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The Impact of Technostress on Impulsivity Among University Students: A Quantitative Study in the Pakistani Context

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Abstract

This study investigates the impact of technostress on impulsivity among university students in Pakistan, focusing on demographic influences such as gender, age, education, and socioeconomic status. Conducted in two phases, the research aims to address the rising challenge of managing technostress in an increasingly digitalized academic environment. Phase I focused on developing a reliable Technostress scale. A systematic process was employed, including item generation, pilot testing, a try-out study, factor analysis, and reliability assessments. The finalized 40-item scale demonstrated high internal consistency (Cronbach's alpha = .93) and revealed a five-factor structure accounting for 51.07% of the variance. Phase II utilized a quantitative survey methodology, collecting data from 300 full-time students aged 18–25 at the International Islamic University Islamabad using the Technostress Scale and the Barratt Impulsiveness Scale (BIS-11). Results indicated that while technostress levels were significantly higher among male students, there was no statistically significant correlation between technostress and impulsivity ($r = -0.059$, $p > 0.05$). Gender-based analysis revealed that males experienced higher technostress ($M = 127.2$, $SD = 29.8$) compared to females ($M = 87.9$, $SD = 22.9$) with a large effect size (Cohen's $d = 1.47$). Impulsivity scores showed minimal gender differences, with males and females reporting similar mean values. These findings suggest that while technostress is prevalent, its direct influence on impulsivity remains inconclusive. This study highlights the need for culturally tailored interventions to mitigate technostress among university students, particularly males. It also calls for further research on the technostress-impulsivity nexus. The findings offer practical recommendations to enhance students' well-being and academic performance in Pakistani university settings.

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1. INTRODUCTION

The rapid advancement of technology has led to increased exposure to technostress, a phenomenon characterized by struggles to adapt to emerging computer technologies (Brod, 1984). Technostress has become a pervasive issue affecting individuals worldwide, with far reaching consequences for mental health, productivity, and overall well-being.

A growing body of research indicates that excessive technology use is linked to elevated stress levels, reduced productivity, and impaired mental well-being (Kushlev & Dunn, 2012; Tarafdar et al., 2019). Notably, studies have demonstrated that frequent email checking can exacerbate stress and hinder productivity (Kushlev & Dunn, 2012), and technostress can lead to decreased job satisfaction, increased turnover intentions, and compromised mental health outcomes (Tarafdar et al., 2019).

Furthermore, studies have uncovered a correlation between technostress and impulsivity, indicating that individuals overwhelmed by technostress may exhibit impulsive tendencies (Moeller et al., 2001; Stanford & Barratt, 1997). Characterized by hasty decision-making and diminished self-regulation, impulsivity can have far-reaching consequences, including eroded self-control and amplified risk-taking (Patton et al., 1995).

This study aims to investigate the technostress-impulsivity nexus among university students, elucidating the potential consequences of excessive technological use on mental health and behavioral outcomes.

1.1. Rationale

Investigating technostress and impulsivity among Pakistani university students is vital due to the country's distinct cultural, economic, and educational landscape. The interplay between collectivist values, Islamic principles, and traditional social norms may shape technostress experiences uniquely, differing from western contexts. Furthermore, Pakistan's economic limitations, restricted technology accessibility, and infrastructure deficits may intensify technostress, necessitating context-specific solutions. With over 3 million students enrolled in higher education, Pakistan's expanding university sector underscores the importance of exploring technostress and impulsivity within this demographic. Examining these factors can inform targeted interventions, promoting digital well-being and resilience among students. Furthermore, informed education policy, and digital literacy practices, promoting digital well-being, mental health, and academic success among Pakistani university students while contributing to the global understanding of technostress and impulsivity.

1.2. Objectives

The following are objectives of the study:

1. To evaluate the impact of technostress on impulsivity among university students.
2. To investigate the relationship between technostress and impulsivity among university students.
3. To examine whether gender, age, education, marital status, socioeconomic status influences the relationship between technostress and impulsivity.

1.3. Hypotheses

The following are hypotheses of this study:

Hypothesis 1. There is a positive correlation between technostress and impulsivity among university students.

Hypothesis 2. Technostress has an impact on impulsivity among university students.

Hypothesis 3. Male students exhibit higher impulsivity level than female students in response to technostress.

2. THEORETICAL FRAMEWORK

2.1. Technostress Model.

Technostress Model states that technostress is a negative feeling towards technology resulting from factors such as information overload, job demands and lack of control. These stressors can impair cognitive functions and lead to impulsive behaviors. The constant pressure for students to manage digital communication and work tasks creates an environment that leads to stress and uncertainty. Understanding this relationship is important for developing strategies that will help students manage technological stress and improve their learning and well-being (Tarafdar et al., 2007).

This model explains that technology-related stressors, such as overload, complexity, and insecurity, diminish cognitive control, which is associated with impulsive behavior (Ragu-Nathan et al., 2008).

2.2. Transactional Model of Stress.

Lazarus and Folkman's (1984) Stress Discussion Model (TMS) is a framework for examining stress in organizations and private settings. According to this model, stress results from the interaction between the individual and their environment, where environmental demands exceed the individual's ability to cope effectively which increases their sensitivity to impulsive decision making (McGrath, 1976; Lazarus and Folkman, 1984; Cooper et al., 2001). In the context of stress, this means that technological aspects such as complexity, reliability, and usability are evaluated according to need or "stress high technology" that burdens the individual and requires change. These needs lead to solutions which in turn lead to various psychological, physical, and behavioral problems (Tarafdar et al., 2019). If a person evaluates his work negatively, he experiences stress, called technostress.

The degree to which these situations cause stress is determined through a cognitive appraisal process that includes a primary appraisal wherein individuals rate the potential impact on their eating habits, followed by a secondary appraisal evaluating their problem-solving skills. Negative stress occurs when people perceive that they have insufficient resources to cope with the situation, affecting their mental health and behavior (Lazarus and Folkman, 1984; Califf et al., 2020).

2.3. Person-Environment (P-E) Fit Theory.

Person-environment (P-E) fit theory states that stress results from conflict between personal and environmental needs. According to Edwards et al., (1998) inconsistencies in competition from sport to sport can be stressful and detrimental to work and health. Stress results from a mismatch between an individual's abilities and environmental demands. A poor fit between ICT competencies and academic digital requirements may drive maladaptive coping strategies like impulsivity (Wang et al., 2020). Edwards and Shipp (2007) argued that a better F-K fit is a positive predictor of profitability. Increased athletic competition in higher education is associated with increased academic performance. This study predicts that a mismatch between students' ICT skills and Online Distance Learning (ODL) needs will lead to anxiety about technology use, affecting boys' and girls' learning satisfaction and achievement expectations. Stress occurs when the learning environment does not meet students' needs or when students cannot cope with ODL needs, indicating the importance of matching students' environmental needs to reduce technology stress (Edwards et al., 1998).

2.4 Cognitive Load Theory.

Cognitive Load Theory posits that the human cognitive system has a limited capacity for processing information. When cognitive load surpasses working memory capacity, individuals may exhibit reduced self-regulation and increased impulsivity (Paas & Van Merriënboer, 1994). In the context of technostress, the constant demands of technology can overload students' cognitive resources, making it difficult for them to process information effectively. This excessive cognitive load can lead to decreased focus, impaired decision-making, and heightened impulsivity as students struggle to manage the influx of digital information and tasks. The theory highlights the importance of balancing cognitive demands to avoid overload and maintain optimal performance. Thus, understanding and managing technostress is crucial for preventing cognitive overload and its associated impulsive behaviors among students (Sweller, 1988).

2.5 Self-Determination Theory.

Self-Determination Theory (Deci and Ryan, 1985) posits that individuals have basic psychological needs for autonomy, competence, and relatedness. Technostress may undermine

basic psychological needs (autonomy, competence) which in turn leads to frustration and impulsive behavior (Vansteenkiste & Ryan, 2013).

Together, these frameworks directly inform the hypotheses: technostress correlates with and predicts impulsivity (H1, H2), and that gender moderates this effect (H3).

3. LITERATURE REVIEW

The Internet has experienced remarkable growth over the past few decades with approximately 4.1 billion people – or 53.6% of the global population connected worldwide by the end of 2019 (ITU, 2019; Lopez-Fernandez, 2019). This surge in Internet usage has significant implications for various aspects of society. Prior research indicates that technostress impairs psychological functioning and performance, particularly in young populations (Salanova et al., 2013). The pervasive integration of technology into daily life has also transformed the way university students interact, learn, and manage their time. While the Internet's expansion has yielded many advantages; increased reliance on digital devices has also given rise to a growing concern: technostress. The adverse effects of modern technology have led to the emergence of technostress, a condition marked by technological addiction and stress (Khlaif et al., 2022), highlighting the "dark side" of technology's influence (Nastjuk et al., 2024).

Excessive Internet use can trigger a range of negative symptoms, mirroring substance abuse, including preoccupation, anxiety, irritability, aggression, and impulsivity (Ko et al., 2012). According to Cao et al. (2007), adolescents struggling with Internet addiction exhibit heightened impulsivity and often experience co-occurring psychiatric disorders, suggesting a potential link between these conditions and Internet addiction. Similarly, Kayis et al. (2016) reported a significant correlation between Internet addiction and impulsivity in a sample of young adults. Individuals with impulsivity issues display difficulties in managing their actions, characterized by recurrent impulsive behaviors and perceived control loss, often linked to addiction (Zhang et al., 2021; Rømer Thomsen et al., 2018).

Adolescents are uniquely vulnerable to the negative consequences of technostress, encompassing cognitive, psychological, and physiological outcomes due to their ongoing development and extensive technology use (Compas et al., 2001; George & Odgers, 2015). Research has highlighted the unique challenges faced by university students in managing technostress. A study by Wang et al. (2019) found that university students' technostress levels were significantly higher than those of non-students. Furthermore, Kirschner and Karpinski (2010) discovered that excessive technology use among university students was linked to decreased academic performance and increased stress levels.

Previous study explores how technostress affects vocational education students in Pakistan, particularly during the shift to online learning due to the COVID-19 pandemic. The researchers collected data from 300 students and performed various quantitative tests to assess the impact of technostress on students' productivity, satisfaction, and commitment to their programs. In Pakistani contexts, Pirzada et al. (2022) found that the shift to online learning exacerbated technostress but did not directly assess behavioral outcomes like impulsivity.

The scientific consensus supports a significant relationship between impulsivity and Internet Addiction, with studies highlighting the role of impulsivity in addictive tendencies (Zhang et al., 2021).

4. METHODOLOGY

4.1. Research design

To conduct this study a survey method was used to collect data through distributing self-reported questionnaire among students.

4.1.1. Phase 1

Development of Scale. This phase outlines the systematic process of creating and validating the "Technostress Scale." The scale consists of 40 items, designed to measure various dimensions of technostress. The development process included item generation, pilot testing, try-out study, factor analysis, and reliability assessment.

1. Item Generation: The development began with an extensive review of literature on technostress, focusing on its dimensions, theoretical frameworks, and manifestations. The goal was to ensure comprehensive coverage of the construct.
Initial Item Pool: A total of 60 items were created, covering key dimensions such as "technological overload," "technological insecurity," "technological invasion," "technological complexity,".
Design: Items were formulated as statements reflecting experiences of technostress, rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

2. Finalization of Items: The initial pool of 60 items was carefully reviewed by the researcher to finalize the scale. This review focused on three key aspects: clarity, relevance, and overlap. Items were examined to ensure they were easy to understand and free from ambiguity. Each item's relevance was assessed to confirm that it appropriately reflected the construct of technostress. Additionally, redundant items or those measuring the same concept were removed to streamline the scale. As a result of this thorough review, 20 items were eliminated, leaving a refined 40-item scale for further evaluation.

3. Pilot Study: The 40-item scale was administered to a pilot sample of 30 participants from the target population to evaluate its clarity and usability. This phase aimed to ensure that participants understood the items as intended and that the scale could be completed efficiently without causing confusion or fatigue. Based on feedback from the participants, minor wording adjustments were made to enhance clarity and comprehension of specific items, ensuring the scale was well-suited for the main study.

4. Try-Out Study: The refined 40-item scale was administered to a larger sample of 100 participants, representative of the target population. This stage aimed to evaluate the scale's structure and psychometric properties.

5. Factor Analysis: Exploratory Factor Analysis (EFA) was conducted to identify the underlying structure of the technostress scale. The analysis revealed a clear 5-factor structure, accounting for 51.07% of the total variance. Remarkably, all 40 items were retained and appropriately distributed across these five factors, confirming the robustness of the scale's structure.

6. Reliability Analysis: Internal consistency of the scale was assessed using Cronbach's alpha:
Overall Scale: Cronbach's alpha = .93

4.1.2. Phase II

Sample: Convenience sampling method was used to collect data from students to examine the impact of technostress on impulsivity among university students. The sample contained a total of 300 individuals involving 150 female students and 150 male students enrolled on regular basis in different academic programs.
Inclusion criteria: Currently enrolled full-time students at Islamic international university Islamabad were employed for the study. Students aged between 18 to 25 were included in the study. Students' willingness was well ensured. Those students who have access to the use of digital devices i.e. mobile, computer, tablets and laptops, were included in the study. Active internet users were employed for this study.

Exclusion criteria: Students who were not currently enrolled as full-time students in International Islamic University Islamabad were excluded. Students younger than 18 and older than 25 were excluded from the study. Students who were not willing to participate were also not included. Students who do not have access to digital devices like mobiles and computers were not included in the study. Students who were not active internet users were excluded from the sample.

4.1.3. Operational definition

Techno-stress: Techno-stress refers to the adverse effects of technology overload on humans, manifesting as negative psychological (anxiety), physiological (fatigue), and behavioral responses (exhaustion), as documented by researchers (Ramakrishna Ayyagari et al., 2011; Hudiburg& Necessary, 1996). High score reveals that respondents have high level of technostress and lower score means that respondents have less technostress**.**

Impulsivity:. Impulsivity is a multifaceted construct characterized by a tendency to act or react without adequate forethought, consideration, or restraint (Moeller et al., 2001). It encompasses cognitive, emotional and behavioral aspects which were assessed using Barratt Impulsiveness scale (BIS-11) (Patton et al., 1995) that evaluates the tendency to engage in impulsive behaviors. High score reveals that respondents have high level of impulsivity, and lower score means that respondents have less impulsivity.

4.1.4. Research Instrument

Demographic Sheet: A demographic sheet was developed to collect essential background information from participants. The demographic sheet will be designed to gather data that could influence the study's primary variables—technostress and impulsivity. The following demographic factors have been included: age, gender, education, marital status, and socioeconomic status.

Barratt Impulsiveness Scale (BIS): The original Barratt Impulsivity Scale (BIS; Barratt, 1959) has been revised since its creation. The BIS-11 (Patton et al., 1995) was developed from the BIS-10 by analyzing a sample of items amongst individuals in order to compare their scores on BIS 11 with those of other patients and prison inmates. The BIS-10 is a 34-item self-report questionnaire designed to measure impulsivity (Patton et al., 1995). Each item is answered on a 4-point scale (rarely/rarely, sometimes, often, almost always/always). This scale was administered to university students, psychiatric patients, and men in prison. Four items were eliminated because of the item-total correlation, leaving a total of 30 items. The three second-order measures were labeled impulsivity (combination and impulsivity), motor impulsivity (combined motor impulsivity and impulsivity), and cognitive deficits (self-control and cognitive deficits). Two of the three second-order measures identified in the BIS-11 were consistent with those proposed by Patton et al., (1995) but did not identify with any taxon. Results suggest that the BIS-11 total score is a peripheral measure of impulsivity and has the potential to be clinically useful in assessing impulsivity amongst selected patients and prisoners.

4.1.5. Ethical Consideration.

Participants have been approached and briefly informed about the importance and purpose of research. After filling in the research form, participants were informed and assured that confidentiality of their data would surely be ascertained. Data has been analyzed through SPSS version 21.

4.1.6. Procedure.

Data has been collected from students after getting their consent. After having selected the scales and questionnaires, participants were approached and briefed about the purpose of the research and asked to participate in the research. Then questionnaires were given to the participants. Participants were given the opportunity to withdraw from the research at any given time as per convenience. Further, they were briefed about how to respond on each scale as well as on demographic form. After the data collection process, the next phase was to analyze data through SPSS**.**

5. RESULTS

Table 1: Frequencies and Percentages of Demographic Variables of Study (N = 300)

Variables	Category	*f*	%
Gender	Male	150	50.0
	Female	150	50.0
Education	BS	197	65.7
	MS/ MPhil	83	27.7
	PhD	20	6.7
Marital Status	Married	69	23.0
	Unmarried	231	77.0
Socioeconomic Status	Lower	9	3.0
	Middle	190	63.3
	Upper	101	33.7
Family Structure	Nuclear	95	31.7
	Joint	205	68.3

Table 1 presents a total of 300 participants who were surveyed to explore various demographic variables. The sample was evenly distributed in terms of gender, with 150 males and 150 females, representing 50.0% of the total population for each gender category. Regarding education levels, a significant majority of participants held a Bachelor of Science (BS) degree, accounting for 65.7% (197 individuals). A smaller portion had attained a Master's (MS/MPhil) degree, comprising 27.7% (83 individuals) while 6.7% (20 individuals) held a Doctoral (PhD) degree. Participants were also classified based on marital status revealing 23.0% (69 individuals) as married, compared to a substantial majority of 77.0% (231 individuals) who identified themselves as unmarried. In terms of socioeconomic status, most participants belonged to the middle-class category, which encompassed 63.3% (190 individuals). The upper-class category represented 33.7% (101 individuals) while a small segment of 3.0% (9 individuals) were identified as lower class. Finally, upon examining family structure, a predominant 68.3% (205 individuals) participants reported living in a joint family arrangement whereas 31.7% (95 individuals) were from nuclear families.

Table 2: Descriptive Statistics and Psychometric Properties of Technostress Scale and Barratt Impulsiveness Scale (N=300)

				Range			
Variables	*k*	*α*	*M (SD)*	Potential	Actual	Skew	Kurt
Technostress Scale	40	.93	107.63 (33.0)	40-200	40-211	.503	.136
Barratt Impulsiveness Scale	9	.43	18.17 (3.10)	9-36	9-27	-.078	-.189

Table 2 presents descriptive statistics and psychometric properties for the "Technostress Scale" and the "Barratt Impulsiveness Scale" based on a sample of 300 participants. The Technostress Scale, consisting of 40 items, demonstrates high internal consistency with a Cronbach's alpha (α) of .93, indicating that it is a reliable measure. The mean score for this scale is 107.63, with a standard deviation of 33.0, reflecting substantial variability in technostress levels among the respondents. The potential range of scores spans from 40 to 200, while the actual observed range was from 40 to 211; suggesting that some participants reported technostress levels exceeding the expected maximum. The skewness value of .503 indicates a slight positive skew in the data, while the kurtosis value of .136 reflects a relatively flat distribution. In contrast, the "Barratt Impulsiveness Scale" comprises of 9 items with a lower internal consistency, evidenced by a Cronbach's alpha of .43. The average score on this scale is 18.17, with a standard deviation of 3.10. The potential scoring range is between 9 and 36, while actual scores varied from 9 to 27 among participants. The skewness of −.078 suggests a near-normal distribution with a slight negative skew, and the kurtosis of −.189 indicates a flatter distribution relative to a normal curve. Overall, these findings highlight reliability of scales and varying levels of technostress and impulsiveness within the sample.

Table 3: Correlation of Technostress and Impulsivity Among University Students (N=300)

	Variables	1	2
1	Technostress Scale	---	-.059
2	Barratt Impulsiveness Scale	---	---

Note. ***p < .001, **p < .01, *p < .05

Table 3 presents the correlation between technostress and impulsivity among university students based on a sample size of 300 participants. The "Technostress Scale" measures the stress experienced with respect to technology, while the "Barratt Impulsiveness Scale" assesses impulsive behaviors. The correlation coefficient between these two variables is -.059, indicating a very weak negative relationship. This suggests that as levels of technostress increase, impulsivity may slightly decrease, or vice versa, but the relationship is not strong enough to suggest a meaningful correlation. The note at the bottom indicates the thresholds for significance, with ***p < .001, **p < .01, and *p < .05. However, since the correlation does not meet any of these criteria for significance, we can conclude that the correlation observed between technostress and impulsivity in this sample is not statistically significant. This implies that, within this sample of university students, there is no strong evidence to suggest that technostress significantly affects impulsivity.

Table 4: Simple Linear Regression Showing X (Technostress) as Predictor of Y (Impulsivity) (N=300)

Variable	*B*	*SEB*	*B*	*t*	*p*
Constant	18.7	.611		30.71	.000
Technostress	-.006	.005	-0.59	-1.02	.308

This table presents the results of a simple linear regression analysis, where "Technostress" (X) is examined as a predictor of "Impulsivity" (Y) using a sample size of 300 participants (N=300). The constant has a regression coefficient of 18.7 (SEB = 6.11, t = 30.71, p = .000), representing the predicted value of impulsivity when technostress is zero. The regression coefficient for technostress is -0.006 (SEB = 0.005, t = -1.02, p = .308), indicating a negative but non-significant relationship between technostress and impulsivity. This suggests that technostress does not significantly explain the variance in impulsivity.

Table 5: Mean, standard deviation and t-values for male and female on Technostress and Impulsivity (N=300)

Variables	Female(*n*=150)		Male(*n*=150)						
	M	SD	M	SD	*t*(298)	*p*	Lower Limit	Upper Limit	Cohen's *d*
Technostress	87.9	22.9	127.2	29.8	12.7	.000	33.24	45.33	1.47
impulsivity	18.4	2.7	17.9	3.4	-1.5	.001	-1.24	-1.24	0.16

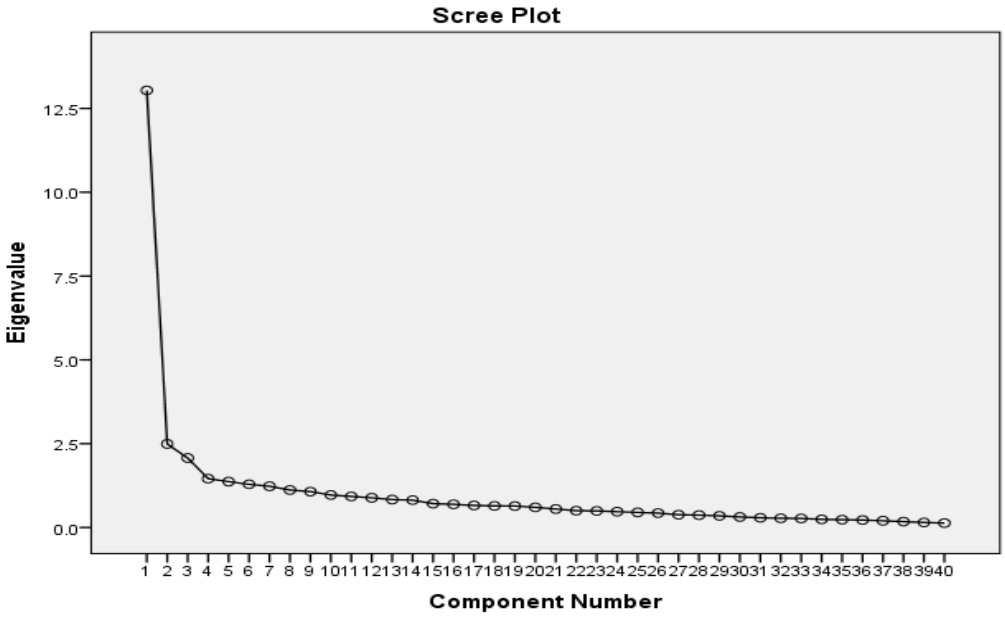
This table presents the mean, standard deviation, and t-test results comparing males (n = 140) and females (n = 150) on technostress and impulsivity, with a total sample size of 300. For technostress, females have a mean of 87.9 (SD = 22.9), while males have a mean of 127.2 (SD = 29.8). The t-value is 12.7, with a p-value of .000, indicating a significant difference between genders. The confidence interval ranges from 33.24 to 45.33, with a large effect size of 1.47. For impulsivity, females have a mean of 18.4 (SD = 2.7), and males have a mean of 17.9 (SD = 3.4). The t-value is -1.5, with a p-value of .001, also showing a significant difference. The confidence interval ranges from -1.24 to -1.24, with a small effect size of 0.16.

Table 6: Factor Loadings of the Items of Technostress Scale Obtained Through Principal Component Factor Analysis (N = 300)

Item No.	Techno-insecurity	Techno-complexity	Techno-overload	Techno-invasion	Techno-uncertainty
TSS32	**.704**	.253	-.017	-.015	.024
TSS28	**.650**	.022	.281	.153	.088
TSS38	**.640**	.305	.080	.208	-.053
TSS30	**.640**	.195	.179	.035	-.162
TSS26	**.633**	.031	.180	.052	.196
TSS24	**.589**	-.001	.131	.113	.358
TSS39	**.563**	.165	.401	.034	.147
TSS34	**.560**	.166	.176	.148	.192
TSS40	**.514**	.161	.076	.157	.093
TSS37	**.504**	.042	.110	.389	.312
TSS31	**.489**	.196	.201	.000	.325
TSS29	**.483**	.400	.112	.120	.181
TSS22	**.465**	.182	.264	.204	.147
TSS27	**.453**	.237	.255	.094	.392
TSS36	**.440**	.181	-.099	.411	.246
TSS10	.300	**.652**	.236	.126	.051
TSS8	.225	**.635**	.119	-.043	.374
TSS9	.164	**.631**	.297	.121	.037
TSS7	.166	**.614**	.250	-.110	.373
TSS4	.307	**.527**	.199	.221	.059
TSS5	.230	**.514**	-.031	.413	.085
TSS17	.207	**.409**	.395	.353	.049
TSS11	.185	.134	**.709**	.063	.050
TSS18	.246	.074	**.666**	.214	.226
TSS19	.275	.140	**.634**	.165	.266
TSS12	.059	.372	**.601**	.142	.042
TSS2	.288	.281	**.533**	.176	.120
TSS20	.183	.357	**.432**	.417	-.184
TSS15	.032	.351	**.417**	.195	.414
TSS23	.087	-.062	.127	**.671**	.052

TSS16	-.009	.363	.282	**.618**	.224
TSS3	.197	.056	.140	**.574**	-.058
TSS13	.039	.270	.329	**.517**	.172
TSS14	.064	.312	.247	**.458**	.351
TSS21	.364	-.221	.086	**.440**	.122
TSS6	.211	.537	.215	-.175	**.543**
TSS35	.192	-.001	.401	.268	**.518**
TSS25	.362	.180	.103	.143	**.515**
TSS33	.449	.191	-.125	.363	**.457**
TSS1	.158	.261	.358	.246	**.410**
Eigen Values	6.08	4.20	3.99	3.39	2.81
% Variance	15.04	10.51	9.99	8.48	7.03
Cum. %	15.04	25.56	35.55	44.04	51.07

The table displays the factor loadings of the "Technostress Scale" items derived from Principal Component Factor Analysis (PCA) on a sample of 300 participants, revealing five factors with eigenvalues exceeding 1, cumulatively explaining 51.07% of the variance. Each factor represents a distinct dimension of technostress, with items grouped, based on their highest loadings, indicating their relevance to that factor. For instance, TSS32 shows the strongest loading on Factor-I (techno-insecurity) (.704), while other items like TSS10 and TSS8 primarily load onto Factor-II (techno-complexity). The eigenvalues and percentage variance for each factor demonstrates their relative contribution, with Factor-I (techno-insecurity) contributing the most (15.04%) and Factor-V(techno-uncertainty) the least (7.03%). These results help identify specific technostress components measured by the scale.



6. DISCUSSION

The study sheds light on the complex relationship between technostress and impulsivity among university students while emphasizing the development and reliability of the "Technostress Scale." The 40-item scale, created through a detailed process of item generation, pilot testing, and factor analysis, demonstrated high internal consistency (Cronbach's alpha = .93) and a clear five-factor structure accounting for 51.07% of the variance. This methodological rigor ensures the scale's effectiveness in measuring different aspects of technostress, such as techno-invasion and techno-complexity. Despite the robust scale development, the study found no

significant correlation between technostress and impulsivity, diverging from previous research which suggests that stress often correlates with impulsive behaviors.

Unlike previous studies (Cao et al., 2007; Stanford & Barratt, 1997) that found a link between stress and impulsive behaviors, this research discovered a weak and non-significant negative correlation between technostress and impulsivity among university students. This discrepancy suggests that cultural and contextual factors may play a significant role.

There are strengths and weaknesses prevalent in the methodology employed for this study. A key strength is the high internal consistency of the "Technostress Scale", which ensured reliable measurement of technostress. The "Technostress Scale" used in this study demonstrated high reliability, aligning with previous validations of similar instruments (Tarafdar et al., 2007; Salanova et al., 2013). However, the low reliability of the "Barratt Impulsiveness Scale" indicates the need for culturally adapted measures to capture impulsivity more accurately in non-western contexts. This limitation might partly explain the lack of a significant relationship between technostress and impulsivity, as culturally insensitive tools can fail to detect nuanced behaviors (Moeller et al., 2001).

Results also underscore cognitive implications of technostress. As predicted by "Cognitive Load Theory" (Sweller, 1988), excessive technological demands can impair decision-making and increase impulsive behaviors. However, the absence of a significant correlation in this study suggests that students may be using effective strategies to manage cognitive overload. This could be influenced by academic environments that emphasize discipline and routine (George & Odgers, 2015) which may help students develop coping mechanisms to mitigate the negative effects of technostress.

Previous studies have shown that technostress can have far-reaching consequences, including decreased productivity and mental well-being (Kushlev & Dunn, 2012; Tarafdar et al., 2019). Although this study did not find a strong connection between technostress and impulsivity, yet the high levels of technostress reported by students emphasize the need for targeted interventions. One potential strategy is to reduce technological overuse which as (Kirschner and Karpinski 2010) have suggested could improve academic outcomes and possibly alleviate cognitive strain associated with technostress.

The explanation of results lies in the cultural context of the participants. The sample consisted of university students in Pakistan - a collective society where copying mechanisms often include social support, family participation and structured educational routine (Hofstede, 2001; Mishra and Castillo, 2004). These culturally embedded strategies can buffer practical expression of impulse even in high technical conditions. In such settings, students can internalize stress responses instead of expressing them through observable impulse functions which can be underestimated indicating reduced impulse in quantitative assessment. The negative correlation between technostress and impulsivity (as demonstrated through this study) can be accounted for the presence of the third variable of non-lectured or arbitration. For example, emotion regulation, educational motivation, or flexibility may moderate this association, and reduce its direct statistical visibility.

A gender-based analysis of the study's findings revealed that male students experienced higher levels of technostress compared to their female counterparts. This disparity may be attributed to differences in how male and female students interact with technology or cope with academic and social pressures. Additionally, male students exhibited slightly higher impulsivity scores, although the difference was relatively small compared to the disparity in technostress levels. These findings are consistent with research conducted by (Kayis et al., 2016) who suggested that impulsivity may vary by gender in stressful situations.

Previous studies (Ko et al. 2012 and Zhang et al. 2021) have shown that stress impacts individuals differently based on their socio-cultural context and coping resources. However, further research is needed to confirm these trends among Pakistani students.

The study's results highlight the importance of implementing targeted interventions to address technostress in university settings. Given the significant gender differences, tailored strategies may be more effective, particularly in supporting male students who reported higher stress levels. To address this, institutions could consider implementing workshops and training programs focused on digital literacy and stress management. This approach aligns with recommendations by Wang et al. (2019) who found that reducing technostress can lead to improved academic performance.

7. CONCLUSION

This research offers valuable insights into the impact of technostress on university students, highlighting the absence of a significant relationship between technostress and impulsivity. The study underscores the importance of culturally specific contexts in shaping how students experience and manage technostress. Furthermore, the findings emphasize the need for institutional interventions to support students in coping with technological demands, while maintaining their mental well-being and academic performance.

7.1 Limitations and Suggestions

While this study adds to the understanding of technostress and impulsivity, its limitations such as reliance on a single university sample may limit generalizability of its findings to other educational contexts. In this regard, cross-sectional design should be addressed in future research. Longitudinal studies with diverse populations could offer deeper insight into the causal mechanisms underlying these relationships. Additionally, incorporating qualitative methods could illuminate students' subjective experiences, offering a rich understanding of how technostress manifests and is managed in different cultures.

Although the research design was methodologically sound, it did not include possible confounding variables such as pre-technology experience, educational performance and control of gender. These factors may have affected the relationship between technostress and impulsivity, and their omissions may have affected the validity of results. Accepting these variables and controlling statistically for them in future studies will strengthen the accuracy and interpretation of conclusions.

The study also employed convenience sampling, which can limit the generalizability of results. Since participants were randomly selected, the sample could not represent the broader student population in terms of demographics, educational background, or regional diversity. Future research will benefit from using random or stratified sampling techniques to obtain a more representative sample to increase external validity of the study.

Furthermore, the "Barratt Impulsiveness Scale", a tool developed in the western context, exhibited low reliability, suggesting a need for culturally adapted measures to accurately assess impulsivity amongst Pakistani students.

7.2 Future Implications

Future research should consider longitudinal studies to explore the causal dynamics between technostress and impulsivity over time. Expanding the sample to include students from diverse educational and cultural backgrounds would enhance the generalization of findings. Moreover, incorporating qualitative methods could provide deeper insights into students lived experiences with technostress, capturing nuances not evident through quantitative measures.

Developing culturally sensitive tools for measuring such constructs as impulsivity would also be critical for advancing this field of research.

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ANNEXURE 1

Informed Consent

Title: The impact of Technostress on Impulsivity among university students
Purpose: To understand the relationship between technostress and impulsivity in university students.
What to Expect:
- You will complete a paper-based questionnaire.
- The questionnaire will take approximately 10-15 minutes.
- Your responses will be anonymous and confidential.

Risks and Benefits:
- Minimal inconvenience.
- Contribution to research on technostress and impulsivity.

Confidentiality: All responses will be kept confidential and stored securely.
Voluntary Participation: Your participation is voluntary. You may withdraw at any time.
Consent:
I have read and understood the information. I voluntarily consent to participate.
Signature: _____
Date: _____
Please return the completed questionnaire to the concern person.

ANNEXURE 2

Demographic Sheet

1.What is your gender?
- Male
- Female

2. What is your age?

_____

3. What is your level of education?
- BS
- MS/MPhil
- PhD

4.What is your marital status?
- Married
- Unmarried

5.Please indicate socioeconomic condition of your family?
- Lower
- Middle
- Upper

6.What is your family structure?
- Nuclear
- Joint

ANNEXURE 3
Technostress Scale

This scale contains following statements:

Techno-insecurity

This construct reflects feelings of insecurity about one's job security due to rapid technological changes and automation

Statements	**Strongly Agree**	**Agree**	**Neutral**	**Strongly Disagree**	**Disagree**
1. I worry that technology may replace my job role.					
2. I fear that new technology will make my skills obsolete.					
3. I am concerned about keeping up with technology to stay employable.					
4. I feel stressed about potential layoffs due to automation					
5. I worry that younger colleagues are better					
equipped with technology skills than I am.					
6. I feel insecure when new technologies are introduced at work.					
7. My organization may not need my role if technology continues to evolve.					
8. Technology makes me feel that others are more qualified for my role					
9. My career progression feels limited due to technological changes.					
10. My skills seem outdated compared to new technologies.					

Techno-complexity

This construct reflects feelings of difficulty in using technology due to its complexity. Items may relate to challenges in learning new technologies, feeling overwhelmed, or having to work harder to keep up with technological changes.

Statements	**Strongly Agree**	**Agree**	**Neutral**	**Strongly Disagree**	**Disagree**
1. I find it hard to understand the technical aspects of new software at work.					
2. Learning how to use new technology takes too much time for me.					
3. My job requires me to frequently learn complex software.					
4. I feel overwhelmed by the amount of new technology I am expected to use.					
5. Technology used in my job is too complicated.					

6. I often need assistance to understand how to use the software at work.					
7. It takes a long time for me to get comfortable with new technology.					
8. The complexity of new software makes my work harder.					
9. My tasks have become more difficult because of the complexity of technology.					
10. I struggle to keep up with the required technological skills for my job. .					

Techno-overload

Statements	**Strongly Agree**	**Agree**	**Neutral**	**Strongly Disagree**	**Disagree**
1.Do you worry about data, security and privacy breaches.					
2. Do you feel anxious when thinking about technology related tasks.					
3.how satisfied are you with your technology use experience.					
4. Do you see others expressing frustrations or anxiety while using technology.					
5.Do you imitate collogues or friend coping strategies for technostress					
6. I take breaks from technology to relax					
7) I notice physical tension while using technology.					
8) I accept my emotions while experiencing technostress.					
9) I set boundaries around technology.					
10) I notice when my mind wander while using technology					

Techno-invasion

Statements	**Strongly Agree**	**Agree**	**Neutral**	**Strongly Disagree**	**Disagree**
(1)I feel uncomfortable when not connected virtually.					
(2)I feel the need to be constantly connected to internet.					
(3)I feel my face to face interaction has been decreased.					

(4)I feel like my device has been traced or my activities are being monitored.					
(5)I constantly check my emails and notifications due to work pressure.					
(6)I think spending quality time with my family has decreased.					
(7) Excessive use of technology has affected my physical and mental health.					
(8)I feel stressed when my device is out of reach.					
(9)I feel myself unable to escape or ignore being online all the time					
10)I feel excessive use of technology is invaded my personal space.					

ANNEXURE 4
Barratt Impulsiveness Scale (BIS-11)

Name:

Date:

Instructions: Please read each statement and mark the number that best describes how frequently the statement applies to you. Try to answer each question as honestly and quickly as possible.
Scoring Key:1 = Rarely/Never **2** = Occasionally **3** = Often **4** = Almost Always/Always

Attentional Facet

1. I don't "pay attention."
   1
   2
   3
   4
2. I concentrate easily. (Reverse Score)
   1
   2
   3
   4
3. I "squirm" at plays or lectures.
   1
   2
   3
   4

Motor Facet

1. I do things without thinking.
   1
   2
   3
   4

2. I make up my mind quickly.
    1
    2
    3
    4
3. I am future oriented. (Reverse Score)
    1
    2
    3
    4

Planning Facet

1. I plan tasks carefully. (Reverse Score)
    1
    2
    3
    4
2. I plan trips well ahead of time. (Reverse Score)
    1
    2
    3
    4
3. I say things without thinking.
    1
    2
    3
    4

Remember to reverse the scores of reverse score questions before adding up your scores in each section. After answering all the questions, add your scores for each section. If you're unsure about an answer, it's okay to guess based on your overall feelings about each statement.

Note: This is a simplified version of the BIS-11; you may need a professional or healthcare provider to interpret the results accurately.