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Exploring Digital Burnout and Screen Fatigue in Adolescents: A Comparative Mental Health Perspective

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Abstract: *The rapid rise of digital engagement among adolescents has sparked growing concern over the psychological effects of prolonged screen exposure, such as digital burnout and screen fatigue. This study investigates the relationship between screen time exposure and its impact on key mental health indicators such as depression, anxiety, emotional exhaustion, sleep disruption and self-esteem. To study this, a cross-sectional survey was conducted among 360 adolescents, categorized into three screen time groups: high (>6 hours/day), moderate (3–6 hours/day), and low (<3 hours/day). Collected data were analysed using SPSS (Version 26). Descriptive statistics, one-way ANOVA and Tukey HSD post hoc tests were deployed to compare mental health outcomes across three screen-time groups. Pearson's correlation coefficients were used assess relationships between screen time and psychological indicators and multiple regression analysis to identify predictors of digital burnout. Research results found the significant differences across three screen-time groups for all mental health indicators ($p < 0.01$). Higher screen exposure was associated with increased depression, anxiety, emotional exhaustion, and lower self-esteem. Emotional exhaustion emerged as the strongest predictor of digital burnout ($\beta = 0.38$, $p < 0.001$), Sleep disruption was paradoxically higher in the low screen time group. These findings reinforce a graded relationship between screen time and mental health outcomes, with higher exposure linked to greater emotional and psychological strain.*

Key Words: *Digital Burnout, Screen Fatigue, Adolescents, Mental Health.*

1. INTRODUCTION:

The 21st century is widely known as the digital age, marked by rapid technological progression and comprehensive world-wide connectivity. This rapid development in digital communication technologies has transformed the whole nature of adolescent's interaction methods and procedures with their peers and environment. Digital age brought not only the new ways of communication, social interaction and entertainment but it also caused increased changes in educational system where screen-based environments in education became very common. The global data reveals among teenager's average daily screen time has reached up to 7-9 hours per day [1].

This involvement of online learning in educational system, the heightened use of social media for communication and the normalization of prolonged and constant connectivity have made the boundaries hazy between personal, academic and social life. Nevertheless, this unparalleled level of access to information, connectivity has given the probability of given rise of new psychological phenomenon namely '*Digital Burnout'* that warrant the need for systematic investigation. These new psychological stressors are posing new challenges and demands immediate attention among adolescent populations. Digital burnout is the psychological condition often characterized by emotional exhaustion, depersonalization and diminished personal accomplishment resulting from extended usage of digital devices, represents a contemporary adaptation of traditional occupational or work-place burnout theory to the digital age [2].

Parallel to this phenomenon, screen fatigue also known as 'Computer Vision Syndrome' or digital eye strain manifests as a group of musculoskeletal, ocular and neurological symptoms arising mainly from prolonged exposure to visual display [3].Research evidences are reporting that with the sustained digital engagement has been directly linked to mental health issues such as augmented levels of depression and anxiety, raising imperative queries about the long-term psychological impact of screen overuse.

1.1 Theoretical framework

The present comparative study is backed up with several theoretical underpinnings that collectively enhances our understanding the concept of mental health issues those are related to digital overuse.

i. **The Conservation of Resources (COR) theory:** This is mainly a stress theory proposed by Dr. Stevan E. Hobfoll in 1989 [4], provides a strong foundation to comprehend the concept of digital burnout. It explains that people or individuals strive to obtain, maintain and try to safeguard resources and that psychological stress emerges when these resources are depleted. In the digital context, attention and emotional energy which will become finite possessions that can be exhausted caused by extreme digital usage.

ii. **The Technostress Theory:** This theory was developed by Brod in 1984 [5], and later extended by Tarafdar et al. in 2007 [6]. The techno stress theory offers further additional insights to understand how technology induce stress impacts the modern digital users by identifying five important dimensions of technostress namely techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty, all of which directly contribute to the development of digital burnout symptoms.

iii. **The Accommodative Theory:** This screen fatigue theory also known as the Accommodative Theory of Computer Vision Syndrome suggests that the prolonged refocusing demands poses on the visual system during screen time causes to accommodative stress related symptomatology [7].

iv. **Blue Light Hypothesis:** This theory proposes that high frequency visible light waves emitted from the screens of digital devices can prominently disrupts the circadian rhythms and gives rise to both ocular and systemic health issues [8].

2. Literature review

New age technology has brought many changes and developments into the world with high-speed information technology utilization in almost all the sectors like educational, medical, agriculture, defence, and communication. With these widespread changes, adoption of smartphones, tablets, screen-based engagements became a dominant feature of present generation. With all these unmatched benefits it also has introduced new psychological stressors notably ‘Digital Burnout’ and ‘Screen Fatigue’.

Digital burnout among Adolescents

Digital burnout is characterized by irritability, emotional exhaustion and detachment resulting from extended and intense digital usage. Research findings highlights that adolescent population tend to experience psychological strain due to prolonged online presence, particularly from social media platforms. Being active on social media extended time often tend to encourage social validation-seeking behaviours through quantifiable metrics such as likes, comments and shares etc., which further contributed to emotional exhaustion [9] and prolonged usage of smartphones can overwhelm adolescents’ emotional resources by creating a ‘Perpetual Connectivity’ [10].

We cannot completely avoid the digital usage because of the essentiality and the unmatched benefits in terms of educational information and communication with a moderate usage, but prolonged usage has been linked to heightened levels of stress, anxiety and depression among adolescents [11]. Along with these mental health issues, mood instability, low self-esteem and increased depressive symptomatology can also occur due to constant dependency on external validation which was created by a continuous feedback loop in the social media [12]. According a systematic review study with 22 studies done by [13], found that consistent associations between prolonged screen time and negative psychological outcomes.

The sedentary nature of screen-based activities also contributes to social isolation and reduced physical activity, further impacting adolescent mental health. Research findings tells that the adolescents in India spend an average of 4 to 5 hours daily on screens, often for academic, recreational, and social purposes. This overexposure has been linked to sleep disturbances, reduced empathy, and impaired attention span [14]. Screen fatigue can significantly affect sleep patterns, cognitive functioning, and emotional well-being in adolescents [15].

Research gap and Rationale of the study

Despite the rising utilization of digital platforms for numerous purposes digital burnout and screen fatigue became high prevalent mental health concern, several clear research gaps still exist in the current literature. The growth and

developmental related characteristics among adolescents are unique and often gives rise to psychological challenges, to name a few, identity exploration, susceptibility to peer pressure, academic expectations may manifest in unique and different ways in this population when compared to adults [16]. But most of the existing studies has focused on adult populations predominantly working professionals and office workers with inadequate attention to adolescent-specific risk factors [17]. Along with the developmental factors, adolescent population's patterns of digital platform usage in terms of social media engagement, multitasking, frequency of usage and entertainment focused consumption differ to a large extent from adult digital usage for occupational needs. These differences demand a strong need for age specific research approaches. Furthermore, there is a clear paucity of comparative research examining the relative prevalence, symptom profiles and risk factors of these circumstances within the same population.

3. Methodology

Research design

This comparative study employs a comparative, cross-sectional survey design to examine the psychological effects of digital burnout and screen fatigue among adolescents. Research has chosen this design to enable the analysis of mental health outcomes across varying levels of screen time exposure, providing a deep understanding of how digital engagement influences psychological well-being of the adolescent populations. A total of 350 adolescents from non-residential colleges, aged 16 to 18 years were recruited in Telangana, India. Participants were selected using stratified random sampling, ensuring balanced representation across age groups, gender, and academic backgrounds.

Inclusive Criteria

- Students who are willing to take part of the study.
- Undergraduate students in their adolescence, ages ranging from 16-18 years. Studying in residential and non-residential colleges in Nizamabad, Telangana.
- 350 Non-residential college students who has access and are actively using smartphones with internet for educational and communication purposes.

Exclusive Criteria

- Students who don't fit within the designated age range.
- Students who are or not willing to provide their informed consent.

Ethical Considerations

- **Informed Consent:** A detailed consent form was presented to parents/guardians, and assent was taken from adolescent participants.
- **Anonymity and Confidentiality:** No identifiable information was collected. Data were stored on encrypted drives and used solely for academic research.
- **Right to Withdraw:** Participants were informed that they could withdraw from the study at any point.

Tools used:

The following standardized tools were used to assess screen habits and mental health indicators along with the demographic data sheet.

- **Demographic Data Sheet:** Demographic information of the sample such as age, gender, and type of education institution (residential or non-residential) they are currently studying in were collected through this questionnaire.
- **Screen Time Questionnaire (STQ)**: It is a 14 item self-report inventory designed by a group of psychologists [18] to capture daily screen usage patterns across academic, recreational and social domains. STQ has demonstrated strong content validity and moderate to high reliability across most items.

- **Sleep Quality Scale (SQS):** This scale was developed by Yi, Shin and Shin in 2006 [19] and it assesses sleep latency, disturbances, subjective sleep quality. It is a scale with 28 items rated on a 4-point Likert scale and has high internal consistency (Cronbach's $\alpha = 0.92$) and good test-retest reliability ($r = 0.81$).
- **Digital Burnout Scale (DBS)**: Was developed and validated by Seung-Yi Choi and Jung-Hee Kim in 2024 [20] with 24 items and 3 sub-scales namely Digital aging, Digital deprivation and Emotional exhaustion. This 5-point Likert scale has excellent reliability (Cronbach's $\alpha = 0.95$). It Measures emotional exhaustion, irritability, and disengagement due to prolonged digital exposure.
- **Generalized Anxiety Disorder Scale (GAD-7)**: This is widely used scale because it is validated across diverse populations and settings to assess symptoms of anxiety with 7 items and with 4-point Likert scale [21]. GAD shows strong internal consistency (Cronbach's $\alpha = 0.92$).
- **Beck Depression Inventory-II (BDI-II)**: It is a 21-item self-report questionnaire developed by Dr. Aaron T. Beck and colleagues [22] and widely used to evaluate the severity of depressive symptoms. It shows excellent reliability and validity (Cronbach's $\alpha = 0.86–0.93$, $r = 0.73–0.96$).
- **Rosenberg Self-Esteem Scale (RSES)**: This is one of the most widely used instruments for measuring global self-esteem which is developed by Morris Rosenberg in 1965 [23]. The RSES is a 10-item self-report questionnaire designed to assess an individual's overall sense of self-worth and self-acceptance. RSES has a high degree of reliability which shows in Cronbach's alpha values between 0.77 and 0.88, as reported, indicate that the RSES will normally exhibit a high level of internal consistency.

Statistical Analysis: Collected data was entered and analysed with into SPSS (Version 26). Descriptive statistics like means, standard deviations, frequencies and percentages were calculated for demographic variables and scale scores. Screen time exposure was categorized into three groups which are high (> 6 hours/day), moderate (3-6 hours/day) and low (<3 hours/day). One-way ANOVA was conducted to compare mean score of depression, anxiety, sleep disruption and self-esteem. Post Hoc Analysis was conducted to identify specific group differences. Pearson's correlation coefficients were calculated to examine relationships between screen time (continuous variable) and mental health indicators. Multiple Regression Analysis was conducted to identify predictors of digital burnout and emotional distress.

4. Results

Presented in the table below are the findings, which aim to provide a complete picture of the study's participants. The demographics, frequency and percentages were presented in the tabular form.

Table 1: Characteristics of the Study Subjects (N = 360)

Variables	Categories	Frequency (F)	Percentage (%)
Age	13-14	142	39.4%
	14-15	161	44.7%
	15-16	57	18.6%
Gender	Male	187	51.9%
	Female	173	48.1%

Table-1 shows the demographic information such as age and gender of the participants of the present study. The age distribution revealed that the majority of participants were between 14 and 15 years old, accounting for 44.7% (n = 161) of the sample. Participants aged 13–14 years comprised 39.4% (n = 142), while those aged 15–16 years represented 18.6% (n = 57). In terms of gender, the sample was nearly balanced, with 51.9% (n = 187) of male and 48.1% (n = 173) of female participants. This distribution supports a relatively equitable representation of gender in the study, allowing for comparative analysis across groups.

Table 2: Screen Time Exposure Classification.

Group	Screen time (hours/day)	Number of participants
Group-A	>6 hours	131
Group-B	3-6 hours	147
Group-C	<3 hours	82

Table-2 shows that the sample was further categorized into three groups based on their average usage of daily screen time. Group A, representing those with high screen time exposure (>6 hours/day), included 131 participants (36.4%). The largest proportion belonged to Group B (3–6 hours/day), comprising 147 participants (40.8**%).** Group C, with low screen time exposure (<3 hours/day), accounted for 82 participants (22.8%).

Table 3: Mean Scores of Mental Health Indicators by Screen Time Group

Variable	Group-A (High)	Group-B (Moderate)	Group-C (Low)	F-Value	p-Value
Depression (BDI-II)	22.8	17.2	11.6	18.65	< 0.001 ***
Anxiety (GAD-7)	12.5	9.3	5.9	15.47	< 0.001***
Emotional exhaustion (DBS)	14.9	10.7	7.2	20.12	< 0.001***
Sleep Disruption (SQS)	19.2	23.4	27.1	13.88	< 0.001***
Self-esteem (RSES)	4.1	3.0	1.8	10.94	< 0.01**

*p≤0.05 **p≤0.01 ***p≤0.001

Table-3 shows the one-way ANOVA results to examine differences in mental health outcomes among adolescents categorized by screen time exposure. Depression (BDI-II) scores were highest in Group A (M = 22.8), followed by Group B (M = 17.2), and lowest in Group C (M = 11.6), F (2,357) = 18.65, $p < 0.001$. Anxiety (GAD-7) scores showed a similar trend, with Group A reporting the highest levels (M = 12.5), compared to Group B (M = 9.3) and Group C (M = 5.9), F (2,357) = 15.47, $p < 0.001$. Emotional exhaustion (DBS) was significantly greater in Group A (M = 14.9) than in Group B (M = 10.7) and Group C (M = 7.2), F (2,357) = 20.12, $p < 0.001$. Sleep Disruption (SQS) scores were highest in Group C (M = 27.1), followed by Group B (M = 23.4) and lowest in Group A (M = 19.2), F (2,357) = 13.88, $p <$ 0.001, indicating an inverse relationship with screen time. Self-esteem (RSES) scores were lowest in Group A (M = 4.1), moderate in Group B (M = 3.0), and highest in Group C (M = 1.8), F (2,357) = 10.94, $p < 0.01$, suggesting that increased screen time may be associated with reduced self-esteem.

Table 4: Post Hoc Tukey's HSD Test Results for Comparison of Group Mean Differences

Condition	Mean Difference	Std. Error	p-value
Group A vs. Group B	+2.8	0.65	< 0.007**
Group A vs. Group C	+5.1	0.72	< 0.001***
Group B vs. Group C	+2.3	0.68	< 0.05*

*p≤0.05 **p≤0.01 ***p≤0.001

Table-4 shows that the observed difference between Group A (>6 hours/day) and Group B (3–6 hours/day) is statistically significant with a mean difference of +2.8 (SE = 0.65, $p < 0.007$). Comparison of mean differences between Group-A and C is +5.1 (SE = 0.72, $p < 0.001$) and the mean differences between Group B and Group C was +2.3 (SE = 0.68, $p <$ 0.05).

Table 5: Pearson Correlation Between Screen Time and Mental Health Variables

Mental Health Indicator	Pearson r	p-value
Depression Score	0.58	<0.001***
Anxiety Score	0.52	<0.001***
Sleep Disruption Index	0.47	<0.001***
Emotional Exhaustion	0.61	<0.001***
Self-Esteem Score	-0.39	0.002*

*p≤0.05 **p≤0.01 ***p≤0.001

Table-5 show s the correlation coefficients of various mental health indicators. For Depression indicator correlation score *r was* 0.58, with the p-value of < 0.001. For Anxiety, correlation score *r was* 0.52 with the p-value of < 0.001. The correlation score for Sleep disruption was 0.47 with a p-value of < 0.001, *r* for emotional exhaustion was 0.61 with *p*-value of < 0.001, and the Pearson correlation coefficient for self-esteem with screen time was–0.39 with the *p-value of* 0.002.

Table 6: Multiple Regression – Predictors of Digital Burnout

Predictor Variable	β (Standardized Coefficient)	t-value	p-value
Depression Score	0.28	3.76	<0.001***
Anxiety Score	0.33	4.21	<0.001***
Sleep Disruption Index	0.19	2.47	0.015*
Emotional Exhaustion	0.38	4.89	<0.001***
Self-Esteem Score	-0.22	-2.68	0.009**

*p≤0.05 **p≤0.01 ***p≤0.001

Table-6 shows that the significant psychological predictors of digital burnout among adolescents. Depression score was a significant positive predictor of digital burnout where $\beta = 0.28$, $t = 3.76$, $p < 0.001$. Anxiety score also significantly predicted burnout where $\beta = 0.33$, $t = 4.21$ and $p < 0.001$. Sleep disruption index showed a moderate but significant effect with $\beta = 0.19$, $t = 2.47$ and $p = 0.015$. Emotional exhaustion emerged as the strongest predictor where $\beta = 0.38$, $t = 4.89$ and $p < 0.001$. Self-esteem score was negatively associated with burnout $\beta = –0.22$, $t = –2.68$ and $p = 0.009$.

5. Discussion

The present study explored the relationship between the frequency of screen time and its impact on various mental health indicators among adolescents. The research results suggesting a strong significant association between prolonged digital usage and psychological distress. Digital burnout and Screen fatigue among adolescents is a complex and multidimensional that involve continued cognitive-emotional stress consequential from extended digital use, categorized by feelings of exhaustion, reduced motivation, and impaired emotional regulation [24].

Excessive screen time contributes to emotional exhaustion, anxiety, depression, and diminished self-esteem in youth populations and these findings align with the previous research findings which emphasized that constant digital engagement particularly through social media intensifies the pressure to seek validation, leading to emotional fatigue and burnout [9]

Consistent significant associations between prolonged screen exposure and diminished well-being, with social media use particularly linked to higher depression risk [25]. Excessive screen time leads to blue light exposure and this further impacts the patterns of cognitive arousal from screen use which eventually interfere with sleep quality and duration [26].

The significant negative correlation between the screen time and self-esteem further supports the concept that digital environments can erode adolescents' sense of self-worth. Research findings suggest that prolonged exposure to curated online personas and comparison-driven platforms like Instagram and TikTok can distort self-image and reduce confidence [14].

6. Conclusion

The evaluation of Digital burnout and Screen fatigue findings from this comparative study will contribute to several important domains. From a theoretical perspective the research will help in advance our understanding of how traditional stress and fatigue models can be applied to modern-day digital settings particularly among adolescent populations. Methodologically, the study will establish validated assessment approaches for measuring digital-related mental health challenges in younger populations. Clinically, the research will inform the urgent need for incorporation of evidence-based intervention in the educational institutes to support adolescents who are undergoing digital burnout and screen fatigue. It is important to create awareness about healthy technology use guidelines and preventive measures such as digital detox routines, offline recreative activities, peer and parental support to break this vicious cycle of mental health issues due to addictive nature of digital realm.

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