Positive reframing as a mediator between gratitude and technostress amongst Indian students during the COVID-19 pandemic

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Abstract

Purpose – The aim of the current study was to examine the previously unexplored relationship between positive reframing as a mediator between gratitude and technostress in Indian students. By examining this relationship, the authors aim to expand the theoretical domain of gratitude research by examining its potential influence on technology-induced stress.

Design/methodology/approach – A cross-sectional survey was used to collect and analyze data from 552 Indian college students who participated in graduate and postgraduate programs across various educational institutions in India. Regression and mediation analyses were performed with both IBM SPSS 25 and AMOS.

Findings – This study's data suggest that positive reframing plays an important mediating role between gratitude and technostress. Gratitude also encourages positive reframing, which reduced technostress among the students. Taken together, our data showed that gratitude induces positive reframing, which in turn reduces techno-stress among Indian students in the current study.

Research limitations/implications – The sample size in this study is relatively small in relation to the student population in India. The current study relied primarily on quantitative data and analysis and further research could use a mixed-method approach to better understand the underlying mechanisms between positive reframing, gratitude and technostress. The results are derived under an extreme coronavirus disease 2019 (COVID-19) pandemic situation; therefore, the results cannot be generalized to normal times.

Practical implications – The paper includes implications for teachers, academic leaders, parents and civil society.

Originality/value – Overall, the relationship between positive reframing, gratitude and technostress has not been thoroughly explored. To the best of the authors' understanding, this is the first study to examine the influence of gratitude on technology-induced stress and the role of reframing.

Keywords Gratitude, Positive reframing, Students, Technostress, Mediation, Coping, COVID-19

Paper type Research paper

Introduction

The novel coronavirus disease 2019 (COVID-19) pandemic has impacted the world economically, financially, psychologically and socially. Country-by-country statistics on COVID-19 infections are largely disappointing for South Asian countries, particularly India. After the United States (USA), India is the second most affected country with a total of 33,174,954 cases of COVID-19 as at September 2021. Despite numerous government measures such as lockdowns, quarantine, social distancing, vaccination campaigns and rapid antigen

tests, it has claimed a significant loss of life. It has challenged the ability of humankind to effectively address a public health crisis of global concern. On an individual level, the pandemic has created psychological pressure among people infected with COVID-19 and healthy people (Duan and Zhu, 2020). For example, people have reported high levels of stress, anxiety, depression and loneliness (Erren *et al.*, 2020; Zhou *et al.*, 2020). In addition, movement restrictions have reduced physical activity, disrupted sleep patterns, and increased high blood pressure, mortality and obesity (Majumdar *et al.*, 2020).

COVID-19 has also impacted the education system and students academically, financially, physically and psychologically (Kecojevic *et al.*, 2020). Psychologically, the shift has led to more stress, less interaction and more severe depressive symptoms in students (Crawford *et al.*, 2020; Klussman *et al.*, 2020; Mailizar *et al.*, 2021). Academically and physically, the move from the traditional physical classroom to online teaching and learning has resulted in a significant increase in acceptance and enrollment of online digital courses and distance learning as a viable option to fill the classroom void (Kaur *et al.*, 2020). India's digital online services include Diksha, e-Pathshala, SWAYAM, MOOCs and e-PG Pathshala (Jena, 2020). These services have emerged as a way for a developing country like India to move from a traditional education system to a digital India, increasing digital literacy and adoption of digital technologies.

Nonetheless, the shift towards the adoption of online learning and the increased reliance on various electronic and digital devices has resulted in students being constantly online. This longer screen time leads to decreased cognitive and academic performance (Majumdar *et al.*, 2020), discomfort, tension, digital burnout (Bozkurt and Sharma, 2020), obesity, high blood pressure, type 2 diabetes, depression, sleep disorders (Sultana *et al.*, 2021) and technology-induced stress, i.e. technostress. Recent studies have also reported the adverse effects of stress on the learning experience and mental health of students (Kecojevic *et al.*, 2020). With this abrupt change in the teaching and learning landscape, students are regularly exposed to an increased risk of technology stress (Sahu, 2020). Prior to the pandemic, students found technology beneficial for improving their academic performance and completing study-related tasks. However, technostress and fatigue created by excessive and invasive technology and information and communications technology (ICT) enabled devices have weakened students' mental resources to effectively complete learning activities (Aharony and Zion, 2018; Wang *et al.*, 2020). Overall, the quick transition to online learning was a challenge for most students.

The consequences of increased technostress and its impact on student performance need to be addressed. In general, students face many difficulties in their daily life, especially in the current pandemic; therefore, it is crucial to understand adaptive coping mechanisms that can be used to address the challenges of the pandemic. Studies on the assessment of stress in students during COVID-19 are primarily limited to the documenting and analysis of psychological and physiological sources and symptoms of technostress (Penado Abilleira *et al.*, 2021; Spagnoli *et al.*, 2020). In the current study, however, we examine the intervention of positive reframing along with expressing gratitude to alleviate the negative effects of technostress. The ability to reframe positively during the pandemic has been linked to less stress in adults (Shanahan *et al.*, 2020). Likewise, as a positive emotion, gratitude is incompatible with negative emotions (Garland *et al.*, 2010) and can help to buffer negative emotions such as fear and stress. Overall, the relationship between positive reframing, gratitude and technostress has not been thoroughly explored. Positive reframing and gratitude are associated with wellbeing and can act as useful resources against stressors such as technostress. In the present study, using the broaden-and-build theory (Fredrickson, 2004) as a theoretical premise, we examine positive reframing as a mediator between gratitude and technostress.

Theoretical framework

Gratitude

Gratitude has been conceptualized in a number of ways. It is defined as "an emotion, a virtue, a moral sentiment, a motive, a coping response, a skill, and an attitude" (Emmons and Crumpler, 2000, p. 56). More specifically, gratitude is evoked as an emotion when receiving costly, unexpected and deliberate benefits from others (Forster *et al.*, 2017). As an affective trait of the individual, gratitude is defined as a "generalized tendency to recognize and respond with grateful emotions to the roles of other people's benevolence in the positive experiences and outcomes that one obtains" (McCullough *et al.*, 2002, p. 112). As a virtue, gratitude is a tendency to acknowledge and respond to the benevolent behavior of others. As a skill, it is the ability to see positive things, even in a challenging situation (Allen, 2018). Gratitude has also been conceptualized through two paradigms: one worldly and one transcendent (Emmons and Stern, 2013). A worldly paradigm suggests gratuitous feelings arise out of beneficial interpersonal exchanges and is based on "benefit triggered" feelings. A transcendent paradigm suggests that a grateful person realizes that others are not the source of gifts; instead, they come through a deep connection with nature. Steindl-Rast (2004) portrays these two paradigms as two extreme ends of a continuum. At one end, worldly gratitude is expressed as a feeling of gratitude when receiving a gift from others. At the other end of the continuum, a transcendent paradigm understands that gratitude arises from an experience of cosmic oneness when one receives an undeserved gift or experiences a deep connection with nature. Steindl-Rast (2004) describes the first experience as personal and the second as transpersonal.

Based on these conceptualizations, previous researchers have described several ways that gratitude affects an individual's wellbeing. Grateful people report better physical health, and they are more likely to engage in physical activity (Hill *et al.*, 2013). The experience of gratitude leads to better sleep, less fatigue and less cellular inflammation (Mills *et al.*, 2015; Wood *et al.*, 2009). Individuals who show high levels of gratitude show more resilience and vitality (Garg and Sarkar, 2020). Gratitude is also positively associated with happiness (Mahipalan and Sheena, 2019; Watkins *et al.*, 2003), positive affect (Sun and Kong, 2013), less anxiety and depression (Bono *et al.*, 2020), being self-efficient (Sun *et al.*, 2020), trust and social intelligence (Garg *et al.*, 2020).

Positive reframing

Positive reframing refers to "construing a stressful transaction in positive terms" (Carver, 1997, p. 269). Positive reframing is a process of positively perceiving something that was previously viewed as unfavorable. For example, an employee loses their job but positively reframes the situation and then starts up their own small-scale business. Recent studies have shown that the use of positive reframing as a coping strategy in students has positive effects on satisfaction even after failure (Stoeber and Janssen, 2011). Students typically use active coping, planning and positive reframing as the most common coping strategies to buffer between different stressors that affect them (Abraham *et al.*, 2019). A recent study by Prasath *et al.* (2021) found the influence of positive reframing on predicting the wellbeing of individuals. They stated that such coping behaviors would be helpful in countering the negative wellbeing effects of the pandemic. Another study also characterized the role of positive reframing in improving physical health, managing adversity effectively and creating a more stable emotional response (Salman *et al.*, 2020).

Technostress

Technostress is understood as "a modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner" (Brod, 1982, p. 16). It is a negative effect

that leads to disturbances in human thoughts, attitudes, behavior and psychology due to the direct or indirect consequences of exposure to technology (Brillhart, 2004). Technostress arises from an individual's inability to adapt to technology (Tarafdar *et al.*, 2007). Like other stressors, technostress induces tension, anxiety and depression (Galvin *et al.*, In press; Giorgi *et al.*, 2020). Tarafdar *et al.* (2007) discussed five components of technostress: techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty. Techno-overload occurs when the use of ICT exceeds the optimum level and leads to negative results (Karr-Wisniewski and Lu, 2010). Techno-invasion refers to the impact of ICT on work and personal life and requires one to be easily accessible at all times. It leads to stress because the distinction between professional and personal life becomes blurred. Techno-complexity takes place when users do not have confidence working with computers. The users are forced to spend time and effort to learn the computer skills and required ICT tools. Techno-insecurity creates job loss fear among employees, believing that new technology could lead to automation or it could be replaced by people with better skills and abilities. Techno-uncertainty deals with the rapidly changing technical changes that make users uncertain about their work or job. Frequent changes in technology require users to keep upgrading and learning new ICT.

Gratitude and technostress

The proposed relationship between gratitude and technostress is theoretically premised in Fredrickson's (2004) broaden-and-build theory of positive emotion. The broaden-and-build theory holds that gratitude broadens the array of thoughts and actions of an individual. It encourages one to play and push limits. A grateful person indulges in creativity and innovation in dealing with others. This expansion of one's own thought-action repertoire builds psychological and social resources for a person. These resources can be relied on even in the most difficult phases of life (Fredrickson, 2004). Psychological resources include resilience, vitality, self-efficacy, hope, positive attitude and optimism. Social resources include social bonds, friendships, trustworthy and reliable friends, and colleagues. The broaden-and-build theory suggests different ways in which gratitude can reduce the technostress among students. First, gratitude provides technostressed students with psychological resources to help them cope with technology-induced stress. Stress is negatively associated with vitality (Satici, 2020), resilience (Petzold *et al.*, 2020) and self-efficacy (Freire *et al.*, 2020; Şahin and Çetin, 2017). Second, students with high levels of gratitude are more likely to have more trustworthy friends, teachers, relatives and family members. Such students can rely on these social resources to reduce technostress. For example, a student stressed out by the complexities of technologies can add new knowledge and skills with the help of seniors and friends.

Likewise, a student full of gratitude for the teachers will form a strong bond with them. In the case of techno-overload, such students can seek expert advice from their professionally trained teachers. Third, positive emotions like gratitude are incompatible with negative emotions (Garland *et al.*, 2010). They cancel out negative emotions like stress, anxiety and depression. Fourth, gratitude breeds innovation and creativity. In this way, a student who shows a high level of gratitude can find new ways to deal with technostressors. For example, students struggling to balance online classes, tests and household tasks may evenly distribute classes throughout the week with the help of recorded lectures and online tutorials. Thus, it is proposed that, like stress, gratitude may also counter technostress among students, and accordingly, the following three hypotheses are formulated:

H1. Gratitude is negatively associated with techno-overload.

H2. Gratitude is negatively associated with techno-invasion.

H3. Gratitude is negatively associated with techno-complexity.

The mediating effect of positive reframing

Several studies have stated that gratitude promotes positive reframing in at least three possible ways (Fredrickson *et al.*, 2000; Garg *et al.*, 2020). First, grateful people put their negative experiences on a more positive note. Second, they experience more positive emotions. Third, they tend to ignore negative emotions. In all three cases, gratitude reduces the frequency, intensity and density of negative emotions such as technostress.

A person who shows high levels of gratitude focuses on abundance and the fullness of life (Garg and Sarkar, 2020; Mahipalan and Sheena, 2019). Gratitude heralds a sense of abundance and negates a sense of deprivation. A grateful person could derive positivity even in the most testing times. Therefore, students who are overloaded with online courses during the COVID-19 pandemic may see a silver lining that they are some of the lucky ones who have the luxury of learning even during the pandemic. Additionally, that millions of other students were unable to take online courses for various reasons such as network connectivity and affordability. They may also realize that technostress will be the new normal of future professional organizations. Working from home will no doubt lead to techno-invasion and techno-complexity. Therefore, grateful students can view the current situation as training for their future professional life. They may also learn some techniques like meditation and breathing exercises to deal with technostress. Such focus on positivities is poised to lower the technostress level of students.

Students staying home due to COVID-19 can reframe the inevitable situation as an opportunity to hone and develop new skills or to try new things that they longed for but were unable to achieve due to work pressures or lack of time. Perceiving the positive aspects in such unpleasant and unfortunate events benefits the individual to discern a new path of exploration. Grateful people also have a strong sense of appreciation. A person who shows high levels of gratitude recognizes and appreciates most life events such as pleasant weather, their favorite meal and meeting an old friend (Lee *et al.*, 2019; Watkins *et al.*, 2003). They also appreciate others for their valuable contributions in their life. Such gratitude-induced positive reframing is poised to reduce technostress among students. Pirkkalainen *et al.* (2019) empirically validated that positive reframing shifts attention away from stressful situations, and users emphasize the positive, which reduces the negative consequences of technostress and enables higher productivity. Such gratitude-induced proactive coping, i.e. positive reframing, has contributed to foreseen challenges that lead to better outcomes in stressful situations (Vieselmeyer *et al.*, 2017). Positive reframing therefore leaves room for pause, reflection and reinterpretation by the individual in order to perceive technostress as a challenge rather than a threat. The current generation perceives ICT demanding situations as a positive challenge or as an opportunity for personal growth (Ioannou and Papazafeiropoulou, 2017; Reuman *et al.*, 2012).

Based on the previous discussion, the following three hypotheses are proposed which examine the mediating effect of positive reframing of the relationship between gratitude and technostress.

H4. Positive reframing mediates the relationship between gratitude and techno-overload.

H5. Positive reframing mediates the relationship between gratitude and techno-invasion.

H6. Positive reframing mediates the relationship between gratitude and techno-complexity.

In summary, the main purpose of our study is to examine the mediating effects of positive reframing on gratitude and technostress.

Research methodology

Sample and data collection

Using a cross-sectional survey strategy, we collected data from 552 Indian college students participating in graduate and postgraduate courses at various educational institutions in the Delhi-National Capital Region (NCR), India. The study is limited to the Delhi-NCR region for two reasons. First, almost all colleges, especially in this region, have quickly switched to online teaching and evaluation. Second, the area has good network connectivity and Internet coverage. Convenience sampling with some elements of snowball sampling was used in this study. The convenience sampling method was considered suitable and efficient for this study because of outside restrictions imposed and limited opportunity to physically interact with participants in Delhi-NCR due to the COVID-19 pandemic. Therefore, readily available students were contacted online to enable quick and efficient participation in this study. Online questionnaires were sent to the targeted sample of 600 college students. Of these 600 students, 560 returned the questionnaire, which corresponds to a response rate of 93%. In the data analysis, eight questionnaires were discarded due to incompleteness. Thus, a total of 552 participant questionnaires were processed.

The demographic description of the sample is shown in Table 1. The sample includes 51.8% females, 47.8% males and 0.4% third gender. The majority of the respondents were in the 17–20 age group (68.5%). Most of the respondents were pursuing a bachelors' degree (488 undergraduate students, i.e. 88.5%) and the remainder are either postgraduate (9.7%) or in 12th class (1.8%). 47.3% of students in the study reported that their ICT device usage time was less than 5 h, followed by 31.9% of students who used ICT devices for 5–6 h, and 20.8% of students use digital devices for more than 6 h.

Measures

Gratitude. We measured gratitude with 16 items from the gratitude, resentment and appreciation test (GRAT)(Watkins *et al.*, 2003). The GRAT consists of a 16-item measure of gratitude as a nine-point Likert scale (1 = *strongly disagree* to 9 = *strongly agree*). This measure assesses three different facets of grateful disposition: lack of sense of deprivation (LOSD), simple appreciation (SA) and appreciation for others (AO). Sample items include: "*Life has been good to me*", "*I think that it's important to pause often to count my blessings*" and "*I feel deeply appreciative for the things others have done for me in my life*".

Technostress. We measured technostress with 12 items using an adapted version of the technostress questionnaire developed by Westermann (2017). The items were rated on a five-point Likert scale (0 = *strongly disagree* to 4 = *strongly agree*). Since the present study comprises a sample of students, only three dimensions of technostress, i.e. techno-overload,

Variable	Category	Frequency	Percent	Cumulative %
Gender	Male	263	47.8	47.8
	Female	286	51.8	99.6
	Third gender	3	0.4	100.0
Age groups	17–20 years	379	68.5	68.5
	21–25 years	173	31.5	100.0
Courses	10 + 2	10	1.8	1.8
	Undergraduate	488	88.5	90.3
	Postgraduate	54	9.7	100.0
ICT devices usage time (per day)	Less than 5 h	261	47.3	47.3
	5–6 h	176	31.9	79.2
	More than 6 h	115	20.8	100.0
Source(s): Primary data				

Table 1.
Demographic description of the sample (*N* = 552)

techno-invasion and techno-complexity, were assessed in this study. The other two dimensions i.e. techno-insecurity and techno-uncertainty, were discarded because these techno-savvy students were well-equipped with information technology and its applications and are highly unlikely to experience techno-insecurity and techno-uncertainty. Moreover, post-millennial students have confidence in the use of technology, and are ready to learn new uses of technology (Upadhyaya and Vrinda, 2020). The sample items include "*I am forced to change my habits to adapt to new technologies,*" "*I have to be always available due to this technology*" and "*I need a long time to understand and use new technologies.*"

Positive reframing. We measured positive reframing with four items using the COPE Inventory developed by Carver *et al.* (1989). The items were rated on a four-point Likert scale (1 = *I usually do not do this at all* to 4 = *I usually do this a lot*) and were used to measure positive reframing. A sample item included "*I try to see it in a different light, to make it seem more positive.*"

Reliability, validity and common method bias
Reliability is assessed using Cronbach's alpha and composite reliability estimates (see Table 2). Cronbach's alpha values for gratitude, positive reframing, techno-invasion, techno-overload and techno-complexity are 0.754, 0.741, 0.716, 0.801 and 0.850, respectively. The composite reliability estimates for gratitude, positive reframing, techno-invasion, techno-overload and techno-complexity are 0.765, 0.743, 0.720, 0.789 and 0.862.

Both reliability estimates are greater than 0.70, which shows a satisfactory reliability (Fornell and Larcker, 1981). Convergent validity and discriminant validity are assessed using average variance extracted (AVE) values. The AVE estimates of all constructs are greater than 0.5 (see Table 2). These values explain the satisfactory convergent validity of the study variables. In addition, the square roots of the AVE values (diagonal cells in Table 3) are greater than the corresponding correlation coefficient between the

Variables	Mean	SD	CA	CR	AVE
Gratitude	5.645	0.708	0.754	0.765	0.569
Positive reframing	3.197	0.197	0.741	0.743	0.522
Techno-invasion	2.481	0.118	0.716	0.720	0.568
Techno-overload	2.125	0.083	0.801	0.789	0.586
Techno-complexity	2.113	0.154	0.850	0.862	0.557
Overall technostress	2.20	0.20	0.903	0.847	0.649

Note(s): SD-Standard Deviation, CA-Cronbach's alpha, CR-Composite reliability, AVE-Average Variance Extracted
Source(s): Primary data

Table 2. Descriptive statistics, reliability and validity estimates

Variables	1	2	3	4	5	6
Gratitude	0.754					
Positive reframing	0.526*	0.722				
Techno-invasion	−0.508	−0.372*	0.753			
Techno-overload	−0.498	−0.397*	0.678*	0.765		
Techno-complexity	−0.499*	−0.323*	0.596*	0.664*	0.746	
Overall technostress	−0.698*	−0.404*	0.723*	0.763*	0.731*	0.805

Note(s): * Sig. at 0.05, Highlighted values in the diagonal are square roots of the AVE and demonstrate existence of discriminant validity
Source(s): Primary data

Table 3. Correlation and discriminant validity

constructs, which demonstrates the existence of discriminant validity (Fornell and Larcker, 1981). The common method bias could seriously affect the results of the study; therefore, both procedural and quantitative methods should be used to deal with this (Podsakoff *et al.*, 2011). Two procedural remedies and a quantitative technique are used in this study. As per the suggestions of MacKenzie and Podsakoff (2012), measures with different scales are used e.g. gratitude–nine-point scale, technostress–five-point scale and positive reframing–four-point scale. Harman's one-factor method is also used to assess common method variance. All items in the study are subjected to a factor analysis. One single factor does not account for the majority of variation, negating the existence of common method bias.

Results

The data were analyzed using IBM SPSS 25 and AMOS. Table 2 shows the reliability, validity and descriptive statistics for each of the concerned variables used in this study. Reliability was rated using Cronbach's alpha, and all of the variables reported α value more than 0.70, which indicates a satisfactory, reliable scale (Schutte *et al.*, 2000). Few researchers have argued using composite reliability in place of Cronbach's alpha for a more robust understanding of reliability. Therefore, composite reliability (CR) values for all constructs are also greater than 0.70, suggesting good reliability (Hair *et al.*, 2010). For validity assessment, average variance extracted (AVE) values are reported to be greater than or equals to 0.50, suggesting an adequate level of convergent validity (Fornell and Larcker, 1981).

Table 3 highlights the correlation coefficients among variables of the study. There is a positive and significant correlation of 0.526 between gratitude and positive reframing. The correlation coefficient between gratitude and overall technostress is -0.698 and suggests that gratitude can reduce student technostress. A negative correlation ($r = -0.404$) between positive reframing and technostress is also reported.

The associative relationship between the predictor and outcome variables was established through regression analysis. Regression results are presented in Table 4. The results suggest that a significant variation in the dependent variables (techno-invasion, techno-overload, techno-complexity and overall technostress) could be explained by the independent variable (gratitude). R-square values showed 35.6% variation in techno-overload, 32.1% variation in techno-invasion, 31.7% variation in techno-complexity and 40.2% variation in overall technostress, are explained by gratitude. Our results suggest that gratitude significantly explains, techno-invasion, techno-overload, techno-complexity and overall technostress. The results support the assumption of the first three hypotheses, i.e. H1, H2 and H3.

The mediation results of each technostress component, i.e. techno-invasion, techno-overload and techno-complexity, are reported in Tables 5–7, respectively. The overall impact of gratitude on technostress with positive reframing is reported in Table 8. Table 5 shows

IV	DV	Unstandardized coefficient	Standard error	Standardized coefficient	R-square	Sig.
G	Techno-invasion	−0.263	0.011	−0.271	0.321	0.004*
	Techno-overload	−0.325	0.015	−0.278	0.356	0.013*
	Techno-complexity	−0.157	0.019	−0.299	0.317	0.003*
	Overall technostress	−0.597	0.039	−0.349	0.402	0.014*

Table 4.
Regression results

Note(s): * Sig. at 0.05, G-Gratitude, IV-Independent Variable, DV-Dependent Variable
Source(s): Primary data

Relationships	Standardized	Unstandardized	p-value
Direct effect			
Gratitude → positive reframing	0.325	0.045	0.000*
Gratitude → techno-invasion	−0.220	−0.036	0.000*
Indirect effect			
Gratitude → PR → techno-invasion	−0.111	−0.018	0.001*
Total effect			
Gratitude on techno-invasion	−0.109	−0.017	0.004*
Note(s): * Sig. at 0.05			
Source(s): Primary data			

Table 5.
Results of mediation
analysis (DV–techno-
invasion)

Relationships	Standardized	Unstandardized	p-value
Direct effect			
Gratitude → positive reframing	0.325	0.045	0.000*
Gratitude → techno-overload	−0.218	−0.048	0.001*
Indirect effect			
Gratitude → PR → techno-overload	−0.120	−0.026	0.001*
Total effect			
Gratitude on techno-overload	−0.098	−0.021	0.030*
Note(s): * Sig. at 0.05			
Source(s): Primary data			

Table 6.
Results of mediation
analysis (DV–techno-
overload)

Relationships	Standardized	Unstandardized	p-value
Direct effect			
Gratitude → positive reframing	0.325	0.045	0.000*
Gratitude → techno-complexity	−0.304	−0.87	0.000*
Indirect effect			
Gratitude → PR → techno-complexity	−0.105	−0.030	0.000*
Total effect			
Gratitude on techno-complexity	−0.199	−0.057	0.002*
Note(s): * Sig. at 0.05			
Source(s): Primary data			

Table 7.
Results of mediation
analysis (DV–techno-
complexity)

Relationships	Standardized	Unstandardized	p-value
Direct effect			
Gratitude → positive reframing	0.325	0.045	0.000*
Gratitude → technostress	−0.290	−0.171	0.000*
Indirect effect			
Gratitude → PR → technostress	−0.127	−0.075	0.000*
Total effect			
Gratitude on technostress	−0.163	−0.096	0.013*
Note(s): * Sig. at 0.05			
Source(s): Primary data			

Table 8.
Results of mediation
analysis (DV–
technostress)

that the direct and indirect effects of gratitude on techno-invasion are significant. It is also noted that the effect of gratitude on techno-invasion increases from −0.220 to −0.111 with positive reframing (indirect effect). These results confirm the partial mediation effect of positive reframing and thus suggest the acceptance of H4. Similar results reported in Tables 6 and 7 also conclude the acceptance of H5 and H6. In parallel, Table 8 shows that positive reframing mediates the relationship between gratitude and overall technostress. The results show that gratitude induces positive reframing, which in turn reduces technostress among Indian students in the current study.

Discussion

The aim of the current study was to examine the previously unexplored relationship between positive reframing as a mediator between gratitude and technostress in Indian students. Our results suggest that positive reframing has a mediating effect between gratitude and technostress. In addition, we found a negative relationship between gratitude and three dimensions of technostress (techno-overload, techno-invasion and techno-complexity). Taken together, the results suggest that gratitude induces positive reframing, which in turn reduces technostress among Indian students in the current study. In the current study, students who show high levels of gratitude will positively reframe technology overload and possibly view the situation as an opportunity to learn various technologies, or as training for future roles. Such an optimistic interpretation will surely lessen the effects of the techno-overload stressor. Similarly, grateful students will try to learn different types of work–life balance while facing techno-invasion stressors.

Based on the broaden-and-build theory, previous researchers have reported empirical evidence for a negative relationship between gratitude and stress (Killen and Macaskill, 2015; Lee *et al.*, 2019; Leung and Tong, 2017; Sarkar and Garg, 2020; Vieselmeyer *et al.*, 2017). Likewise, using the same theoretical premise, this study confirms a negative relationship between gratitude and the three dimensions of technostress (techno-overload, techno-invasion and techno-complexity). To the best of the authors' understanding, this is the first study to examine the influence of gratitude on technology-induced stress.

Our results also confirm a positive relationship between gratitude and positive reframing. Grateful people are more likely to discover multiple ways to reinterpret negative events and reinforce the positive meanings behind them than to get bogged down without any endeavor (Frias *et al.*, 2011; Leon *et al.*, 2018). Gratitude benefits the individual indirectly in order to get out of a negative situation and at the same time promotes adaptive and flexible coping with a change of perspective (Lambert *et al.*, 2009, 2012; Sun *et al.*, 2020).

Theoretical implications

First, while the broaden-and-build theory is developed and used primarily in Western settings, it also shows applicability from an Eastern context. Generalizing a theory or phenomenon requires cross-cultural validation and application. Thus, empirical evidence for explaining the broaden-and-build theory among Indian students may encourage other researchers to investigate its usefulness in other non-Western countries. Second, this study is one of the few studies that examines the technostress among Indian students during COVID-19. We point out one of the hidden and indirect negative repercussions of the pandemic. While the whole world is intensely focused on rebuilding its health infrastructure, the present study also suggests some significant changes in education systems. Third, although previous studies have reported a negative association between gratitude and stress, this study extends the understanding of gratitude by concluding a negative association between gratitude and technostress. Finally, this study suggests another way that gratitude affects stress. It reports that gratitude develops positive reframing, which leads to less technostress in the students.

Practical implications
The results of the present study have some practical implications for teachers, academic leaders, parents and civil society. Although the study highlights the issue of technostress in difficult times of COVID-19, students are constantly exposed to technology-induced stress even in normal times too. The exponential growth of electronic devices, social media platforms and mobile apps is putting students under extreme pressure and increasing screen time, especially during the pandemic (Sultana *et al.*, 2021; Wong *et al.*, 2020). Together with lockdowns and restrictions on movement, as well as the sudden switch to online education, other stressors have been added. In addition, it has been suggested that online teaching and learning is the future of education. In summary, we suggest that college and school administrations organize seminars and workshops on how to apply gratitude in everyday life. These workshops could allow students to learn various gratitude interventions and practices, such as "count your blessings," "gratitude letter," "gratitude collages," "meditation," "self-introspection," "balancing blessings and wishes." Frequent interactions by in-house college teachers must follow these periodic exercises (Garg, 2020). The virtue of gratitude is contagion. Therefore, teachers, parents and the management of educational institutions are required to learn and express thankfulness more freely. It is also recommended to organize various short gratitude training programs for educators and parents.

As technostress is here to stay, we suggest integrating the concept of gratitude and its application into the curriculum. The University of Delhi and Delhi government schools have already introduced a "*Happiness course*" for their students. Similarly, Delhi Technological University has offered a course on gratitude for its management students. Other educational institutions could develop appropriate courses. Regulators like the University Grant Commission (UGC) and the All India Council of Technical Education (AICTE) could assist in the process. Similar to research ethics courses that are mandatory for doctoral students, we believe that courses on gratitude and happiness might be made mandatory for graduate or postgraduate students.

Limitations and future research directions
Several limitations of this study need to be acknowledged. First, the sample size in this study is relatively small in relation to the student population in India. In addition, the study is limited to the Delhi-NCR region only. Future research could examine a larger sample size with adequate representation from all over the country. Second, the current study relied primarily on quantitative data and analysis and further research could use a mixed-method approach to better understand the underlying mechanisms between positive reframing, gratitude and technostress. Third, the results are derived under an extreme COVID-19 pandemic situation; therefore, the results cannot be generalized to normal times. Follow-up studies could verify the results after the pandemic ends. Fourth, data on gratitude, positive reframing and technostress were collected from the same source and at the same time. This can lead to common method bias. Although appropriate remedies are used, future researchers may use longitudinal research design or double source data to negate common method bias.

In conclusion, the purpose of the current study was to examine the relationship between positive reframing as a mediator between gratitude and technostress. This study has shown that positive reframing has a mediating effect between gratitude and technostress. Moreover, we found a negative relationship between gratitude and three dimensions of technostress (techno-overload, techno-invasion and techno-complexity). Taken together, our data showed that gratitude induces positive reframing, which in turn reduces technostress among Indian students in the current study.

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