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# Digital Literacy and Healthy Technology Use Among College Students in Chengalpattu, Tamil Nadu: A Statistical Analysis of Usage Patterns and Psychological Correlates

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***ABSTRACT:***

*This study examines the relationship between digital literacy, technology usage patterns, and mental well-being among college students in Chengalpattu, Tamil Nadu. With India's higher education sector witnessing rapid digitalization post-NEP 2020, understanding healthy technology habits becomes crucial. A sample of 400 undergraduate students (18-22 years) from arts, science, and engineering streams across five colleges participated in a mixed-method study employing the Digital Literacy Scale (DLS) and the Problematic Internet Use Questionnaire (PIUQ). Descriptive statistics revealed that 72% of students spent 4+ hours daily on non-academic digital activities, with social media (68%), OTT platforms (45%), and gaming (32%) being primary engagements. Correlation analysis showed a significant negative relationship between digital literacy scores and problematic usage ($r = -0.51$, $p<0.01$), indicating that digitally literate students demonstrated healthier habits. Regression models controlling for demographic factors explained 38% variance in academic performance ($\beta=0.42$ for productive tech use vs. $\beta=-0.36$ for excessive entertainment use, $p<0.01$). Cluster analysis identified three distinct user profiles: "balanced" (28%), "academic-focused" (34%), and "at-risk excessive users" (38%). The latter group reported 2.3 times higher stress levels ($p<0.05$) and lower sleep quality scores ($M=5.2$ vs. 7.1 in balanced users). Gender differences emerged, with male students showing higher gaming addiction ($t=3.21$, $p<0.01$) while female students reported more social media-induced anxiety ($\chi^2=6.45$, $p<0.05$). The findings underscore the need for institutional digital wellness programs, suggesting that colleges integrate technology self-regulation modules into curricula. Policy implications*

*include developing region-specific digital competency frameworks for Tamil Nadu's higher education sector to balance technological integration with student well-being.*

***Keywords:*** *Digital literacy, healthy technology use, college students, Chengalpattu, regression analysis, problematic internet use, mental health, NEP 2020, digital wellness, Tamil Nadu education.*

# 1. INTRODUCTION:

## 1.1 Background and Context

The digital revolution in education, accelerated by NEP 2020, has transformed learning paradigms in Indian higher education. With the integration of smart classrooms, online platforms, and hybrid learning models, technology is no longer supplementary but central to academic experience. However, alongside these advancements, a parallel rise in digital dependency, mental health concerns, and academic distractions has emerged. The overuse of digital media, especially among young adults, poses risks to sleep hygiene, concentration, and emotional well-being.

Chengalpattu, a rapidly developing district adjacent to Chennai, is home to a growing number of higher education institutions. It serves both urban and semi-urban students, making it an ideal setting to explore the multifaceted impacts of digital technology. The unique demographic and socio-cultural landscape of Chengalpattu allows for a nuanced understanding of how digital literacy and usage behaviors manifest across varied educational and economic backgrounds.

## 1.2 Research Objectives

- To assess digital literacy levels among college students in Chengalpattu
- To analyze patterns of technology use and their psychological impacts
- To examine correlations between digital literacy, technology habits, and academic performance
- To propose policy recommendations for healthy technology integration

## 1.3 Research Questions

- How does digital literacy influence technology usage behaviors?
- What are the mental health consequences of different usage patterns?
- How can institutions promote balanced digital engagement?

## 1.4 Significance of the Study

This research is significant as it offers localized insights into a national and global issue: the balance between educational technology and student well-being. By focusing on Chengalpattu, the study addresses a gap in region-specific research and contributes to the formulation of informed digital policies in Tamil Nadu. It highlights the need for educational institutions to go beyond mere access and focus on guiding students toward responsible and mindful use of digital tools. The outcomes are expected to inform curriculum design, digital wellness campaigns, and state-level policy interventions aligned with NEP 2020 goals.

## 2. Literature Review

### 2.1 Conceptual Framework

Digital literacy is increasingly recognized as a multidimensional construct encompassing cognitive, technical, and socio-emotional skills (Eshet-Alkalai, 2004). These competencies enable individuals to navigate, evaluate, and ethically use digital tools in academic and everyday settings. The World Health Organization (2021) introduced the Digital Wellness Continuum, which emphasizes the balance between digital engagement and well-being, positioning digital wellness as a dynamic interplay between productivity and overuse risks.

### 2.2 Global Perspectives

Comparative studies across OECD countries have examined the impact of screen time on cognitive development and mental health. Findings indicate that excessive recreational screen use negatively affects sleep quality, concentration, and academic performance, especially among youth. In Asia, South Korea has pioneered digital detox programs integrating mindfulness and behavioral therapy to address youth technology overuse. These interventions have shown measurable reductions in stress and improved digital self-regulation.

### 2.3 Indian Context

India's National Education Policy (NEP) 2020 highlights the importance of integrating digital tools into pedagogy while promoting responsible use. The policy calls for digital literacy training as a core competency in higher education. In Tamil Nadu, Kumar & Rajan (2022) found that while students possess technical proficiency, they often lack critical digital judgment, leading to problematic usage patterns. These insights stress the need for localized studies to design effective digital wellness interventions.

## 3. Research Methodology

### 3.1 Research Design

This study employed a mixed-methods approach, integrating both quantitative and qualitative data. Quantitative data were collected through structured surveys using standardized scales, while qualitative insights were gathered through focus group discussions to understand contextual behaviors and perceptions.

### 3.2 Sampling Strategy

A total of 400 undergraduate students, aged 18–22, were selected using stratified random sampling from five diverse higher education institutions in Chengalpattu. The sample was balanced across arts, science, and engineering disciplines.

### 3.3 Data Collection Instruments

The study used three primary instruments: the Digital Literacy Scale (DLS), the Problematic Internet Use Questionnaire (PIUQ), and the WHO-5 Well-being Index to assess mental health.

### 3.4 Analytical Methods

Data analysis involved descriptive statistics, Pearson's correlation, multiple regression, and cluster analysis to identify patterns and psychological correlates.

## 4. Results and Findings

This section presents the comprehensive statistical analysis of data collected from 400 college students in Chengalpattu, Tamil Nadu, focusing on digital literacy, technology usage patterns, and their psychological correlates. The findings are organized into three subsections: descriptive statistics, correlation analysis, and regression analysis, each accompanied by detailed tables and interpretations.

### 4.1 Descriptive Statistics

**Table 1 presents the central tendency and dispersion measures for key variables in the study**

| Variable | Scale Range | Mean | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|---|---|
| **Daily Screen Time** | 1-12 hours | 5.2 | 2.1 | 0.87 | 0.32 |
| **Academic Screen Time** | 1-8 hours | 2.8 | 1.4 | 0.45 | -0.12 |
| **Leisure Screen Time** | 1-9 hours | 3.1 | 1.7 | 0.92 | 0.56 |
| **Digital Literacy Score** | 1-5 | 3.8 | 0.7 | -0.23 | -0.45 |
| **Problematic Internet Use** | 1-5 | 3.2 | 0.9 | 0.34 | -0.67 |
| **Sleep Quality** | 1-10 | 6.3 | 1.5 | -0.56 | 0.23 |
| **Academic Performance** | 1-10 | 7.1 | 1.2 | -0.78 | 0.89 |
| **Perceived Stress** | 1-5 | 3.4 | 0.8 | 0.12 | -0.34 |

**Table 1: Descriptive Statistics of Primary Variables (N=400)**

- **Screen Time Patterns:** Students reported an average of 5.2 hours of daily screen time, with leisure activities (3.1 hours) slightly exceeding academic use (2.8 hours). The positive skewness (0.87) indicates some students have significantly higher screen time.
- **Digital Literacy:** The mean score of 3.8/5 suggests moderate digital literacy, with negative skewness (-0.23) showing a ceiling effect where some students maxed out the scale.
- **Mental Health Indicators:** Sleep quality averaged 6.3/10, while stress levels were moderately high (3.4/5). The negative skewness (-0.56) in sleep quality suggests a cluster of students reporting poor sleep.
- **Academic Performance:** The mean of 7.1/10 with negative skewness (-0.78) indicates generally good performance but with some struggling students.

### 4.2 Correlation Analysis

**Table 2 presents Pearson correlation coefficients between key variables**

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **1. Digital Literacy** | 1 | | | | | | |
| **2. Problematic Use** | -.51** | 1 | | | | | |
| **3. Total Screen Time** | -.32** | .67** | 1 | | | | |
| **4. Academic Perf.** | .42** | -.38** | -.29** | 1 | | | |
| **5. Perceived Stress** | -.27** | .43** | .51** | -.36** | 1 | | |
| **6. Sleep Quality** | .31** | -.39** | -.47** | .28** | -.52** | 1 | |
| **7. Social Media Use** | -.18** | .62** | .58** | -.24** | .39** | -.31** | 1 |

**Table 2: Correlation Matrix of Study Variables** **p<0.01

- **Digital Literacy Relationships:** Strong negative correlation with problematic use (r=-.51) and positive with academic performance (r=.42), suggesting digitally literate students have healthier tech habits.
- **Screen Time Effects:** Total screen time correlated positively with stress (r=.51) and negatively with sleep quality (r=-.47), indicating dose-response relationships.
- **Mental Health Links:** The strong negative stress-sleep quality correlation (r=-.52) reveals interconnected mental health impacts.
- **Platform Differences:** Social media showed stronger links to problematic use (r=.62) than academic performance (r=-.24), suggesting differential impacts by platform type.

### 4.3 Regression Analysis

Three hierarchical regression models were tested to predict academic performance, stress levels, and sleep quality:

**Regression Analysis Predicting Academic Performance**

| Predictor | β | T | p | 95% CI | ΔR² |
|---|---|---|---|---|---|
| **Step 1: Demographics** | | | | | .11 |
| **Gender** | .08 | 1.56 | .12 | [-.03, .19] | |
| **Stream** | .12 | 2.34* | .02 | [.02, .22] | |
| **Step 2: Tech Use** | | | | | .27** |
| **Digital Literacy** | .42 | 6.78** | <.001 | [.31, .53] | |
| **Problematic Use** | -.36 | -5.12** | <.001 | [-.47, -.25] | |
| **Academic Screen Time** | .21 | 3.45** | .001 | [.09, .33] | |
| **Leisure Screen Time** | -.28 | -4.67** | <.001 | [-.39, -.17] | |
| **Total R²** | | | | | .38 |

**Table 3**

**Regression Analysis Predicting Perceived Stress**

| Predictor | β | T | p | 95% CI | ΔR² |
|---|---|---|---|---|---|
| **Step 1: Demographics** | | | | | .09 |
| **Gender** | .11 | 2.01* | .045 | [.00, .22] | |
| **Step 2: Tech Factors** | | | | | .34** |
| **Problematic Use** | .38 | 5.89** | <.001 | [.26, .50] | |
| **Social Media Use** | .29 | 4.56** | <.001 | [.17, .41] | |
| **Digital Literacy** | -.22 | -3.78** | <.001 | [-.33, -.11] | |
| **Total R²** | | | | | .43 |

**Table 4**

**Regression Analysis Predicting Sleep Quality**

| Predictor | β | T | p | 95% CI | ΔR² |
|---|---|---|---|---|---|
| **Step 1: Demographics** | | | | | .07 |
| **Step 2: Tech Factors** | | | | | .39** |
| **Night-time Use** | -.41 | -7.12** | <.001 | [-.52, -.30] | |
| **Digital Literacy** | .18 | 3.45** | .001 | [.07, .29] | |
| **Problematic Use** | -.33 | -5.67** | <.001 | [-.44, -.22] | |
| **Total R²** | | | | | .46 |

**Table 5**

- **Academic Performance Model:** Digital literacy was the strongest positive predictor (β=.42), while leisure screen time was the strongest negative predictor (β=-.28). The model explained 38% of variance.
- **Stress Model:** Problematic internet use (β=.38) and social media use (β=.29) significantly predicted stress, with the model accounting for 43% of variance.
- **Sleep Quality Model:** Night-time device use showed the strongest negative association (β=-.41), explaining 46% of sleep quality variance.
- **Control Variables:** Gender differences emerged in stress models, with female students reporting higher stress (β=.11), while academic stream affected performance (science students scored higher).

### 4.4 Cluster Analysis Results

A k-means cluster analysis identified three distinct user profiles:

**Technology User Clusters (N=400)**

| Cluster | % Sample | Characteristics | Academic Perf. | Stress | Sleep Quality |
|---|---|---|---|---|---|
| **1. Balanced Users** | 28% | Moderate use (3.1 hrs), high literacy | 7.8 | 2.9 | 7.5 |
| **2. Academic-focused** | 34% | High academic use (3.9 hrs), low leisure | 8.1 | 3.1 | 6.9 |
| **3. At-risk Users** | 38% | High leisure use (5.2 hrs), low literacy | 5.9 | 4.1 | 5.3 |

**Table 6**

- **Balanced Users** demonstrated healthiest outcomes with moderate, purposeful technology use.
- **Academic-focused Users** showed slightly elevated stress despite good performance, suggesting academic pressure.
- **At-risk Users** exhibited significantly poorer outcomes across all measures, representing a priority intervention group.

### 4.5 Gender Differences Analysis

Independent t-tests revealed significant gender variations:

**Table 7: Gender Differences in Technology Use (Mean Scores)**

| Variable | Male (n=210) | Female (n=190) | t | P |
|---|---|---|---|---|
| **Gaming Time** | 2.1 hrs | 0.9 hrs | 5.67 | <.001 |
| **Social Media Time** | 2.3 hrs | 3.4 hrs | -4.89 | <.001 |
| **Problematic Use** | 3.0 | 3.5 | -3.45 | .001 |
| **Academic Impact** | 6.9 | 7.3 | -2.34 | .02 |

- Male students reported significantly higher gaming time (p<.001) but lower social media use.
- Female students showed higher problematic use scores (p=.001) and slightly better academic performance.
- These findings suggest need for gender-tailored interventions in digital wellness programs.

## 5. Discussion

### 5.1 Key Findings

The study reveals a high prevalence of excessive non-academic screen time among college students, with 72% spending over four hours daily on digital activities unrelated to their coursework. Social media, OTT platforms, and gaming dominate students' digital engagements. Importantly, digital literacy was found to be a protective factor, with students demonstrating higher levels of digital literacy engaging in healthier technology use patterns, including lower levels of problematic internet use (PIU). Gender differences also emerged, as male students were more likely to be addicted to gaming, while female students reported higher levels of anxiety due to social media use.

### 5.2 Theoretical Implications

These findings support the Digital Dualism Theory (Turkle, 2011), which suggests that technology use can simultaneously have both positive and negative effects on mental well-being. While technology can enhance academic performance through productive use, excessive engagement with entertainment and social media can lead to increased stress and poor sleep quality, supporting the dualistic nature of digital interaction.

### 5.3 Practical Recommendations

To mitigate the adverse effects of excessive screen time, several practical recommendations are proposed:

- **Institutional digital wellness programs**: Colleges should implement programs that promote healthy technology habits and educate students on the risks of excessive screen time.
- **Faculty training on tech-balanced pedagogy**: Faculty should be trained to integrate technology effectively in teaching while promoting a balanced approach to its use.
- **Parent-student awareness campaigns**: Awareness programs aimed at both parents and students can foster collaborative efforts to regulate technology use and support mental well-being.

## 6. Conclusion

The study highlights the significant relationships between digital behaviors, digital literacy, and student well-being in Chengalpattu, Tamil Nadu. It emphasizes that healthy technology usage is critical for

fostering academic success and mental well-being among college students. The findings suggest that improving digital literacy and promoting balanced technology use can help mitigate the negative psychological effects associated with excessive screen time. Given the rapid digitalization under NEP 2020, educational institutions must prioritize initiatives to encourage sustainable digital habits, integrating digital wellness programs into curricula to support student growth, both academically and mentally.

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