Psychology Research and Behavior Management

Dovepress

open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Turning Lemons into Lemonade: Social Support as a Moderator of the Relationship Between Technostress and Quality of Life Among University Students

Khalid Mehmood[1], Aamir Suhail[2], Pradeep Kautish[3], Muhammad Mohsin Hakeem[4], Md Rashid[5]

[1]Research Center of Hubei Micro & Small Enterprises Development, School of Economics and Management, Hubei Engineering University, Xiaogan, People's Republic of China; [2]Department of Management and Leadership, Business School, Tecnologico de Monterrey, Guadalajara, Mexico; [3]Department of Marketing, Institute of Management, Nirma University, Ahmedabad, India; [4]NUCB Business School, Nagoya University of Commerce and Business, Nagoya, Japan; [5]Department of Civil Engineering, Indian Institute of Technology, Kharagpur, India

Correspondence: Md Rashid, Indian Institute of Technology, Kharagpur, India, Email rashidgeog@gmail.com; Pradeep Kautish, Institute of Management, Nirma University, Ahmedabad, India, Email pradeep.kautish@nirmauni.ac.in

Purpose: The overuse of internet-based technologies as a means of coping with the stress they generate has resulted in an alarming level of addiction, adversely impacting the quality of life and overall health of younger individuals. This social detachment, in turn, contributes to both physical and mental health deterioration. The potential remedy for this predicament lies in the application of social support as an antidote to internet addiction. In this context, our present study employs the Stress-Strain-Outcome model to explore the indirect effects of internet addiction and the moderating role of social support in relation to the influence of technostress on the quality of life of adults.
Methods: We adopted a time-lagged design to collect data from university graduates and evaluated our study hypotheses using Mplus.
Results: Our empirical findings highlight the significant influence of technostress on internet addiction, with the latter significantly mediating the relationship between technostress and quality of life. Furthermore, our results reveal that social support effectively moderates the indirect effects of technostress on quality of life through its impact on internet addiction.
Conclusion: These findings can help researchers and educators better understand the underlying mechanisms between technostress and quality of life with social support as the silver lining. This form of social support holds the potential not only to alleviate internet addiction but also to positively enhance the quality of life and overall wellbeing of individuals facing these challenges. The implications of these findings and avenues for future research are also discussed.
Keywords: internet addiction, quality of life, social support, technostress, social media, moderation-mediation

Introduction

Pervasive use of information and communication technologies has reached to an extent that is causing health and wellbeing deterioration[1] by affecting the overall quality of life of youth. Excessive use of internet-based technologies to reduce the stress caused by the use of those technologies to a level of addiction is taking a toll on the quality of life and health of the younger generation.[2] Their cutoff from social life leading to physical and mental health deterioration can probably be cured by using social support as an antidote to internet addiction. The young generation all over the world is almost equally affected by internet addiction and technological stress.[3,4] The average time adolescents spend online has significantly increased, from about 8 hours weekly in 2005 to 18.9 hours in the last decade.[5] This substantial engagement, particularly during the crucial stages of adolescence, raises questions about its association with potential declines in mental, quality of life, and social well-being.[6] Recent data highlights an alarming trend in the pervasive use of information and communication technologies, particularly among the youth, which is raising concerns about health, quality of life, and wellbeing deterioration. For instance, in Taiwan, a staggering 99.5% of individuals aged 15–24 are

Received: 9 November 2023
Accepted: 21 February 2024
Published: 11 March 2024

regular internet users, as reported by Chern, Huang.[7] This widespread use has been paralleled by a noticeable increase in internet addiction among adolescents and youths, including university students. Studies have indicated that internet addiction prevalence in this demographic ranges from 5.9% to 26.8% in Taiwan.[8] Furthermore, a comprehensive review revealed that the incidence of internet addiction among adolescents in various global regions, both Western and non-Western, spans from 1.98% to 35.8%.[9] These figures underline the growing concern that extensive engagement with information and communication technologies is contributing to a rise in health and quality of life issues among young people worldwide. The youth in universities which embodies a significant portion of this affected population faces distorted educational performance outcomes in addition to social challenges.[10,11] It is also evidenced that quality of life and wellbeing of the university students is undermined by technostress.[12] Given the high level of engagement with technology in youth it is necessary to find linkage between technostress, internet addiction and quality of life of university students. In developing countries like India, younger people are equally suffering from the stress caused by internet-based technologies. Therefore, it warrants a deep probe into the causes of stress caused by excessive use of technologies, its effects on behavior (eg, internet addiction), and quality of life (physical, mental and social health) while considering the role of society in overcoming these negative effects from the life of miserable youth through social support. This study is an attempt to empirically test the technostress and internet addiction as sequential antecedents of quality of life (QoL) in the presence of social support as a moderator that can help in alleviating the deteriorating quality of life because of internet addiction.

Technostress is an unrecognized disorder of the modern digital world that has several implications for the physical and mental health and well-being of people, particularly young people.[13,14] The over-dependence of people on internet-based devices causes stress referred to as the technostress[15] that results from an inability to properly manage the time spent on the use of internet-connected technologies[16,17] leading to addictive behavior in users. Technostress indicates the negative mental state of people in the modern digital world.[18] People suffering from technostress are characterized by some cognitive symptoms such as memory disorders, irritability, and poor concentration.[19] The studies have found that technostress leads to job dissatisfaction, poor job performance, memory problems, and sleep disorders[20] that influence the mental and physical health of people.[21]

Addiction to any substance and/or behavior such as internet usage is an important outcome of stress.[22] The technostress generates addictive behavior in people toward internet usage called internet addiction[1] which is similar to the findings of studies in the field of medical sciences.[22] However, very few research studies have examined the impact of technostress on the IA of people.[23] Internet addiction that is characterized by inability of individuals to avoid internet use is adversely affecting their QoL.[24] This is a mental disorder that reduces the life satisfaction attained by the interaction with friends, family, and the natural environment.[25] IA leads to physical inactivity, insomnia, social disorders, and depression in most people.[26] Studies have found that IA causes many health problems which deteriorate physical and mental health causing multi-dimensional impairments to QoL, particularly among younger adults.[27] Such issues in younger adults may affect their career and social support system in future life as these are negative experiences that may accumulate over one's life and may adversely impact QoL in later phases of life. Hence, proper management of stress caused by a technology-dependent lifestyle leading to IA may help in improving the QoL of people.

In general, the QoL indicates the well-being of societies and the physical and mental health of individuals in particular. The concept of QoL is used in a wider context and often includes social, psychological, and physical relationships, and environmental features.[28] The technostress along with IA significantly influences the mental and physical quality of life of people. Previous studies have found that the QoL of people is critically influenced by stress-producing human behavior such as IA.[29] However, the awareness of most people, particularly young people regarding the health consequences of excessive usage of the internet is low which causes several health issues during the later stages of life.[30] Additionally, young people are less concerned with healthy lifestyle behavior such as social interaction which further accelerates the deterioration of mental and physical health affecting QoL.[31]

Social support has been found to be an important factor that plays a crucial role in minimizing the negative impact of IA[32] and in the improvement of QoL.[33] Therefore, it is important to identify the impact of technostress-induced internet addiction on the QoL of people and how their influence can be moderated by the social support system. The negative consequences of internet addiction on the mental, physical, and social health of people causing deterioration of all aspects

of their QoL[34] can be managed through appropriate social support.[35] Understanding these relations may help in identifying the conditions that improve and/or lower mental and physical health, which is important for making strategies for promoting the QoL of people. Hence, it feels necessary to understand the relationship between technostress, IA, and QoL, and the moderating effect of social support on improving the QoL of people. As per our knowledge, no study has examined the impact of technostress on QoL while considering the IA as a mediator between them and social support as a moderator between IA and QoL (See Figure 1).

The purpose of the present study is to find the effect of technostress on quality of life through internet addiction considering the moderation effect of social support between internet addiction and quality of life on Indian youth. The sample population of the study comprised of a students enrolled in the graduation and post-graduation programs in various universities located in state of Gujarat, India. The study advances the research by Brooks, Longstreet, Califf[1] by answering the question does the technostress which is a stressor affect the strain ie, internet addiction. In the past most of the studies have endeavored to find the effect of internet addiction on stress in context of developed countries as well as the reciprocal effect of technostress on internet addiction. Another innovation in this study is the use of social media support as a moderator between internet addiction and quality of life. The study is also a contribution to the literature on stressor-strain-outcome (SSO) framework. The structure of this study is woven around SSO framework which is a suitable framework to explore the problem understudy.

Theoretical Background and Hypothesis Development

Stressor-Strain-Outcome (SSO) Framework

In the current research, the stressor-strain-outcome (SSO) framework has been applied to discover the impact of technostress on IA and its influence on QoL. The SSO theory explains how environmental stimuli affect users' psychological and behavioral activities through generated strains.[36] It is noteworthy that the SSO framework suggests that a stressor has an indirect effect on the outcome and that the strain typically works as a mediator between stressors and outcome variables. A stressor is defined as an external or environmental stimulation that a person experiences and that affects their internal states,[37] and which is typically regarded as irritating, troublesome, and disruptive.[38] Strain can be considered as both an internal process and an effect of external stimuli, causing the outcome of the stressor and strain interaction together. Hence, stressors cause strain, which puts the individual under stimulation at risk for adverse consequences. Therefore, both outcome and strain can be considered behavioral or psychological reactions to stressors.

The excessive use of internet-based technologies works as a significant stressor to persuade technostress[13] which further increases the use of the internet causing IA.[39] Previous studies have found that technostress has a significant impact on strain causing fatigue[40] that affects the quality of sleep and cognitive dysfunction.[41] The technostress and IA affect mental and physical health[40] which has several behavioral consequences and significantly influences the QoL of people.[38] Accordingly, based on the SSO model, the current research considers the technostress as a stressor, IA as strain, and QoL as an outcome.

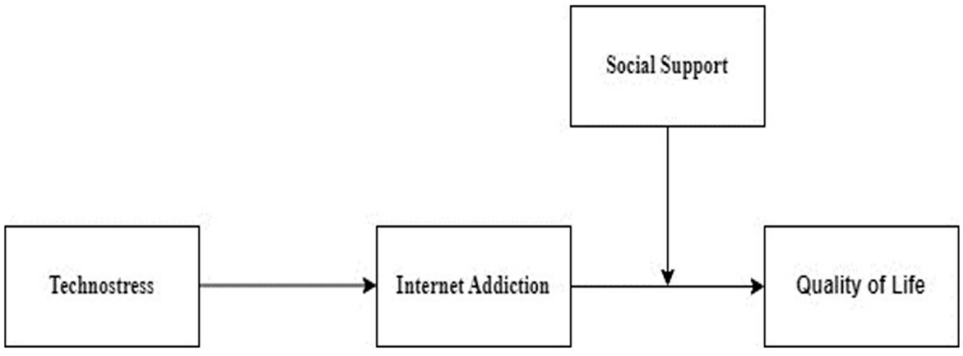

Figure 1 Conceptual model of the study.

Technostress and Internet Addiction

Earlier studies have found that stress propels people toward addictive behavior.[42] The technostress caused by the excessive use of internet-dependent devices can be reduced by decreasing or stopping the use of stress-causing technologies.[39] However, this is not the case as research found that people continue to use the technology even when it is causing stress.[43] Thus, the use of internet-based technology resembles the symptoms of compulsive behavior like alcohol and drug addiction.[44] On the same line, Lee, Chang, Lin, Cheng,[42] identified that technostress leads to compulsive behavior which is found by Tice, Bratslavsky, Baumeister,[45] as positively linked to addiction. In the field of medical sciences, researchers have identified that drug usage increases with an increase in stress[46] which may resemble the symptoms produced in the case of technostress. As Kuss, Griffiths,[47] noted that social network addicts exhibit mood disorder, conflict, withdrawal symptoms, and relapse which are similar to classic addiction symptoms. Therefore, technostress encourages people to use internet-based technologies as people consider them more useful, user-friendly, and full of fun leading to IA. Therefore, we propose that

H1: Technostress has a significant positive effect on internet addiction.

Internet Addiction and Quality of Life

IA has a significant impact on different aspects of people's health that encompasses the state of mental, physical, and social well-being[48] which defines the QoL of people.[49] The studies found that internet addicts display the symptoms of poor QoL[50] because the excessive use of the internet leads to a higher level of anxiety and depression. People spending more time on the internet have reported lower perceived QoL induced by insomnia, physical problems, lack of concentration, and reduced social interaction with family and friends.[51] Few studies reported that the use of the internet for long hours affects social and psychological well-being and QoL.[52] Therefore, we hypothesize that.

H2: Internet addiction is related to the QoL of people.

The Mediating Role of Internet Addiction

Technostress, arising from excessive use of internet-dependent devices, does not necessarily decrease when individuals reduce or stop using stress-inducing technologies.[53] Hsiao, Shu, Huang[54] found that technostress can lead to compulsive behavior, a factor positively associated with addiction according to Brooks, Longstreet, Califf.[1] Furthermore, individuals addicted to social networks exhibit mood disorders, conflict, withdrawal symptoms, and relapse, which resemble classic addiction symptoms.[55] Consequently, technostress can drive people to intensify their use of internet-based technologies, as they perceive them as more useful, user-friendly, and enjoyable, ultimately leading to IA. Using sense from the SSO framework, it can be suggested that technostress is a stressor that influences people working with stress-causing technologies and thus induces strain in them which may take the form of internet addiction leading to excessive use of the internet to cope with the stress caused by stress-causing technologies [H1], which in turn develops symptoms of physical and mental distress (anxiety, stress, insomnia, lack of concentration, loneliness, less socialization, solitude, etc.) in those people making them suffer a lower quality of life [H2]. Therefore, we hypothesize that:

H3: Internet addition mediates the relationship between technostress and quality of life.

The Moderating Role of Social Support

Social support serves as a crucial protective force in the context of IA, offering both tangible and psychological assistance to mitigate the adverse effects of IA on quality of life.[56] Individuals who have a strong network of social support are better equipped to manage the detrimental consequences of IA, which often include depression and negative emotions.[35] This highlights the pivotal role of social support in enhancing mental and physical well-being.[33] Moreover, prior research underscores that social support significantly influences the impact of IA on QoL.[57] Essentially, a strong social support system serves as a protective shield against the adverse effects of IA, promoting enhanced overall wellbeing and mental health. It has been shown that individuals grappling with internet addiction can experience an

improvement in their QoL when they have access to increased social support.[58] Conversely, some empirical studies have indicated that IA can lead to a decline in social support, subsequently contributing to a deterioration in QoL.[59] Furthermore, the presence of robust social support can also act as a preventive factor, reducing the likelihood of individuals developing internet addiction and, in turn, contributing to a higher QoL.[7] These findings underscore the intricate interplay between social support, internet addiction, and QoL, highlighting the vital role of a supportive social network in mitigating the negative impacts of excessive internet use on individuals' overall wellbeing. Therefore, we hypothesize that.

H4: Social support moderates the relation between internet addiction and quality of life such that the relation is stronger among higher social support than among lower social support.

In our proposed model, we introduce a comprehensive understanding of the complex interplay between technostress, quality of life, internet addiction, and the moderating influence of social support. We suggest an integrated model, wherein internet addiction plays a central role in mediating the link between technostress and quality of life. This implies that as individuals experience technostress due to their excessive use of technology, it triggers internet addiction, which, in turn, adversely affects their overall quality of life. Notably, we incorporate the role of social support as a moderator in this relationship. Social support is expected to exert its influence by either mitigating or exacerbating the impact of internet addiction on quality of life. Furthermore, building on Edwards, Lambert[60] approach, we argue that the moderating variable, in this case, social support, also moderates the intensity of the mediating effect of internet addiction within the technostress-quality of life connection. This multifaceted model aims to provide a more nuanced and comprehensive understanding of the intricate dynamics involved in the technostress, internet addiction, and quality of life relationship, considering the important role of social support in this context. As a result, we suggest the following hypothesis.

H5. Social support moderates the indirect effect of technostress on quality of life via internet addiction, such that the indirect effect is stronger for people with high levels of social support than for those with low levels of social support.

Methods

Data Collection and Procedure

In order to achieve the purpose of the study we collected data from students enrolled in the universities of the Gujarat State of India. The target population which is extensively engaged in use of internet-based devices and faces problems caused by technostress and internet addiction comprises of students mostly enrolled in various graduation, post-graduation and vocational programs offered in the universities. For the purpose of the study, we considered the universities as clusters of the sample population. The questionnaires were administered to the university students in three waves. Applying the cluster sampling, we first randomly selected the educational institution from a frame of all the universities located in the Gujarat State of India and then we contacted officials in universities to obtain permission to conduct the study. Out of all the universities (Cluster) located in the state only 10 universities were selected randomly and from each university we contacted at least 100 respondents to participate in the study and took their consent and commitment to participate in the study. This study adheres to the ethical principles outlined in the Declaration of Helsinki and the written informed consent has been duly obtained from all participants involved in the research. All respondents were briefed about the purpose of the study, and we exchanged contact details for contact in second and third wave. In this study, a time-lagged research design was employed to facilitate data collection at distinct intervals. This method, increasingly popular in contemporary research, enables the execution of multiple surveys tailored to the specific objectives of the research, as evidenced in recent studies.[61] One significant advantage of this approach is its ability to gather data from a variety of sources, thereby significantly diminishing the risk of common source bias, a concern highlighted in several studies.[62] Additionally, the time-lagged design inherently reduces the potential for common method bias by spacing data collection over several time points.[63] Another benefit of this method is that it allows participants ample time to reflect upon and modify their behaviors before finalizing their responses. This feature adds

depth and reliability to the data collected. Regarding the validity of the theoretical constructs, a rigorous content validation process was undertaken. The validation involved two critical steps: initially, the purification of items through corrected item-total correlation, followed by the assessment of unidimensionality. The latter was conducted using exploratory factor analysis with varimax rotation and principal components extraction. Furthermore, the intraclass correlation coefficient was calculated for all items, with values exceeding the threshold of 0.5, which denotes satisfactory inter-rater agreement. The reliability of the scales was confirmed with Cronbach's alpha values exceeding the acceptable benchmark of 0.7.[64] To mitigate the impact of social desirability bias and further reduce common method variance,[62] data collection was strategically structured into three waves. At first wave questions related to technostress and social support were filled by respondents out of 1000 respondents we successfully obtained 795 completely filled questionnaires. In the second wave questionnaire related to internet addiction was administered using emails. From 795 respondents we obtained 703 complete filled responses. In the third wave questions related to quality of life were asked. Out of 703 respondents, we collected 677 completely filled questionnaires. The detailed demographic information of the respondents is reported in Table 1.

Before initiating data collection, a comprehensive statistical power analysis was undertaken to determine the necessary minimum sample size for precise estimation of the proposed model.[65–69] Considering an expected effect size of 0.150, a target statistical power of 0.80, the inclusion of three predictors, and a confidence level set at 95%, it was determined that a minimum sample size of 132 was indispensable for model estimation. Remarkably, our collected sample encompassed 677 participants, surpassing the minimum requirement and thereby providing ample capacity for the estimation of the proposed model. This comprehensive analysis underscores the robust statistical power of our study in detecting the intended effects. Additionally, it is noteworthy that the efficacy of confirmatory composite analysis in detecting a wide array of model misspecifications with sample sizes of approximately 100 or greater.[70–73]

Measures

In this study, measurements of key variables were derived from existing literature and administered bilingually in English and Hindi. To maintain linguistic fidelity and conceptual integrity, Brislin's[74] back-translation methodology was employed.

Table 1 Demographics Information of Sample

Criteria	Frequency	%
Gender		
Female	221	32.64
Male	456	67.36
Age		
18–25	370	54.65
26–30	288	42.54
31 and above	19	2.81
Educational background		
Technical/Vocational degree	190	28.06
Undergraduate degree	316	46.68
Master's degree and above	171	25.26
Marital status		
Single	496	73.26
Married	181	26.74
Personal income (INR)		
≤10,000	318	46.97
10,001–15,000	232	34.27
15,001–20,000	84	12.40
20,001 and above	43	6.36

Abbreviation: INR, Indian National Rupee.

The initial translation of survey questionnaires from English to Hindi was conducted by an expert in organizational behavior. A bilingual management professional then carefully revised both the English and Hindi versions, addressing any minor discrepancies. Additionally, professors specializing in organizational behavior from the surveyed service establishments validated the appropriateness of these translations for the specific context of our study, as supported by the findings of Khan, Mehmood, Khan,[75] and Mehmood, Jabeen & others.[76] Technostress was measured using a scale developed by Lee, Chang, Lin, Cheng,[42] consisting of six items on a seven-point Likert scale ranging from "1" (strongly disagree) to "7" (strongly agree). An example item was: "I feel my personal life is being invaded by social media and internet-based information and communication technologies". The reliability of this scale was confirmed with α value of 0.913. Quality of life was assessed using a four-item scale adapted from Kim, Schmöcker, Nakamura & others,[77] with a seven-point range from "1" (very dissatisfied) to "7" (fully satisfied). A representative item was: "Overall, I am very satisfied with my current life". The scale's reliability was indicated by a α value of 0.892. Social support was evaluated using a twelve-item scale, adapted from Zimet, Dahlem, Zimet & others[78] and subsequently used by Osman, Lamis, Freedenthal & others.[79] Responses were recorded on a seven-point Likert scale, from "1" (strongly disagree) to "7" (strongly agree), with an example item being: "I can talk about my problems with my friends". The scale demonstrated high reliability with a α value of 0.931. Internet addiction was assessed through an eight-item scale, derived from Elphinston, Noller,[80] and later employed by Wang, Wang, Wu & others.[81] The scale used a seven-point Likert scale from "1" (never true) to "7" (always true). An illustrative item was: "I lose track of how much I am using social networking sites (eg, Facebook, Twitter, Instagram, TikTok, etc.)", and the scale showed good internal consistency with a α value of 0.907.

Control Variables

In this study, gender, age, education, income, and marital status were incorporated as control variables, due to their potential influence on the studied variables within the model, as supported by existing literature.[82,83] Gender was dichotomously coded, with male assigned a value of 1 and female a value of 0. Educational attainment was categorized into three levels: technical/vocational degree (coded as 1), undergraduate degree (coded as 2), and postgraduate degree (coded as 3). The age of the respondents was quantified in years. Marital status was coded as unmarried (0) and married (1). Regarding income, it was classified into four categories based on the amount in Indian rupees: less than or equal to 10,000 (coded as 1), between 10,001 and 15,000 (coded as 2), between 15,001 and 20,000 (coded as 3), and 20,001 and above (coded as 4).

Analytical Techniques

In the analysis of the collected data, a comprehensive array of statistical techniques was meticulously applied. This suite included factor analysis, correlation analysis, as well as the computation of means and standard deviations. Additionally, analyses of direct effects, mediating effects, moderation, and moderated mediation were conducted. Confirmatory factor analysis (CFA), using Mplus 7.0 software,[84] was employed to assess the distinctiveness of the variables under study. This CFA played a crucial role in establishing discriminant validity among the variables. The reliability of the measures was ascertained through the calculation of Cronbach's alpha values. Correlation analysis was utilized to explore the relationships between various variables under study. For a comprehensive and robust analysis of moderated mediation, the bootstrapping method was employed. This method involved the use of Model 14 of the PROCESS Macro, drawing upon 10,000 bootstrapped samples and 95% bias-corrected confidence intervals. This approach provided a thorough and nuanced understanding of the intricate relationships among the variables.

Results

Non-Response Bias

We addressed the potential influence of non-response bias within our collected dataset through a two-step approach. Initially, during the data collection phase, efforts were made to reassure respondents regarding the confidentiality of their personal information and responses on the provided scale, thus mitigating the impact of non-response.[85–87] Subsequently, we employed statistical measures, in accordance with the recommendations of Lambert, Harrington.[88] To this end, we

conducted a Mann–Whitney *U*-test, comparing data from respondents in the first and third waves concerning the study variables. The first 90 data entries were considered early participants, while the last 90 were designated as late participants. The statistical analysis revealed no statistically significant differences between the data of initial and late participants. In summary, it can be inferred that non-response bias did not pose a significant concern within the scope of this research.

Common Method Variance

To address the potential issue of common method bias (CMB), a multifaceted approach was employed, encompassing both procedural and statistical strategies. Initially, procedural measures were enacted to foster unbiased responses. Complete respondent anonymity was ensured, as explicitly outlined in the survey cover letter, thus reducing the likelihood of socially desirable responses.[62,89–92] In this research, rigorous measures were taken to enhance clarity and minimize ambiguity in survey items. Scale items were defined with precision, and questions were crafted to be both direct and specific, aligning with the methodologies suggested by prior scholars.[62,93,94] To mitigate response biases, variables were not labelled according to their reported constructs, and items were not grouped by variables, thus reducing the likelihood of respondents making educated guesses or deliberately associating variables, as advised by Parkhe.[95] Additionally, participants were informed that the survey questions had no definitive right or wrong answers, highlighting the confidentiality of their responses. Alongside these methodological safeguards, a statistical strategy was implemented to assess the presence of common method bias (CMB). CFA was conducted to evaluate the potential existence of CMB. The analysis of a single-factor model revealed a suboptimal fit: $\chi^2 = 3369.851$, df = 464, $\chi^2/df = 7.262$, CFI = 0.599, TLI = 0.576, and RMSEA = 0.109. These indices collectively suggested the absence of significant CMB in the study. Further examination for CMB was carried out using Harman's single-factor test, a widely recognized technique.[96–98] This test was applied to all ten constructs in the research model. The principal axis factoring method revealed that the first factor accounted for only 25.83% of the variance, indicating a minimal impact of CMB, as corroborated by prior studies.[99–102] Furthermore, the sample adequacy measure, with a value of 0.917, surpassed the acceptable threshold of 0.80, confirming the adequacy of the sample size for this study.

Confirmatory Factor Analysis

We employed CFA through Mplus 7.0 software[84] to evaluate the distinctiveness of the following constructs: quality of life (QoL), technostress (TS), internet addiction (IA), and social support (SS). The baseline model, encompassing these four variables, underwent meticulous scrutiny. To assess the discriminant validity of the model, we compared the baseline model with three alternative models. As delineated in Table 2, the four-factor model (baseline model) demonstrated a satisfactory fit, characterized by the following statistics: $\chi^2 = 759.567$, df = 458, $\chi^2/df = 1.658$, CFI = 0.961, TLI = 0.957, and RMSEA = 0.057. Importantly, the fit indices of the baseline model surpassed those of the alternative models like three-factor model in which IA, QoL, and TS were combined ($\chi^2 = 1652.851$, df = 461, $\chi^2/df = 3.585$, CFI = 0.923, TLI = 0.917, and RMSEA = 0.073), two-factor model in which SS and QoL were combined ($\chi^2 = 2485.126$, df = 463, $\chi^2/df = 5.367$, CFI = 0.856, TLI = 0.834, and RMSEA = 0.092), and single-factor model in which all factor were combined ($\chi^2 = 3369.851$, df = 464, $\chi^2/df = 7.262$, CFI = 0.599, TLI = 0.576, and RMSEA = 0.109), providing robust evidence for the distinctiveness of the four variables and thereby confirming discriminant validity. As a consequence, our model is

Table 2 Confirmatory Factor Analyses Results

Models	χ^2	*df*	χ^2/df	$\Delta\chi^2$ (Δdf)	CFI	TLI	RMSEA
Four-factor model (baseline model)	759.567	458	1.658	–	0.961	0.957	0.057
Three-factor model: combined IA, QoL and TS	1652.851	461	3.585	893.284 (3)	0.923	0.917	0.073
Two-factor model: combined SS and QoL	2485.126	463	5.367	1725.559 (5)	0.856	0.834	0.092
Single-factor model: all factor combined	3369.851	464	7.262	2610.284 (6)	0.599	0.576	0.109

Note: N = 677.
Abbreviations: QoL, Quality of Life; TS, Technostress; IA, Internet addiction; SS, Social Support.

deemed appropriate for subsequent hypothesis testing. In Table 3, the majority of factor loadings exceeded the recommended threshold of 0.60 for all items and there is no poor loading and/or evidence of cross-loading, corroborating the convergent validity of the constructs. Additionally, all composite reliabilities (CRs) values exceeded the recommended threshold of 0.80, as per the criteria proposed by prior scholars.[103–105] Furthermore, the average variance extracted (AVE) values for all the constructs under investigation exceeded the recommended benchmark of 0.50, in accordance with prior research.[103] Moreover, as portrayed in the diagonal of Table 4, the reliability of the measurement instruments was assessed using Cronbach's alpha (α). Reliability levels above 0.80 are indicative of good reliability, while those falling within the range of 0.70 are considered acceptable, and values below 0.60 are categorized as poor, following the criteria outlined by prior research.[103] Notably, Cronbach's alpha coefficient estimates for all four variables exceeded 0.70, signifying an acceptable level of reliability.

Table 3 Variables Reliabilities and Validities

Constructs	Coding	λ	Composite Reliabilities	Average Variance Extracted
Quality of Life (QoL)			0.886	0.567
	QoL1	0.715		
	QoL2	0.763		
	QoL3	0.639		
	QoL4	0.867		
	QoL5	0.661		
	QoL6	0.845		
Technostress (TS)			0.907	0.625
	TS1	0.711		
	TS2	0.923		
	TS3	0.905		
	TS4	0.882		
	TS5	0.606		
	TS6	0.653		
Internet addiction (IA)			0.916	0.580
	IA1	0.904		
	IA2	0.836		
	IA3	0.819		
	IA4	0.632		
	IA5	0.611		
	IA6	0.769		
	IA7	0.801		
	IA8	0.669		
Social Support (SS)			0.928	0.521
	SS1	0.662		
	SS2	0.603		
	SS3	0.678		
	SS4	0.856		
	SS5	0.763		
	SS6	0.659		
	SS7	0.703		
	SS8	0.736		
	SS9	0.865		
	SS10	0.659		
	SS11	0.672		
	SS12	0.763		

Notes: N = 677; λ = factor loading.

Table 4 Correlation Matrix and Summary Statistics

Variables	Mean	SD	CR	AVE	1	2	3	4	5	6	7	8	9
1. Gender	0.46	0.51	–	–									
2. Age	24.07	4.32	–	–	0.04								
3. Education	2.61	0.96	–	–	0.09	0.03							
4. Marital status	0.43	0.54	–	–	0.03	0.04	0.06						
5. Income	2.31	1.01	–	–	0.01	0.06	0.07	0.05					
6. Quality of Life	5.97	1.53	0.886	0.567	0.06	0.07	0.05	0.08	0.13**	(0.892)			
7. Technostress	3.22	1.28	0.907	0.625	−0.07	−0.04	−0.03	−0.01	−0.09	−0.34**	(0.913)		
8. Internet addiction	3.78	0.93	0.916	0.580	−0.02	−0.10*	−0.08	−0.06	−0.04	−0.27**	0.24**	(0.907)	
9. Social Support	5.73	0.85	0.928	0.521	0.04	0.03	0.09	0.09*	0.3	0.46**	−0.36**	−0.15**	(0.931)

Notes: α values appear in parentheses. N = 677; **p < 0.01, *p < 0.05; Gender: 1=male, 0=female; Marital status: 0=unmarried, 1=married; age = number of years; education: 1=technical/vocational degree, 2=undergraduate, 3=postgraduate; income in Indian rupee: 1=less than and equal to 10,000, 2 = between 10,001–15,000, 3 =15,001–20,000, and 4=20,001 and above.

Descriptive Statistics

The findings presented in Table 4 indicate several significant correlations among the variables under investigation. Firstly, technostress exhibited a positive correlation with internet addiction ($r = 0.24$, $p < 0.01$). Secondly, there was a significant negative correlation between internet addiction and quality of life ($r = -0.27$, $p < 0.01$). Lastly, social support displayed a noteworthy positive correlation with quality of life ($r = 0.46$, $p < 0.01$). These results serve as preliminary evidence supporting our hypotheses.

Hypothesis Testing

We conducted a series of tests on the hypothesized model using Mplus,[84] with the results presented in Tables 5 and 6. These findings lend support to our hypotheses. In Table 5, the impact of control variables on the variables under study is examined. However, it is noteworthy that all control variables in our research exhibited insignificant effects. As shown in Table 6, specifically, H1, which proposed a positive association between TS and IA, is substantiated [unstandardized β = 0.295, SE = 0.024, 95% CI (0.2316, 0.3303)]. Moreover, H2, suggesting an association between IA and QoL, is validated [unstandardized β = −0.383, SE = 0.047, 95% CI (−.5346, −0.2860)]. To evaluate Hypothesis 3, Hypothesis 4, and Hypothesis 5, we employed the bootstrapping method approach Preacher, Hayes[106] with Model 14 based on 10,000 bootstrapped samples and 95% bias-corrected confidence intervals.[107] Hypothesis 3 posited that IA mediates the link between TS and QoL. As illustrated in Table 7, the PROCESS analysis revealed a significant indirect effect of TS on QoL through IA [indirect effect = −0.1132, 95% CI (−.2011, −0.0463)], thus supporting Hypothesis 3.

Hypothesis 4, which proposed that SS moderates the association between IA and QoL, received support, as the interaction term (SS * IA) was significant (β = 0.311, $p < 0.01$) (see Table 5). Furthermore, the plotted interaction (SS * IA) (see Figure 2) demonstrated a stronger link with a high level of SS, thereby corroborating H4. Hypothesis 5 proposed that SS would moderate the indirect impact of TS on QoL via IA. Specifically, it was hypothesized that this indirect effect

Table 5 Coefficients of Control Variables

Control Variables	IA	TS	SS	QoL
Gender	−0.037	−0.042	0.053	0.079
Age	−0.054	−0.079	0.061	0.083
Education	−0.026	−0.031	0.047	0.091
Marital status	−0.043	−0.019	0.083	0.065
Income	−0.022	−0.038	0.043	0.077

Note: All the coefficients were unstandardized.
Abbreviations: QoL, Quality of Life; TS, Technostress; IA, Internet addiction; SS, Social Support.

Table 6 Hypotheses Results

Hypothesis	Estimate	S.E.	Boot LL 95% CI	Boot UL 95% CI
Direct effects				
H1: TS → IA H1: IA → QoL	0.295** −0.383**	0.024 0.047	0.2316 −0.5346	0.3303 −0.2860
Moderating effects				
H4: SS * IA → QoL	0.311**	0.023	0.2647	0.3856
H5: Results of conditional indirect effects across levels of TS on QoL at (± 1 of SS)				
Low SS (−1 SD) Mean High SS (+1 SD)	−0.1762 −0.1129 −0.0907	0.036 0.057 0.048	−0.2263 −0.2025 −0.1138	−0.1064 −0.0567 −0.0148

Note: Interaction term: *Unstandardized statistically significant estimates:**$p < 0.01$.
Abbreviations: QoL, Quality of Life; TS, Technostress; IA, Internet addiction; SS, Social Support; 10,000, bootstrapped sample size; CI, confidence interval; LL, lower limit; UL, upper limit; SE, Standard error.

Table 7 Bootstrap Analysis of Mediating Effect

IV	MV	DV	Effect of IV on M (a)	Effect of M on DV (b)	Indirect effect (a*b)	95% CI	Supported
H3: TS → IA → QoL							
TS	IA	QoL	0.2957**	−0.3831**	−0.1132**	[−0.2011, −0.0463]	Yes

Note: Unstandardized statistically significant estimates: **$p < 0.01$.
Abbreviations: CIs-LL, Confidence interval's lower level; CIs-UL, Confidence interval's Upper level; QoL, Quality of Life; TS, Technostress; IA, Internet addiction.

would be more pronounced in individuals exhibiting higher levels of SS. The empirical findings, detailed in Table 5, corroborate this hypothesis. For individuals with high levels of SS (+1 standard deviation), the indirect effect of TS on QoL through IA was statistically significant [estimate = −0.0907, Standard Error (SE) = 0.048, 95% Confidence Interval (CI) with lower limit (LL) = −0.1138 and upper limit (UL) = −0.0148]. Similarly, at low levels of SS (−1 standard

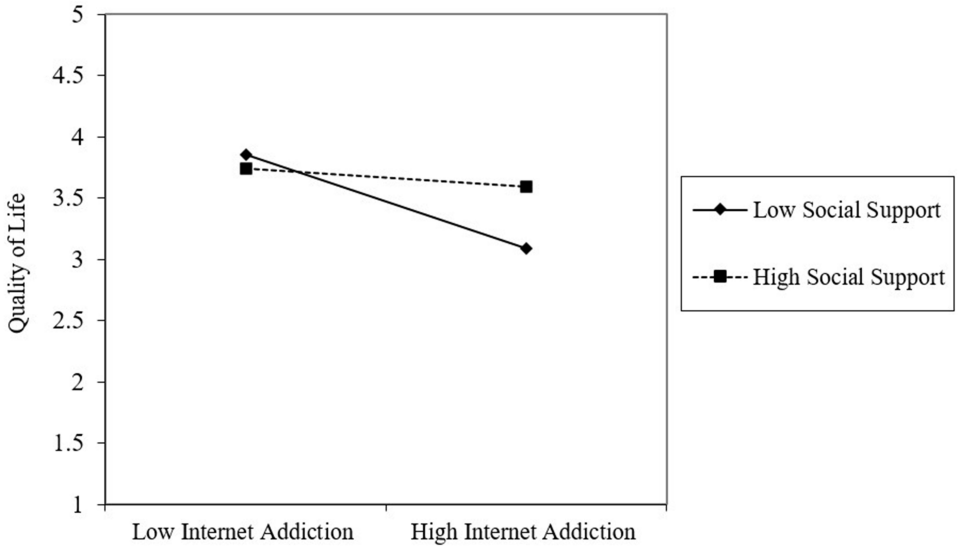

Figure 2 Interactive effects of Internet addiction and Social Support on Quality of Life.

deviation), this mediating effect remained significant [estimate = −0.1762, SE = 0.036, 95% CI (LL = −0.2263, UL = −0.1064)]. The moderated-mediation index also revealed a significant result [Index: −0.0507, Bootstrap SE = 0.048, 95% CI (−.1138, −0.0148)], as it did not include zero. This outcome substantiates the moderating role of SS in the relationship between TS and QoL through IA, thereby supporting Hypothesis 5.

Discussion

The current research aimed to identify the impact of technostress on IA and its influence on QoL. The study also analyzes the moderating role of social support on the relationship between IA and QoL. We found a significant positive correlation between technostress and IA which shows that technostress increases the arousal of people to use internet-connected devices that further increases the stress level of people as found by the previous studies.[57,108] The results also demonstrate that technostress does not directly influence the QoL. The possible reason for this result may be that some people may feel anxiety in online activities, whereas other users may find relief from the use of internet-linked devices.[109,110] However, this type of relief may persist only for a short duration leading to higher online activities to gain relief for a higher duration that triggers compulsive behavior which results in loss of control of internet usage.[111] This may explain why, in this research, technostress predicts a lower QoL only after considering the influence of IA.

The outcomes indicate that IA negatively affects QoL, showing that different aspects of QoL decline as the use of the internet increases. Earlier studies have shown that IA significantly influences the psychological, physical, and social QoL of people.[57] The impact of IA on physical QoL is manifested through lower sleep time, poor diet, physical inactivity, and drinking behavior.[112] IA lowers self-actualization, deteriorates daily activities, and increases anxiety and depression, thus lowering the mental QoL of people.[113] Internet addict people were found to be associated with lower satisfaction with family, home environment, and friends, and lesser participation in social interaction and recreational activities that adversely affect their social QoL.[7] Hence, higher IA lowers all aspects of QoL that require special attention to prevent people to become internet addict. The strategies should be developed for enhancing the capability of people to control their time and effort spent on the internet as internet addicts have lower time and energy management power.[114]

Additionally, we have considered social support as a moderator and the results indicate that the impact of IA on QoL can be minimized by proper social support. While higher social support decreases the impact of IA on QoL, lower social support increases the impact of IA on QoL. This means that people can lower their addictive behavior towards internet usage by increasing their social interaction with surrounding people such as family and friends which is consistent with the findings of earlier studies.[7] Furthermore, behavioral problems, social withdrawal, and impaired QoL are often associated with internet addiction leading to social exclusion which restricts social interaction and support.[115,116] Thus, social support can be a valuable resource for improving all aspects of QoL[117] as lesser social support makes a person unappreciated that works as a distressing factor for QoL.[118] Social support can be used as a protective measure to lower the addictive behavior of people toward the internet.

Theoretical and Practical Implications

The present research contributes to literature on quality of life and wellbeing. This study examines the impact of technostress, IA, and social support on QoL using the SSO framework, which is, as per our knowledge, not done by any previous research. The findings show the significance of these attributes being evaluated using one theory and framework, which is a significant addition to the existing literature on technostress as well. We found that technostress significantly enhances the IA which leads to severe damage to the QoL of people. However, technostress may influence the QoL of different people differently which can be discovered by future research using the framework applied in the study. Previous studies have shown that technostress itself has the power to damage the QoL as stress leads to depression and anxiety leading to poor mental QoL.[1]

The findings of the present research have several implications for practitioners. The clinicians may consider information on the use of internet-connected devices while dealing with internet-addicted patients and giving attention to technostress in their treatment and diagnostic assessment. Technostress should be considered as a comorbidity of internet addiction. Considering the overall impact of technostress on development of internet addiction can help practitioners suggest better remedy for internet addicts. Understanding the linkage between the stressor and strain may

help clinicians better diagnose the root cause of internet addiction and comorbidities. Better diagnosis is most likely to filter out the base problem which should be treated first to get better results of any remedy. As this study has applied SSO model to understand the effect of technostress on internet addiction so it must be considered whether a person is internet addict and he is using technology to relieve stress generated as a result of internet addiction or it is otherwise that a person is feeling stress because of social media and internet based information and communication devices and to relieve that stress he is excessively using those device ie, he/she has got addiction as use of internet gives him/her feel of relieve from technostress.

Furthermore, medical practitioners should offer additional support to persons suffering from technostress taking into consideration the compulsivity dimension and its potential impact on QoL. Specific medications should be given to susceptible groups of patients, especially those suffering from compulsive features so that they approach and handle the internet-linked devices without hampering their QoL. Proper use of health-related information may be vital for the self-care of people, prevention efforts should not only recognize the challenges but also the opportunities. This kind of information should be applied to make people aware of their QoL and the required medical care for its improvement.[119]

As proven by our research the use of social support as a moderator reveals the positive role of friends, family and close people social support in recovery from internet addiction and thus having quality of life back. Internet addicts must be provided social support as it is necessary in getting rid of any other addiction. People around an internet addict should understand a person's stressful lifestyle. Students who used to work on call centers or similar workplaces in addition to their university activities had more technostress and thus sever internet addiction. Friends and family of such students need to understand the load of their excessive and compulsive use of information and communication devices. They must be provided with a healthy social environment to relieve their technostress and internet addiction. Such support from people may not only reduce their internet addiction but also positively influence their quality of life and wellbeing.

Furthermore, universities and educational policymakers play a pivotal role in mitigating IA and fostering a healthy balance between online and offline life for students. To this end, implementing educational seminars and workshops is crucial. These programs should focus on raising awareness about the indicators and ramifications of IA. They ought to educate students about prudent internet use, emphasizing the significance of striking a balance between digital and real-world activities, and imparting self-regulation techniques. Additionally, integrating digital literacy into the curriculum is vital. This includes courses that cover managing digital footprints, comprehending the impact of technology on mental health, and nurturing critical thinking in the digital realm. Such educational initiatives can significantly enhance students' QoL and equip them with skills to navigate the digital world responsibly. In addition to educational efforts, providing robust support systems is essential. Universities should ensure the availability of counseling services for students grappling with internet addiction. These services should offer individualized strategies for behavior modification and coping mechanisms, as well as group therapy sessions, creating a supportive space for shared experiences and mutual learning. Beyond therapeutic interventions, universities should actively foster an engaging campus environment that reduces dependence on digital devices. This can be achieved by organizing a variety of offline activities, clubs, and events catering to a wide range of interests, including sports, arts, and community service. Such initiatives not only offer healthy alternatives to excessive internet use but also enhance social support among students. Lastly, collaboration with tech companies to develop software that monitors and restricts internet use on campus networks can further aid in maintaining a healthy digital balance. By adopting these comprehensive measures, universities can significantly contribute to preventing internet addiction, thereby supporting students' overall QoL and academic success.

Limitations and Future Research

The outcomes of the study should be interpreted cautiously as it has some limitations. The findings on the relationship between technostress, internet addiction, and QoL may not be applicable to the entire population of internet users. Furthermore, the sampling technique may have left out some specific people, making the possibility of sampling people overusing the internet-connected technologies, hence, more suited to a study aimed at understanding the mechanisms underlying technostress. The future works may find it interesting to identify the direct relationship between technostress and QoL. The framework presented in this study can also be used to identify the negative and positive consequences of technostress on IA and QoL as a study has demonstrated that technostress generates both positive and negative

psychological responses to job satisfaction and turnover intention of employees.[120] Despite its limitations, our findings offer intriguing avenues for future research. One such opportunity is the exploration of how various social factors can impact individuals' quality of life in the context of technostress. Subsequent studies could deliberately incorporate the collection of cultural and country-level variables, examining their potential moderating effects. Researchers should be attuned to these cultural nuances when delving into disparities among nations or regions across the world. Even in a moderating role, Hofstede's cultural dimensions can offer valuable insights into the underlying reasons for observed differences.

Conclusion

The current research highlights that IA can be used to understand the mechanisms that link the technostress to decreased QoL. The outcomes of the study add information to the available literature on technostress by exploring its relations with IA and QoL that were overlooked by the previous studies. Moreover, the results of the study point out an important aspect of technostress, which is compulsive behavior. The findings demonstrate that technostress and IA should be considered serious health issues and included in health awareness and intervention programs. The negative association between IA and QoL shows the importance of the development of the self-regulating ability of people to prevent the excessive use of the internet. Social support can be a possible resource to lower the IA as it significantly influences the relationship between internet addiction and QoL. The strategies developed for improving the QoL of internet addict people must emphasize elevating social support from family, friends, and society.

Data Sharing Statement

Data generated or analyzed during the study are available from the corresponding author (Pradeep Kautish) by request.

Ethical Statement

This study was conducted in accordance with the Declaration of Helsinki and Department of Marketing, Institute of Management, Nirma University reviewed and approved the study protocol. All participants read and signed a consent form before they participated in the study. All participants read and signed a consent form before they participated in the study.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Acknowledgement

This study was funded by the Open Project of Micro & Small Enterprise Development Research Center in Hubei Province (grant number XWZD202205).

Disclosure

The authors report no conflicts of interest in this work.

References

1. Brooks S, Longstreet P, Califf C. Social media induced technostress and its impact on internet addiction: a distraction-conflict theory perspective. *AIS Trans Hum Comput Interact*. 2017;9(2):99–122. doi:10.17705/1thci.00091
2. Chou C, Condron L, Belland JC. A review of the research on internet addiction. *Educ Psychol Rev*. 2005;17(4):363–388. doi:10.1007/s10648-005-8138-1
3. Barrault S, Mathieu S, Brunault P, Varescon I. Does gambling type moderate the links between problem gambling, emotion regulation, anxiety, depression and gambling motives. *Int Gambl Stud*. 2019;19(1):54–68. doi:10.1080/14459795.2018.1501403
4. Boysan M, Kuss DJ, Barut Y, Ayköse N, Güleç M, Özdemir O. Psychometric properties of the Turkish version of the Internet Addiction Test (IAT). *Addict Behav*. 2017;64:247–252. doi:10.1016/j.addbeh.2015.09.002
5. Ofcom. Children and parents: media use and attitudes report 2022. Ofcom; 2020. Available from: https://www.ofcom.org.uk/research-and-data/media-literacy-research/childrens/children-and-parents-media-use-and-attitudes-report-2022/interactive. Accessed February 18, 2024.
6. Bell V, Bishop DVM, Przybylski AK. The debate over digital technology and young people. *BMJ*. 2015;h3064. doi:10.1136/bmj.h3064

7. Chern KC, Huang JH. Internet addiction: associated with lower health-related quality of life among college students in Taiwan, and in what aspects? *Comput Human Behav*. 2018;84:460–466. doi:10.1016/j.chb.2018.03.011
8. Yu L, Shek DTL. Testing longitudinal relationships between internet addiction and well-being in hong kong adolescents: cross-lagged analyses based on three waves of data. *Child Indic Res*. 2018;11(5):1545–1562. doi:10.1007/s12187-017-9494-3
9. Park E, Kwon M. Health-related internet use by children and adolescents: systematic review. *J Med Internet Res*. 2018;20(4):e120. doi:10.2196/jmir.7731
10. Perera R. Beyond the minimalist critique: an assessment of the right to education in international human rights law. *Netherlands Q Hum Rights*. 2021;39(4):268–290. doi:10.1177/09240519211057240
11. Upadhyaya P, Vrinda. Impact of technostress on academic productivity of university students. *Educ Inf Technol*. 2021;26(2):1647–1664. doi:10.1007/s10639-020-10319-9
12. Asad MM, Erum D, Churi P, Moreno Guerrero AJ. Effect of technostress on Psychological well-being of post-graduate students: a perspective and correlational study of Higher Education Management. *Int J Inf Manag Data Insights*. 2023;3(1):100149. doi:10.1016/j.jjimei.2022.100149
13. Shi C, Yu L, Wang N, Cheng B, Cao X. Effects of social media overload on academic performance: a stressor–strain–outcome perspective. *Asian J Commun*. 2020;30(2):179–197. doi:10.1080/01292986.2020.1748073
14. Chen C, Zhu Y, Xiao F, Que M. Academic motivation and social support: mediating and moderating the life satisfaction and learning burnout link. *Psychol Res Behav Manag*. 2023;4583–4598. doi:10.2147/PRBM.S438396
15. Salanova M, Llorens S, Ventura M. Technostress: the dark side of technologies. In: *The Impact of ICT on Quality of Working Life*. Springer Netherlands; 2014:87–103. doi:10.1007/978-94-017-8854-0_6
16. French W. Computer shock technostress, the human cost of the computer revolution. Globe Mail; 1984.
17. Gray N, Charness N. Technology obsolescence across the adult lifespan in a USA internet sample. *Front Public Health*. 2022;10:1005822. doi:10.3389/fpubh.2022.1005822
18. Ayyagari R, Grover V, Purvis R. Technostress: technological antecedents and implications. *MIS Q*. 2011;35(4):831. doi:10.2307/41409963
19. Arnetz BB, Wiholm C. Technological stress: psychophysiological symptoms in modern offices. *J Psychosom Res*. 1997;43(1):35–42. doi:10.1016/S0022-3999(97)00083-4
20. Tarafdar M, Tu Q, Ragu-Nathan TS, Ragu-Nathan BS. Crossing to the dark side. *Commun ACM*. 2011;54(9):113–120. doi:10.1145/1995376.1995403
21. Ribeiro ÍJS, Pereira R, Freire IV, de Oliveira BG, Casotti CA, Boery EN. Stress and quality of life among university students: a systematic literature review. *Heal Prof Educ*. 2018;4(2):70–77. doi:10.1016/j.hpe.2017.03.002
22. Sinha R. Chronic stress, drug use, and vulnerability to addiction. *Ann N Y Acad Sci*. 2008;1141(1):105–130. doi:10.1196/annals.1441.030
23. Bucher E, Fieseler C, Suphan A. The stress potential of social media in the workplace. *Inf Commun Soc*. 2013;16(10):1639–1667. doi:10.1080/1369118X.2012.710245
24. Cheng C, lam LAY. Internet addiction prevalence and quality of (real) life: a meta-analysis of 31 nations across seven world regions. *Cyberpsychol Behav Soc Net*. 2014;17(12):755–760. doi:10.1089/cyber.2014.0317
25. Lai CM, Mak KK, Watanabe H, et al. The mediating role of Internet addiction in depression, social anxiety, and psychosocial well-being among adolescents in six Asian countries: a structural equation modelling approach. *Public Health*. 2015;129(9):1224–1236. doi:10.1016/j.puhe.2015.07.031
26. Yen C, Ko C, Yen J, Chang Y, Cheng C. Multi-dimensional discriminative factors for Internet addiction among adolescents regarding gender and age. *Psychiatry Clin Neurosci*. 2009;63(3):357–364. doi:10.1111/j.1440-1819.2009.01969.x
27. Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C. A systematic review of studies of depression prevalence in university students. *J Psychiatr Res*. 2013;47(3):391–400. doi:10.1016/j.jpsychires.2012.11.015
28. World Health Organization. WHOQOL-BREF: introduction, administration, scoring and generic version of the assessment: field trial version, December 1996; 1996. Available from: https://www.who.int/publications/i/item/WHOQOL-BREF. Accessed January 10, 2024.
29. Opoku-Acheampong A, Kretchy IA, Acheampong F, et al. Perceived stress and quality of life of pharmacy students in University of Ghana. *BMC Res Notes*. 2017;10(1):115. doi:10.1186/s13104-017-2439-6
30. Arias-Palencia NM, Solera-Martínez M, Gracia-Marco L, et al. Levels and patterns of objectively assessed physical activity and compliance with different public health guidelines in university students. *PLoS One*. 2015;10(11):e0141977. doi:10.1371/journal.pone.0141977
31. Joseph RP, Royse KE, Benitez TJ, Pekmezi DW. Physical activity and quality of life among university students: exploring self-efficacy, self-esteem, and affect as potential mediators. *Qual Life Res*. 2014;23(2):659–667. doi:10.1007/s11136-013-0492-8
32. Chen Y, Hu R, Xu X, et al. The effect of mental health status and family function on nonsuicidal self-injury: a longitudinal analysis of Chinese children and adolescents. *Psychol Res Behav Manag*. 2023;16:4491–4500. doi:10.2147/PRBM.S429748
33. Zhang D, Wang R, Zhao X, et al. Role of resilience and social support in the relationship between loneliness and suicidal ideation among Chinese nursing home residents. *Aging Mental Health*. 2021;25(7):1262–1272. doi:10.1080/13607863.2020.1786798
34. Rosiek A, Rosiek-Kryszewska A, Leksowski Ł, Leksowski K. Chronic stress and suicidal thinking among medical students. *Int J Environ Res Public Health*. 2016;13(2):212. doi:10.3390/ijerph13020212
35. Goodyke MP, Hershberger PE, Bronas UG, Dunn SL. Perceived social support and heart rate variability: an integrative review. *West J Nurs Res*. 2022;44(11):1057–1067. doi:10.1177/01939459211028908
36. Koeske GF, Koeske RD. A preliminary test of a stress-strain-outcome model for reconceptualizing the burnout phenomenon. *J Soc Serv Res*. 1993;17(3–4):107–135. doi:10.1300/J079v17n03_06
37. Huang Q, Zhang K, Huang Y, Bodla AA, Zou X. The interactive effect of stressor appraisals and personal traits on employees' procrastination behavior: the conservation of resources perspective. *Psychol Res Behav Manag*. 2023;16:781–800. doi:10.2147/PRBM.S399406
38. Cao X, Masood A, Luqman A, Ali A. Excessive use of mobile social networking sites and poor academic performance: antecedents and consequences from stressor-strain-outcome perspective. *Comput Human Behav*. 2018;85:163–174. doi:10.1016/j.chb.2018.03.023
39. Maier C, Laumer S, Eckhardt A, Weitzel T. Online social networks as a source and symbol of stress: an empirical analysis. International Conference on Information Systems, ICIS 2012; 2012.
40. Malik A, Dhir A, Kaur P, Johri A. Correlates of social media fatigue and academic performance decrement. *Inf Technol People*. 2020;34(2):557–580. doi:10.1108/ITP-06-2019-0289
41. Luqman A, Masood A, Shahzad F, Shahbaz M, Feng Y. Untangling the adverse effects of late-night usage of smartphone-based SNS among University students. *Behav Inf Technol*. 2021;40(15):1671–1687. doi:10.1080/0144929X.2020.1773538

42. Lee YK, Chang CT, Lin Y, Cheng ZH. The dark side of smartphone usage: psychological traits, compulsive behavior and technostress. *Comput Human Behav*. 2014;31:373–383. doi:10.1016/j.chb.2013.10.047
43. Maier C, Laumer S, Weinert C, Weitzel T. The effects of technostress and switching stress on discontinued use of social networking services: a study of Facebook use. *Inf Syst J*. 2015;25(3):275–308. doi:10.1111/isj.12068
44. Haynes P, Ayliefe G. Locus of control of behaviour: is high externality associated with substance misuse? *Br J Addict*. 1991;86(9):1111–1117. doi:10.1111/j.1360-0443.1991.tb01878.x
45. Baumeister RF. *Self-Regulation and Self-Control*. Routledge; 2018. doi:10.4324/9781315175775
46. E. Goeders N. The impact of stress on addiction. *Eur Neuropsychopharmacol*. 2003;13(6):435–441. doi:10.1016/j.euroneuro.2003.08.004
47. Kuss DJ, Griffiths MD. Online social networking and addiction—a review of the psychological literature. *Int J Environ Res Public Health*. 2011;8(9):3528–3552. doi:10.3390/ijerph8093528
48. Kaplan RM. Quality of life: an outcomes perspective. *Arch Phys Med Rehabil*. 2002;83:S44–S50. doi:10.1053/apmr.2002.36955
49. Cepeda-Valery B, Cheong AP, Lee A, Yan BP. Measuring health related quality of life in coronary heart disease: the importance of feeling well. *Int J Cardiol*. 2011;149(1):4–9. doi:10.1016/j.ijcard.2010.09.048
50. Tarsilla M. Cochrane handbook for systematic reviews of interventions. *J Multidiscip Eval*. 2010;6(14):142–148. doi:10.56645/jmde.v6i14.284
51. Foerster M, Röösli M. A latent class analysis on adolescents media use and associations with health related quality of life. *Comput Human Behav*. 2017;71:266–274. doi:10.1016/j.chb.2017.02.015
52. Rahme C, Akel M, Obeid S, Hallit S. Cyberchondria severity and quality of life among Lebanese adults: the mediating role of fear of COVID-19, depression, anxiety, stress and obsessive–compulsive behavior—a structural equation model approach. *BMC Psychol*. 2021;9(1):169. doi:10.1186/s40359-021-00674-8
53. Golz C, Peter KA, Zwakhalen SMG, Hahn S. Technostress among health professionals – a multilevel model and group comparisons between settings and professions. *Inf Heal Soc Care*. 2021;46(2):137–149. doi:10.1080/17538157.2021.1872579
54. Hsiao KL, Shu Y, Huang TC. Exploring the effect of compulsive social app usage on technostress and academic performance: perspectives from personality traits. *Telemat Inf*. 2017;34(2):679–690. doi:10.1016/j.tele.2016.11.001
55. Notredame CE, Morgiève M, Morel F, Berrouiguet S, Azé J, Vaiva G. Distress, suicidality, and affective disorders at the time of social networks. *Curr Psychiatry Rep*. 2019;21(10):98. doi:10.1007/s11920-019-1087-z
56. Franqueiro AR, Yoon J, Crago MA, Curiel M, Wilson JM. The interconnection between social support and emotional distress among individuals with chronic pain: a narrative review. *Psychol Res Behav Manag*. 2023;16:4389–4399. doi:10.2147/PRBM.S410606
57. Guo J, Huang N, Fu M, et al. Social support as a mediator between internet addiction and quality of life among Chinese high school students. *Child Youth Serv Rev*. 2021;129:106181. doi:10.1016/j.childyouth.2021.106181
58. Valkenburg PM, Peter J. Online communication among adolescents: an integrated model of its attraction, opportunities, and risks. *J Adolesc Heal*. 2011;48(2):121–127. doi:10.1016/j.jadohealth.2010.08.020
59. Alheneidi H, Smith A. Effects of the internet use on wellbeing and academic attainment of students starting university. *Int J Humanit Soc Sci Educ*. 2020;7(5):20–34. doi:10.20431/2349-0381.0705003
60. Edwards JR, Lambert LS. Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychol Methods*. 2007;12(1):1–22. doi:10.1037/1082-989X.12.1.1
61. Mehmood K, Kiani A, Rashid MD. Is data the key to sustainability? The roles of big data analytics, green innovation, and organizational identity in gaining green competitive advantage. *Technol Anal Strateg Manag*. 2023;1–15. doi:10.1080/09537325.2023.2293867
62. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J Appl Psychol*. 2003;88(5):879–903. doi:10.1037/0021-9010.88.5.879
63. Mehmood K, Kautish P, Mangla SK, Ali A, Kazancoglu Y. Navigating a net-zero economy future: antecedents and consequences of net-zero economy-based green innovation. *Bus Strateg Environ*. 2024;1–23. doi:10.1002/bse.3685
64. Nunnally JC. *Psychometric Theory*. McGraw-Hill; 1978.
65. Mehmood K, Jabeen F, Iftikhar Y, et al. Elucidating the effects of organisational practices on innovative work behavior in UAE public sector organisations: the mediating role of employees' wellbeing. *Appl Psychol Heal Well Being*. 2022:1–19. doi:10.1111/aphw.12343
66. Alkatheeri HB, Jabeen F, Mehmood K, Santoro G. Elucidating the effect of information technology capabilities on organizational performance in UAE: a three-wave moderated-mediation model. *Int J Emerg Mark*. 2023;18(10):3913–3934. doi:10.1108/IJOEM-08-2021-1250
67. Albloushi B, Alharmoodi A, Jabeen F, Mehmood K, Farouk S. Total quality management practices and corporate sustainable development in manufacturing companies: the mediating role of green innovation. *Manag Res Rev*. 2023;46(1):20–45. doi:10.1108/MRR-03-2021-0194
68. Mehmood K, Iftikhar Y, Khan AN, Kwan HK. The nexus between high-involvement work practices and employees' proactive behavior in public service organizations: a time-lagged moderated-mediation model. *Psychol Res Behav Manag*. 2023;16:1571–1586. doi:10.2147/PRBM.S399292
69. Mehmood K, Iftikhar Y, Suhail A, Zia A. How high-involvement work practices, public service motivation, and employees' commitment influence employees' proactive work behavior: evidence from China. *Asian Bus Manag*. 2024;23(1):55–81. doi:10.1057/s41291-023-00260-3
70. Mehmood K, Jabeen F, Hui Z, et al. Socially responsible plastic consumption behavior: a multi-wave study of UAE. *Acad Manag Proc*. 2022;2022(1). doi:10.5465/AMBPP.2022.14620abstract
71. Mehmood K, Jabeen F, Iyanna S, Zhang H, Piccardi P, Nehra NS. Exploring drivers of behavioral willingness to reduce plastic consumption and socially responsible consumption behavior: a stimulus–organism–behavior–consequence paradigm based environmental management perspective. *Corp Soc Responsib Environ Manag*. 2024;1–21. doi:10.1002/csr.2731
72. Khan AN, Jabeen F, Mehmood K, Ali Soomro M, Bresciani S. Paving the way for technological innovation through adoption of artificial intelligence in conservative industries. *J Bus Res*. 2023;165:114019. doi:10.1016/j.jbusres.2023.114019
73. Mehmood K, Jabeen F, Rashid M, Alshibani SM, Lanteri A, Santoro G. Unraveling the transformation: the three-wave time-lagged study on big data analytics, green innovation and their impact on economic and environmental performance in manufacturing SMEs. *Eur J Innov Manag*. 2024. doi:10.1108/EJIM-10-2023-0903
74. Brislin RW. Back-translation for cross-cultural research. *J Cross Cult Psychol*. 1970;1(3):185–216. doi:10.1177/135910457000100301
75. Khan AN, Mehmood K, Le J, Khan NA. Visionary leadership and leaders' burnout: a weekly diary analysis. *Asia Pacific J Manag*. 2023. doi:10.1007/s10490-023-09889-2

76. Mehmood K, Jabeen F, Al Hammadi KIS, Al Hammadi A, Iftikhar Y, AlNahyan MT. Disentangling employees' passion and work-related outcomes through the lens of cross-cultural examination: a two-wave empirical study. *Int J Manpow*. 2023;44(1):37–57. doi:10.1108/IJM-11-2020-0532
77. Kim J, Schmöcker JD, Nakamura T, Uno N, Iwamoto T. Integrated impacts of public transport travel and travel satisfaction on quality of life of older people. *Transp Res Part a Policy Pract*. 2020;138:15–27. doi:10.1016/j.tra.2020.04.019
78. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. *J Pers Assess*. 1988;52(1):30–41. doi:10.1207/s15327752jpa5201_2
79. Osman A, Lamis DA, Freedenthal S, Gutierrez PM, McNaughton-Cassill M. The multidimensional scale of perceived social support: analyses of internal reliability, measurement invariance, and correlates across gender. *J Pers Assess*. 2014;96(1):103–112. doi:10.1080/00223891.2013.838170
80. Elphinston RA, Noller P. Time to face it! Facebook intrusion and the implications for romantic jealousy and relationship satisfaction. *Cyberpsychol Behav Soc Net*. 2011;14(11):631–635. doi:10.1089/cyber.2010.0318
81. Wang P, Wang X, Wu Y, et al. Social networking sites addiction and adolescent depression: a moderated mediation model of rumination and self-esteem. *Pers Individ Dif*. 2018;127:162–167. doi:10.1016/j.paid.2018.02.008
82. Luksyte A, Unsworth KL, Avery DR. Innovative work behavior and sex-based stereotypes: examining sex differences in perceptions and evaluations of innovative work behavior. *J Organ Behav*. 2018;39(3):292–305. doi:10.1002/job.2219
83. Schnell T. The Sources of Meaning and Meaning in Life Questionnaire (SoMe): relations to demographics and well-being. *J Posit Psychol*. 2009;4(6):483–499. doi:10.1080/17439760903271074
84. Muthén LK, Muthén BO. *MPlus: Statistical Analysis with Latent Variables–User's Guide*. Muthén et Muthén; 2012.
85. Al Zaidi SM, Iyanna S, Jabeen F, Mehmood K. Understanding employees' voluntary pro-environmental behavior in public organizations – an integrative theory approach. *Soc Responsib J*. 2023;19(8):1466–1489. doi:10.1108/SRJ-04-2022-0176
86. Ali A, Wang H, Gong M, Mehmood K. Conservation of resources theory perspective of social media ostracism influence on lurking intentions. *Behav Inf Technol*. 2024;43(1):212–229. doi:10.1080/0144929X.2022.2159873
87. Mehmood K, Jabeen F, Rehman H, Iftikhar Y, Khan NA. Understanding the boosters of employees' voluntary pro-environmental behavior: a time-lagged investigation. *Environ Dev Sustain*. 2023. doi:10.1007/s10668-023-03121-3
88. Lambert DM, Harrington TC. Measuring nonresponse bias in customer service mail surveys. *J Bus Logist*. 1990;11(2):1–25.
89. Yu X, Mehmood K, Paulsen N, Ma Z, Kwan HK. Why safety knowledge cannot be transferred directly to expected safety outcomes in construction workers: the moderating effect of physiological perceived control and mediating effect of safety behavior. *J Constr Eng Manag*. 2021;147(1):04020152. doi:10.1061/(ASCE)CO.1943-7862.0001965
90. Khan AN, Mehmood K, Khan NA. How STEM-based CI and leadership support can turn possibly bad situations into opportunities? *Acad Manag Proc*. 2022;2022(1). doi:10.5465/AMBPP.2022.12293abstract
91. Shah TR, Kautish P, Mehmood K. Influence of robots service quality on customers' acceptance in restaurants. *Asia Pacific J Mark Logist*. 2023;35(12):3117–3137. doi:10.1108/APJML-09-2022-0780
92. Mehmood K, Iftikhar Y, Hui Z, Rehman H, Zhang C, Jabeen F. Managers' perceptions of and behavioral responses to COVID-19 threats: a role of ethical leadership. *Acad Manag Proc*. 2023;2023(1). doi:10.5465/AMPROC.2023.17423abstract
93. Shang Y, Mehmood K, Iftikhar Y, Aziz A, Tao X, Shi L. Energizing intention to visit rural destinations: how social media disposition and social media use boost tourism through information publicity. *Front Psychol*. 2021;12. doi:10.3389/fpsyg.2021.782461
94. Khan AN, Khan NA, Mehmood K. Exploring the relationship between learner proactivity and social capital via online learner interaction: role of perceived peer support. *Behav Inf Technol*. 2023;42(11):1818–1832. doi:10.1080/0144929X.2022.2099974
95. Parkhe A. "Messy" research, methodological predispositions, and theory development in international joint ventures. *Acad Manag Rev*. 1993;18(2):227–268. doi:10.5465/amr.1993.3997515
96. Mehrajunnisa M, Jabeen F, Faisal MN, Mehmood K. Prioritizing Green HRM practices from policymaker's perspective. *Int J Organ Anal*. 2022;30(3):652–678. doi:10.1108/IJOA-12-2019-1976
97. Mehmood K, Jabeen F, Iftikhar Y, Acevedo-Duque Á. How employees' perceptions of CSR attenuates workplace gossip: a mediated-moderation approach. *Acad Manag Proce*. 2021;2021(1):13566. doi:10.5465/AMBPP.2021.13566abstract
98. Ullah F, Wu Y, Mehmood K, et al. Impact of spectators' perceptions of corporate social responsibility on regional attachment in sports: three-wave indirect effects of spectators' pride and team identification. *Sustainability*. 2021;13(2):597. doi:10.3390/su13020597
99. Shang Y, Rehman H, Mehmood K, et al. The nexuses between social media marketing activities and consumers' engagement behaviour: a two-wave time-lagged study. *Front Psychol*. 2022. doi:10.3389/fpsyg.2022.811282
100. Mehmood K, Zia A, Alkatheeri HB, Jabeen F, Zhang H. Resource-based view theory perspective of information technology capabilities on organizational performance in hospitality firms: a time-lagged investigation. *J Hosp Tour Technol*. 2023. doi:10.1108/JHTT-05-2021-0149
101. Mehmood K, Alkatheeri BH, Jabeen F, Iftikhar Y. The impact of IT capabilities on organizational performance: a mediated moderation approach. *Acad Manag Proce*. 2021;2021(1):13737. doi:10.5465/ambpp.2021.13737abstract
102. Begum S, Xia E, Mehmood K, Iftikhar Y, Li Y. The impact of CEOs' transformational leadership on sustainable organizational innovation in SMEs: a three-wave mediating role of organizational learning and psychological empowerment. *Sustainability*. 2020;12(20):8620. doi:10.3390/su12208620
103. Hair J, Black W, Babin B. *Multivariate Data Analysis*. 7th ed. NY Pearson; 2010.
104. Li Y, Ashkanasy NM, Mehmood K. The experience of anger and sadness in response to hurtful behavior: effects of gender-pairing and national culture. *Asia Pacific J Manag*. 2017;34(2):423–441. doi:10.1007/s10490-016-9493-9
105. Mehmood K, Li Y, Jabeen F, Khan AN, Chen S, Khalid GK. Influence of female managers' emotional display on frontline employees' job satisfaction: a cross-level investigation in an emerging economy. *Int J Bank Mark*. 2020;38(7):1491–1509. doi:10.1108/IJBM-03-2020-0152
106. Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav Res Methods Instruments Comput*. 2004;36(4):717–731. doi:10.3758/BF03206553
107. Hayes AF. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. 2nd ed. Guilford Press; 2018.
108. Abdullah HB, Bajwa RS, Jaafar WMW, Samah AA. Assessing the relationship between internet usage and technostress: a moderated mediation model. *Nurture*. 2023;17(1):1–9. doi:10.55951/nurture.v17i1.137
109. Starcevic V, Berle D, Arnáez S. Recent Insights Into Cyberchondria. *Curr Psychiatry Rep*. 2020;22(11):56. doi:10.1007/s11920-020-01179-8
110. Javaid M, Haleem A, Singh RP, Rab S, Ul Haq MI, Raina A. Internet of Things in the global healthcare sector: significance, applications, and barriers. *Int J Intell Networks*. 2022;3:165–175. doi:10.1016/j.ijin.2022.10.002

111. Zheng H, Tandoc EC. Calling Dr. Internet: analyzing news coverage of cyberchondria. *J Pract*. 2022;16(5):1001–1017. doi:10.1080/17512786.2020.1824586
112. Wang Y, Zhao Y, Liu L, et al. The current situation of internet addiction and its impact on sleep quality and self-injury behavior in Chinese Medical Students. *Psychiatry Invest*. 2020;17(3):237–242. doi:10.30773/pi.2019.0131
113. Golovanova T, Vlasova E. Influence of internet dependency on youth self-actualization. *Social Hum Dev Int Sci J*. 2019;1(1):5–12. doi:10.37096/SHDISJ-19-1.1-0001
114. Jiang Q, Huang X, Tao R. Examining factors influencing internet addiction and adolescent risk behaviors among excessive internet users. *Health Commun*. 2018;33(12):1434–1444. doi:10.1080/10410236.2017.1358241
115. Huang Y, Zhong XN, Li QY, et al. Health-related quality of life of the rural-China left-behind children or adolescents and influential factors: a cross-sectional study. *Health Qual Life Outcomes*. 2015;13(1):29. doi:10.1186/s12955-015-0220-x
116. Karimy M, Parvizi F, Rouhani MR, Griffiths MD, Armoon B, Fattah Moghaddam L. The association between internet addiction, sleep quality, and health-related quality of life among Iranian medical students. *J Addict Dis*. 2020;38(3):317–325. doi:10.1080/10550887.2020.1762826
117. Wartberg L, Kriston L, Kammerl R. Associations of social support, friends only known through the internet, and health-related quality of life with internet gaming disorder in adolescence. *Cyberpsychol Behav Soc Net*. 2017;20(7):436–441. doi:10.1089/cyber.2016.0535
118. Alsubaie MM, Stain HJ, Webster LAD, Wadman R. The role of sources of social support on depression and quality of life for university students. *Int J Adolesc Youth*. 2019;24(4):484–496. doi:10.1080/02673843.2019.1568887
119. Kalantari A, Valizadeh-Haghi S, Shahbodaghi A, Zayeri F. Opportunities and challenges of consumer health information on the internet: is cyberchondria an emerging challenge? *Libr Philos Pract*. 2021;4990:1–16.
120. Califf CB, Sarker S, Sarker S. The bright and dark sides of technostress: a mixed-methods study involving healthcare IT. *MIS Q*. 2020;44(2):809–856. doi:10.25300/MISQ/2020/14818