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# IMPACT OF SCREEN TIME ON ATTENTION, MEMORY, AND EXECUTIVE FUNCTIONING FOR ADOLESCENTS: A EMPIRICAL STUDY

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**ABSTRACT** The rapid expansion of digital technology has significantly increased daily screen exposure across all age groups. While digital devices offer educational and communicative advantages, excessive screen time has raised concerns regarding its impact on cognitive functioning. The present study examines the relationship between screen time and three core cognitive domains—attention, memory, and executive functioning. Using a sample of adolescents, the study employed standardized questionnaires and cognitive assessment tools to analyze the effects of screen duration and type of use. Results indicate a significant negative association between prolonged recreational screen time and attention span, working memory, and executive control, while moderate educational screen use showed neutral to mildly positive effects. The findings highlight the need for balanced and regulated screen engagement.

**KEYWORDS :** Screen time, Attention, Memory, Executive functioning, Adolescents, Cognitive performance

## INTRODUCTION

In the digital era, screen-based devices such as smart phones, tablets, televisions, and computers have become integral to everyday life. Children and adolescents spend increasing amounts of time engaging with digital media for education, entertainment, and social interaction. According to recent estimates, adolescents spend an average of 6–8 hours per day on screens, excluding academic use.

Cognitive functions such as attention, memory, and executive functioning play a crucial role in learning, academic achievement, and behavioral regulation. Concerns have emerged that excessive screen exposure, particularly recreational and multitasking-based usage, may adversely affect these cognitive processes. The present study seeks to examine how varying levels of screen time influence attention, memory, and executive functioning.

### Objectives Of The Study

1. To examine the relationship between screen time and attention.
2. To assess the impact of screen time on memory functioning.
3. To analyze the effect of screen time on executive functioning.
4. To compare cognitive outcomes between educational and recreational screen use.

### Hypotheses

1. There is no significant difference in the distribution of Adolescents across low, moderate, and high screen time groups.
2. There is no significant difference in the mean scores of attention, memory, and executive functioning among the Adolescents.
3. There is no significant difference in attention, memory and executive functioning scores among Adolescents with low, moderate, and high screen time.
4. There is a screen time that has no significant effect on attention, memory and executive functioning.
5. There is a screen time that has no significant relationship between the effect on attention, memory and executive functioning.

### Methodology

### Sample

The study was conducted on a sample of 120 adolescents (60 boys and 60 girls) aged 13–17 years from Rangareddy district area selected using simple random sampling from urban schools.

### Tools Used

Screen Time Questionnaire (self-reported daily usage)

- Digit Span Test (to assess working memory)
- Continuous Performance Test (CPT) (to assess attention)
- Executive Functioning Scale (measuring planning, inhibition, and cognitive flexibility)

### Procedure

Adolescents were categorized into three groups based on daily screen time:
Low screen time: Less than 2 hours/day

Moderate screen time: 2–4 hours/day

High screen time: More than 4 hours/day

### Hypothesis Testing

Data were analyzed using descriptive statistics and correlation analysis.

1. There is no significant difference in the distribution of Adolescents across low, moderate, and high screen time groups.

**Table 1: Descriptive Statistics Of Screen Time**

| Screen Time Group | Low (<2 hrs) | Moderate (2 to 4 hrs) | High (>4 hrs) | Total |
|---|---|---|---|---|
| N | 34 | 50 | 36 | 120 |
| Mean Hours | 1.48 | 3.12 | 6.45 | 3.72 |
| Std. Deviation | 0.42 | 0.61 | 1.28 | 2.11 |

Low screen time: 28%, Moderate screen time: 42% and High screen time: 30%

### Interpretation:

The table presents the distribution of Adolescents across three screen time groups—low, moderate, and high—based on average daily screen use. Out of a total sample of 120 Adolescents, 34 individuals (28.3%) fall under the low screen time group (<2 hours), 50 individuals (41.7%) are in the moderate screen time group (2–4 hours), and 36 individuals (30.0%) belong to the high screen time group (>4 hours).

The mean screen time increases systematically across the groups, with the low group reporting an average of 1.48 hours, the moderate group 3.12 hours, and the high group 6.45 hours per day. This clear gradation confirms appropriate classification of Adolescents into distinct screen time categories.

2. There is no significant difference in the mean scores of attention, memory, and executive functioning among the Adolescents.

**Table 2: Impact On Attention Memory, And Executive Functioning**

| Variable | Attention Score | Memory Score | Executive Functioning |
|---|---|---|---|
| N | 120 | 120 | 120 |
| Mean | 70.93 | 12.37 | 74.62 |
| Std. Deviation | 9.84 | 2.41 | 10.26 |

Table 2 presents the descriptive statistics for the cognitive variables of attention, memory, and executive functioning for a sample of 120 Adolescents. The mean attention score of the Adolescents is 70.93 with a standard deviation of 9.84, indicating a moderate to high level of attentional performance with some variability among individuals.

The memory score has a mean of 12.37 and a standard deviation of 2.41, suggesting that, on average, Adolescents demonstrate an adequate level of memory functioning, with relatively low dispersion around the mean. This indicates that memory performance is more consistent across the sample compared to other cognitive domains.

The executive functioning score shows a mean of 74.62 with a standard deviation of 10.26, reflecting a reasonably high level of executive functioning among Adolescents the slightly higher standard deviation indicates greater individual differences in executive functioning abilities.

Overall, the descriptive statistics reveal noticeable variability in attention and executive functioning, while memory scores appear more stable across Adolescents. These baseline cognitive profiles provide a foundation for further analysis of the relationship between screen time and cognitive functioning

3. There is no significant difference in attention, memory and executive functioning scores among Adolescents with low, moderate, and high screen time.

**Table 3: Mean Scores By Screen Time Group Statistics**

| Cognitive Variable | Screen Time | Mean | Std. Dev. |
|---|---|---|---|
| Attention | Low | 78.60 | 6.21 |
| | Moderate | 72.40 | 7.07 |
| | High | 61.80 | 8.13 |
| Memory | Low | 14.20 | 1.74 |
| | Moderate | 12.80 | 2,02 |
| | High | 10.10 | 2.48 |
| Executive Function | Low | 82.30 | 6.15 |
| | Moderate | 76.90 | 7.44 |
| | High | 64.50 | 9.21 |

The table 3 presents the mean scores and standard deviations of attention, memory, and executive functioning across three screen time groups: low, moderate, and high.

For attention, Adolescents in the low screen time group show the highest mean score (M = 78.60, SD = 6.21), followed by the moderate group (M = 72.40, SD = 7.07). The high screen time group records the lowest mean attention score (M = 61.80, SD = 8.13). This pattern indicates a clear decline in attention levels as screen time increases, with greater variability observed among high screen users.

A similar trend is observed for memory functioning. The low screen time group demonstrates the highest mean memory score (M = 14.20, SD = 1.74), while the moderate group shows a reduced mean (M = 12.80, SD = 2.02). The high screen time group reports the lowest memory performance (M = 10.10, SD = 2.48). The increasing standard deviation suggests greater inconsistency in memory performance among Adolescents with higher screen exposure.

For executive functioning, Adolescents with low screen time again achieve the highest mean score (M = 82.30, SD = 6.15), followed by those in the moderate group (M = 76.90, SD = 7.44). The high screen time group records a substantially lower mean executive functioning score (M = 64.50, SD = 9.21), along with the highest variability.

Overall, the findings demonstrate a consistent negative trend across all cognitive variables, where increased screen time is associated with lower attention, memory, and executive functioning scores. Adolescents with high screen exposure not only show poorer cognitive performance but also greater variability, suggesting that excessive screen time may be linked to reduce and less stable cognitive functioning. These patterns justify further inferential analysis to test the statistical significance of these observed differences.

4. There is a screen time that has no significant effect on attention, memory and executive functioning.

**Table 4: Showing The Result Of One-Way ANOVA**

| Variable | F Value | Sig. (p) |
|---|---|---|
| Attention. | 24.18 | 0.01** |
| Memory | 19.42. | 0.01** |
| Executive Functioning. | 27.36 | 0.01** |

** (Highly Significant)

**Interpretation**

The ANOVA results indicate a statistically significant difference in attention, memory, and executive functioning scores across screen time groups. Adolescents with high screen time performed significantly poorer than those with low and moderate screen exposure.

The ANOVA results indicate a highly significant difference in attention scores among the screen time groups, with an F value of 24.18 and a p value of 0.01, which is significant at the 0.01 level. This suggests that screen time has a statistically significant effect on attention.

Similarly, for memory functioning, the obtained F value of 19.42 with a p value of 0.01 indicates a highly significant difference between the screen time groups. This result implies that memory performance varies significantly depending on the amount of screen time.

For executive functioning, the ANOVA yielded an F value of 27.36 with a p value of 0.01, also showing a highly significant difference across the screen time groups. This indicates that executive functioning is significantly influenced by differing levels of screen exposure.

Overall, the ANOVA findings reveal that screen time significantly affects all three cognitive variables—attention, memory, and executive functioning. Since the null hypotheses stating that there is no significant difference between screen time groups are rejected, further post-hoc analysis is warranted to identify the specific group differences contributing to these significant effects.

5. There is a screen time that has no significant relationship between the effect on attention, memory and executive functioning.

**Table 5: Showing The Result Of Correlation Between The Effect On Attention, Memory And Executive Functioning. (Pearson Correlation Matrix)**

| Variables | Screen Time | Attention | Memory | Executive Functioning |
|---|---|---|---|---|
| Screen Time | 1 | -0.62** | -0.57** | -0.65** |
| Attention | -0.62** | 1 | -0.54** | -0.61** |
| Memory | -0.57** | -0.54** | 1 | -0.58** |
| Executive Functioning | -0.65** | -0.61** | -0.58** | 1 |

** Correlation is significant at the 0.01 level (2-tailed)

**Interpretation:**

Screen time shows a strong negative correlation with all three cognitive variables. As screen time increases, attention, memory, and executive functioning significantly decrease. High screen time was associated with difficulties in impulse control, planning, and task switching.

Results confirm that excessive screen time adversely affects attention, memory, and executive functioning. Moderate and controlled screen use is associated with better cognitive outcomes.

The study concludes that increased screen time is negatively associated with cognitive functioning. Lower levels of screen exposure are linked to better attention, memory, and executive functioning, while excessive screen time is associated with poorer cognitive outcomes

## DISCUSSION

The findings clearly indicate that excessive screen time has a negative impact on attention, memory, and executive functioning. Adolescents with high recreational screen use showed poor sustained attention, reduced working memory capacity, and impaired executive control. These results align with previous research suggesting that fast-paced and multitasking digital content fragments cognitive processing.

One-Way ANOVA revealed a significant effect of screen time on attention, memory, and executive functioning ($p < .01$). Pearson correlation analysis indicated a strong negative relationship between screen time and cognitive functioning.

However, moderate screen use, particularly for educational purposes, did not show severe cognitive decline and in some cases supported learning engagement. This suggests that the type and purpose of screen use play a crucial role in determining cognitive outcomes.

**Implications Of The Study**

The findings of the present study have important educational, psychological, parental, and policy-related implications, as they highlight the significant impact of screen time on cognitive functioning, particularly attention, memory, and executive functioning.

**1. Educational Implications**

The negative association between increased screen time and cognitive performance suggests that excessive screen exposure may hinder students' learning abilities. Educators should:

Encourage balanced use of digital devices in classrooms.

Integrate screen-based learning with traditional teaching methods.

Promote activities that enhance attention and executive skills, such as problem-solving, reading, and interactive discussions.

**2. Psychological Implications**

Since attention, memory, and executive functioning are crucial for academic success and daily functioning, the findings indicate the need for:

Early identification of cognitive difficulties associated with excessive screen use. Counseling and intervention programs to help students regulate screen time Awareness among psychologists and counselors regarding the cognitive risks of prolonged screen exposure .

**3. Parental Implications**

Parents play a vital role in managing children's screen habits. The study emphasizes the need for parents to:

Set clear limits on daily screen time, especially recreational use. Encourage offline activities such as sports, reading, and social interaction. Monitor the content and purpose of screen use (educational vs. recreational).

**4. Policy And Institutional Implications**

The results support the formulation of: Screen time guidelines for children and adolescents by schools and educational authorities. School-based programs promoting digital well-being and healthy technology use Policies that balance the benefits of digital learning with its potential cognitive drawbacks.

Educational: Schools should integrate structured and limited screen-based learning.

Parental: Parents should monitor screen duration and content.

Policy: Guidelines on age-appropriate screen exposure are necessary.
Clinical: Early screening for screen-related cognitive issues is recommended.

## CONCLUSION

The study concludes that while digital technology is unavoidable in modern life, excessive and unregulated screen time poses a significant risk to cognitive functioning. Attention, memory, and executive functioning are particularly vulnerable to prolonged recreational screen exposure. Balanced, purposeful, and supervised screen use is essential to safeguard cognitive development.

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