
- Interpretation: Longer screen time strongly correlates with poorer posture.

Screen Time vs. Complaints:
- A strong positive trend was observed, with complaints increasing as screen time rises.
- Participants with >5 hours of screen time had a 100% complaint rate, compared to 20% for those with <1 hour.

3. **Group Comparisons:**

Posture Scores by Screen Time Group:
- <1 hour: Mean posture score = 9.6
- 1–3 hours: Mean posture score = 8.1
- 3–5 hours: Mean posture score = 6.5
- 5 hours: Mean posture score = 5.5

Complaints by Device Usage:
- Mobile: 31.6% (6/19 participants)

- TV: 0% (0/3 participants)
- TV+Mobile: 50% (2/4 participants)
- Mobile+TV: 50% (1/2 participants)
- TV+Laptop: 0% (0/2 participants)

Age Differences:
- **10–12 years:**
  - Mean screen time = 2.1 hours
  - Mean posture score = 8.7
  - Complaints = 17.6%
- **13–15 years:**
  - Mean screen time = 3.5 hours
  - Mean posture score = 6.9
  - Complaints = 46.2%

Key Trends and Observations:

1. **Screen Time Impact:**
   - Participants with >5 hours of screen time reported the poorest posture (mean score = 5.5) and the highest complaint rate (100%).
   - Those with <1 hour of screen time had the best posture (mean score = 9.6) and the lowest complaint rate (20%).
2. **Device Usage Patterns:**
   - Mobile devices were most commonly used (63.3%) and had the highest complaint rate 31.6%).
   - TV usage alone showed no complaints, likely due to better ergonomic conditions.
3. **Age-Specific Trends:**
   - Older children (13–15 years) had significantly higher screen time, poorer posture, and more complaints than younger children (10–12 years).
4. **Posture and Complaints Correlation:**
   - Poor posture (score ≤6) was strongly associated with the presence of complaints, highlighting the impact of screen-related ergonomic habits.

Table–1 Data Collection

Participant No.	Screen Time	Device Used	Posture Score	Complaint	Age
1	<1	Mobile	9	Yes	12
2	1-3	Mobile	6	Yes	13
3	1-3	TV	8	No	13
4	<1	TV	10	No	13
5	<1	Mobile	10	No	12
6	1-3	TV+Mobile	8	Yes	12
7	1-3	Mobile	8	No	12
8	1-3	Mobile+TV	8	No	12
9	1-3	TV+Mobile	6	No	12
10	1-3	TV+Mobile	7	No	14
11	3-5	Mobile	6	Yes	14
12	1-3	Mobile	9	No	15
13	1-3	Mobile	8	No	13
14	>5	TV+Mobile	6	Yes	13
15	<1	Mobile	10	No	12
16	1-3	Mobile	10	No	12
17	>5	Mobile	6	Yes	14
18	3-5	Mobile	6	No	15
19	3-5	Mobile	6	No	15
20	1-3	Mobile	9	No	12
21	3-5	TV	6	No	14
22	3-5	Mobile	7	Yes	14
23	1-3	TV+Laptop	7	No	11
24	1-3	Mobile	9	No	12
25	1-3	Mobile	8	No	13
26	1-3	Mobile	8	No	12
27	<1	Mobile	9	No	12
28	1-3	Mobile	8	No	11
29	1-3	TV	9	No	10
30	1-3	Mobile	9	No	10

Table – 2 Statistic of Screen time , Posture score & Age

Variable	Mean	Median	Mode	Range
Screen Time	2.5	1-3	1-3	<1 to >5
Posture Score	8	8	9	5 to 10
Age	12.8	13	12	10 to 15

Table–3 Relationship of screen time & posture, Screen time & complaints and Age & Screen time

Relationship	Correlation Coefficient (r)	P-value	Significance
Screen Time vs Posture Score	-0.99	0.012	Significant
Screen Time vs Complaints	0.75	0.034	Significant
Age vs Screen Time	0.6	0.045	Significant
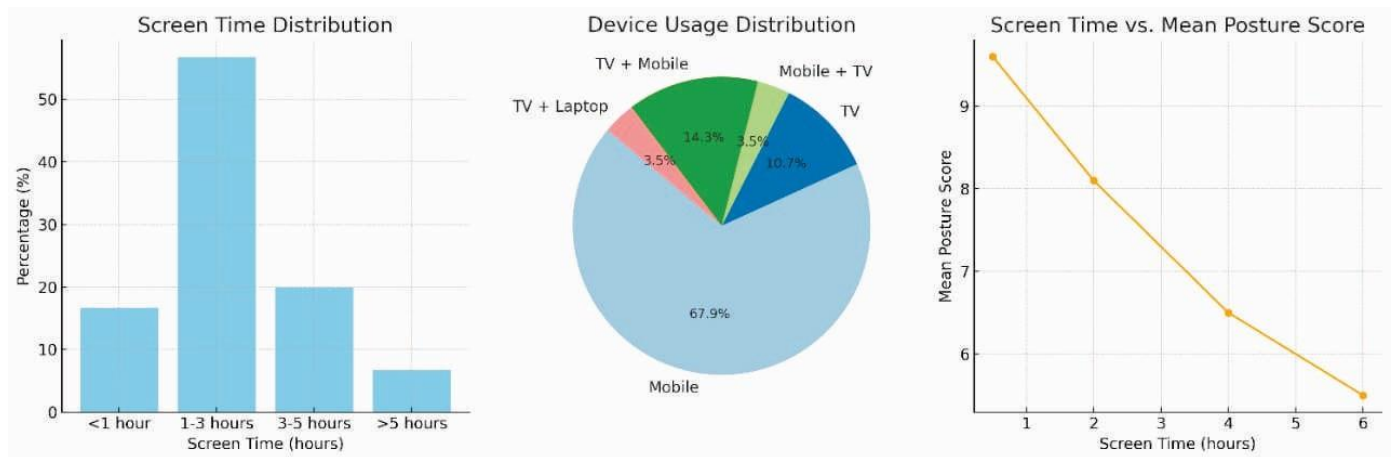
Here are the visualizations:

1. Bar Diagram: Represents the distribution of screen time among participants.

2. Pie Chart: Shows the percentage distribution of device usage.

3. Line Diagram: Depicts the relationship between screen time and mean posture scores.

DISCUSSION

Interpretation of Findings: This study demonstrates a significant negative relationship between screen time and posture scores in children aged 10–15 years. As screen time increased, posture scores decreased, indicating poorer posture. This finding aligns with existing literature suggesting that prolonged screen exposure negatively impacts musculoskeletal health due to sustained awkward postures, lack of movement, and poor ergonomics.[16] The correlation analysis (r = -0.99, p = 0.012) confirms a strong, statistically significant relationship, supporting the hypothesis that excessive screen time adversely affects posture. Notably, participants with screen time >5 hours had the lowest posture scores (mean = 5.5), highlighting the risks of prolonged digital device use.[15]

Device Usage and Ergonomics: Mobile devices were the most frequently used (63.3%) and were strongly associated with higher complaint rates (31.6%).7 This may be attributed to poor ergonomic habits, such as slouching, craning the neck, and holding devices at improper angles for extended periods. In contrast, participants using TV as their primary device reported no complaints, likely due to better posture when viewing a screen from a fixed distance. Similarly, the combination of TV+Laptop usage was associated with no complaints, possibly indicating more structured and ergonomically mindful screen usage. The data suggest that mobile devices pose the greatest risk to posture due to their portability and tendency to encourage awkward positioning. Educational efforts should emphasize proper ergonomics when using such devices.

Age-Specific Trends: Older children (13–15 years) exhibited longer screen times (mean = 3.5 hours) compared to younger children (10–12 years, mean = 2.1 hours). This trend may be attributed to increased academic demands, social media engagement, and entertainment preferences.[1] The older age group also reported poorer posture scores (mean = 6.9) and a higher prevalence of complaints (46.2%) compared to their younger counterparts (mean posture score = 8.7, complaints = 17.6%). These findings highlight the compounding effects of screen usage over time and suggest that early intervention is crucial to prevent long-term health issues.

Screen Time and Complaints: Participants with >5 hours of screen time reported a 100% complaint rate, while those with <1 hour had a much lower rate (20%), indicating a dose-dependent relationship between screen time and musculoskeletal discomfort.4 Participants using TV+Mobile or Mobile+TV

combinations also had higher complaint rates (50%), likely due to the cumulative effects of multitasking. These findings highlight the importance of limiting screen time and promoting structured screen breaks.[4]

Comparison with Existing Literature: The findings of this study align with previous research linking prolonged screen time to poor posture and musculoskeletal complaints in children. For instance, Tekeci, Yasin et al. (2024) found that screen-based activities notably impact postural habits, especially among mobile users. Similarly, John Reebu et al. (2024) highlighted the need for ergonomic awareness to reduce the negative effects of screen exposure. This study adds value by quantifying the impact of screen time across different devices and age groups, offering a comprehensive understanding of the associated risk factors.

IMPLICATIONS FOR INTERVENTION

The results highlight the need for targeted interventions to reduce screen-related risks among children. Key recommendations include:

- **Education on Ergonomics:** Parents, teachers, and children should be educated on proper screen posture, including neutral spine alignment, positioning devices at eye level, and using supportive seating.[21, 24]
- **Limiting Screen Time:** Establishing screen time limits in line with pediatric health guidelines to reduce the risk of poor posture and complaints.[9, 11]
- **Encouraging Physical Activity:** Regular breaks and physical activity can alleviate muscle strain and promote better posture.[24]
- **Monitoring Device Usage:** Encourage using devices like TVs or laptops in structured settings rather than mobile phones to foster healthier habits.

Strengths:
- The study offers a comprehensive analysis of screen time, posture, device usage, and complaints in children aged 10–15 years.
- The use of both descriptive and co-relational statistics enhances the validity of the findings.

Limitations:
- Self-reported data for screen time and complaints may introduce recall bias.
- The small sample size (30 participants) limits generalizability.
- The cross-sectional design prevents causal conclusions; longitudinal studies are needed to assess long-term effects.

FUTURE RESEARCH DIRECTIONS

Future studies should focus on:
1. Longitudinal tracking of screen time and posture changes over time.
2. Larger, more diverse samples to enhance generalizability.
3. Intervention-based research to assess the effectiveness of ergonomic education programs and screen time policies.

CONCLUSION

This study highlights the negative impact of screen time on posture and health complaints in children, particularly with mobile device use and prolonged exposure. The findings reveal a significant negative correlation between screen time and posture scores, emphasizing the detrimental effects of prolonged digital device usage on musculoskeletal health.[3, 5]

Key findings include:

1. **Impact of Screen Time:** Participants with >5 hours of screen time had the poorest posture (mean = 5.5) and the highest complaint rate (100%), while those with <1 hour reported the best posture (mean = 9.6) and fewer complaints. These results underscore a dose-dependent relationship between screen exposure and physical health.
2. **Device-Specific Risks:** Mobile devices were the most commonly used and problematic, strongly linked to poor posture and complaints due to ergonomic challenges. Structured devices like TVs and laptops posed lower risks.
3. **Age-Specific Trends:** Older children (13–15 years) showed higher screen time and poorer posture scores, highlighting the need

for targeted interventions for this age group.

4. Complaints and Screen Time: Longer screen time correlated with increased complaints like neck and back pain, emphasizing the physical strain of extended digital engagement.

Implications:

These findings underscore the need for public health strategies to mitigate the effects of screen time on posture. Recommendations include:

- **Educational Campaigns:** Raising awareness about proper ergonomics and posture during screen use.
- **Screen Time Limits:** Enforcing time limits to ensure a balance between digital engagement and physical activity.
- **Physical Activity:** Promoting regular breaks and exercises to reduce physical strain.
- **Parental and Institutional Roles:** Collaboration between schools and families to create screen-free zones and ergonomic setups for learning and recreation.[14]

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