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Teachers' stress experiences during COVID-19-related emergency remote teaching: Results from an exploratory study

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The study provides a portrait of teachers' stress experience in the face of the needed introduction of information systems (IS) during COVID-19-related emergency remote teaching. Researchers contacted the headmasters at several Italian schools, who choose teacher's representatives. The latters shared the online questionnaire among colleagues; the teachers voluntarily decided to participate. The cross-sectional study involved 237 Italian teachers (81.5% female; M_{age}=50.20; SD_{age}=8.87). This survey wanted to detect information systems-related distress and eustress on the job, and technostress creators and inhibitors. Descriptive statistics, correlational analyses, and a multiple regression model using structural equation modeling were run. As according to the model, IS-related distress and eustress on the job were the dependent variables, technostress creators and inhibitors the independent ones, and respondents' gender and age the control ones. Both technostress creators and inhibitors showed significant relationships with IS-related distress and eustress. Technostress creators showed a positive relationship with IS-related distress and a negative one with IS-related eustress; conversely, technostress inhibitors showed an opposite pattern of relationships. Only technostress creators significantly associate to both age and gender in the model, suggesting that older, female teachers tended to experience more technostress creators. Due to the increases in remote work, the awareness of IS-related stress experiences represents a key factor to evaluate work-related risks and prevent stress-related problems. The results from this study suggest that using technologies can represent both a threat to one's well-being, highlighting the need to provide adequate trainings and support, but also a resource for personal enrichment.

KEYWORDS

technostress, emergency remote teaching, COVID-19, pandemic, lockdown, school teachers

Introduction

During COVID-19 pandemic, due to the need to enforce lockdown orders to slow down the contagion trend, people were forced to adjust to remote working practices, which meant they had to work from their house (Rigotti et al., 2020). In Italy – which is the context of reference for the present study –, the nationwide lockdown lasted about 3 months (between March and May 2020). Such stay-at-home orders led people to spend many hours on their PCs and mobile devices (e.g., smartphones, tablets), blurring the boundaries between work and private life (Carvalho et al., 2021). Overall, this brought about increases in the stress related to the introduction of Information Systems (IS) in workers' activities and procedures, as suggested by La Torre et al. (2020).

However, the study from La Torre et al. (2020) did not focus on a specific job category, even though technostress experiences may have shaped differently across workers categories, due to the various extents of training for remote working practices. Specifically, teachers represent a category which may have been strongly exposed to technostress experiences, since they had to face the sudden and unprepared shift to emergency remote teaching (ERT) – that is, "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated" (Hodges et al., 2020). Overall, ERT produced substantial changes in the ways teachers had to deliver their work as well as in their workloads (Bozkurt et al., 2020; Talidong, 2020; Guidetti and Albanesi, 2021; Novara et al., 2021), requiring them to run their job activities in technology-mediated, hence more complex, settings (Guidetti and Albanesi, 2021; Novara et al., 2021). In the face of ERT, teachers felt unprepared in adjusting to the needed changes (Novara et al., 2021), which required them to either have or quickly develop proper technical skills in order to use the required tools and platforms (Bao, 2020; OECD, 2020). Indeed, increases in IS-related stress experiences were a concrete risk.

Building on this, the aim of this study is to further deepen teachers' experience of IS-related stress during the first months of COVID-19 pandemic. It unravels such experiences with specific reference to (a) technostress, that is, "a long-term pathological reaction to ICT stress" (La Torre et al., 2020, p. 64), (b) IS-related distress, that is, the feeling of being unable to manage, control, and adjust to the introduction and use of new technologies in one's work procedures and activities, and (c) IS-related eustress, that is, the feeling of being stimulated, empowered, and enriched by the introduction of new technologies in one's work procedures and activities (Gaudioso, 2016). Regarding technostress, both the organizational factors which can burden (technostress creators) or lighten (technostress inhibitors) it (Ragu-Nathan et al., 2008; Tarafdar et al., 2010; Gaudioso et al., 2017) will be taken into account. That is, this study tackles not only the negative side of the introduction and management of IS due to the necessity to work

remotely, but also the positive one – that is, the organizational factors which can protect from negative impacts (i.e., technostress inhibitors) as well as the IS-related experience of enrichment (i.e., IS-related eustress). Two main research questions are addressed: (a) Which are the relationships between teachers' experience of technostress creators and inhibitors with regards to school systems and their rates of IS-related distress and eustress?; (b) Which role do teachers' gender and age play with reference to this technology-related experience? The goal is to raise awareness of both the strengths and the pitfalls stemming from the introduction of technologies in work activities without a proper training.

Materials and methods

Participants and procedures

Two hundred and thirty-seven Italian teachers took part in the study. The data were collected from June 4, 2020, to August 18, 2020 – that is, at the end of the months in which ERT had been needed to guarantee students' right to study while complying with stay-at-home orders (Guidetti and Albanesi, 2021; Novara et al., 2021). In compliance with safety standards linked to COVID-19 pandemic, an online questionnaire was used. It was introduced by an explanation about confidentiality issues; participants had to express their informed consent to take part in the study. No IP addresses or identifying data were retained. The recruitment of the participants followed these steps: (1) the researchers contacted the headmasters at several schools in Italy to explain the aims and methods of the study; and (2) they asked the headmasters who were interested in the study so as to appoint a teacher in charge of sharing the questionnaire with the fellow teachers in their schools for voluntary participation in it.

Overall, 33 public schools were involved in the research. Of these, 15 were primary schools, 7 were secondary schools, and 11 were high schools.

Respondents (81.5% female) were aged between 26 and 66 ($M = 50.20$; $SD = 8.87$); one participant did not disclose the age. Most participants were from Northern Italy (77.3%), while 13.9% were from Southern Italy, 8% from the Italian islands, and 0.8% from Central Italy. They worked in high (66.8%), secondary (16.8%), and primary schools (16.4%).

Measures

The questionnaire included a socio-demographic section, followed by these specific measures.

Technostress creators and inhibitors

The Italian versions (Gaudioso, 2016; Turel and Gaudioso, 2018) of 18 items about technostress creators and 12 items about technostress inhibitors from Ragu-Nathan et al. (2008) were used. Due to the peculiarities of the work position of the foreseen

participants, techno-overload, techno-invasion, techno-complexity, and techno-uncertainty were included as the relevant organizational management factors potentially creating workers' technostress. Literacy facilitation, involvement in IS initiatives, and job satisfaction were the relevant ones potentially reducing it. Respondents had to rate their agreement with each item on a 7-points Likert scale (1 = *Strongly disagree*; 7 = *Strongly agree*).

Information-systems-related distress and eustress on the job

Gaudioso's scales (Gaudioso, 2016) about IS-related distress and eustress on the job were used. Each scale comprises 4 items (e.g., "*How often have you felt unable to control what is important for your job role due to the processes related to new technologies?*" for distress, "*One of the main reasons why I like my job is that I feel stimulated by the new job demands generated by new technologies*" for eustress). For both scales, respondents were asked to rate how often they had felt as described in each item during the last 2 weeks on a 7-points Likert scale (1 = *Never*; 7 = *Always*).

Data analysis

Confirmatory factor analyses (CFA) with structural equation modeling (SEM) were used to test the factor structure for each measure. McDonald's omega (ω) was used as the reliability index (McNeish, 2018). A measurement model including the four variables as separate constructs (M1) was compared to a model with two factors (M2; IS-related distress and eustress loading on a dimension, technostress creators and inhibitors loading on another one) and to a model with all the constructs loading on the same factor (M3). To evaluate the model fit, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the Root Mean Square Error of Approximation (RMSEA) and its 90% confidence interval (CI), the Akaike Information Criterion (AIC), and the Bayesian Information Criterion (BIC) were observed (MacCallum and Austin, 2000). For CFI and TLI, values equal to or greater than 0.90 and 0.95, respectively, reflect good or excellent fit indices; for RMSEA, values equal to or smaller than 0.06 and 0.08, respectively, reflect good or reasonable fit indices; for AIC and BIC, the lower the value, the better the fit (Hu and Bentler, 1999).

To address the two research questions, a multiple regression model was tested using SEM. Technostress creators and inhibitors were included in the model as the independent variables, while IS-related distress and eustress as the outcomes; respondents' age and gender were included as control variables (see Figure 1). Specifically, as to technostress creators and inhibitors, a latent variable was included for each of them with all the related dimensions loading on it – and consistently with the aim of the study. To evaluate the model fit, CFI, TLI, RMSEA, and its 90% CI were observed again.

Prior to hypotheses testing, leverage value and Cook's D were used in order to verify the absence of significant values which could affect the analyses – that is, outliers and influential cases. To witness their absence, leverage values and Cook's D should, respectively, be lower than 0.2 and 1 (Cousineau and Chartier, 2010). Multicollinearity was checked through the tolerance index – which should be higher than 0.20 to suggest its absence (Craney and Surles, 2002).

The significance of the results was tested using a bootstrap estimation approach (Hayes, 2018) with 10,000 samples and the bias-corrected 95% confidence intervals were computed by determining the effects at the 2.5th and 97.5th percentiles. The effects are significant when 0 is not included in the CI.

Results

M1 confirmed a better fit, CFI = 0.93, TLI = 0.93, RMSEA = 0.05, 90% CI [0.04, 0.06], AIC = 28,534.09, BIC = 29,013.26, than M2, CFI = 0.87, TLI = 0.86, RMSEA = 0.07, 90% CI [0.06, 0.07], AIC = 28,879.18, BIC = 29,309.74, and M3, CFI = 0.87, TLI = 0.86, RMSEA = 0.07, 90% CI [0.06, 0.07], AIC = 28,878.53, BIC = 29,305.62, supporting the need to consider IS-related eustress, IS-related distress, technostress creators and technostress inhibitors as four different constructs for the subsequent analyses.

Indices of reliability, descriptive statistics, and correlations for all the measures are in Table 1. For all the considered IS-related stress dimensions, medium-to-high levels emerged, suggesting that IS-related stress represented a concrete issue for teachers facing ERT with no training, with reference to both positive and negative experiences.

Leverage value was always lower than 0.1 and Cook's D than 0.07, indicating there were no significant values affecting the analyses. Tolerance indices were always higher than 0.765, suggesting that multicollinearity was not an issue.

The model showed good fit indices, CFI = 0.92, TLI = 0.92, RMSEA = 0.05, 90% CI [0.04, 0.06]. Technostress creators and inhibitors confirmed their relationships with both IS-related distress and eustress rates; specifically, technostress creators showed a positive relationship with IS-related distress and a negative one with IS-related eustress, while technostress inhibitors showed an opposite pattern of relationships. Respondents' gender and age showed a significant association only with technostress creators among the considered variables, displaying that older and female respondents reported higher scores regarding the perception of technostress creators. All the unstandardised effects, their standard errors and their 95% CI are in Table 2.

Discussion

The aim of the present study was to disentangle IS-related stress in teachers' experience, taking into account that, due to COVID-19 pandemic and the related stay-at-home orders, the latter had to suddenly shift to ERT with no proper training for doing so. The paper specifically addresses their experience with
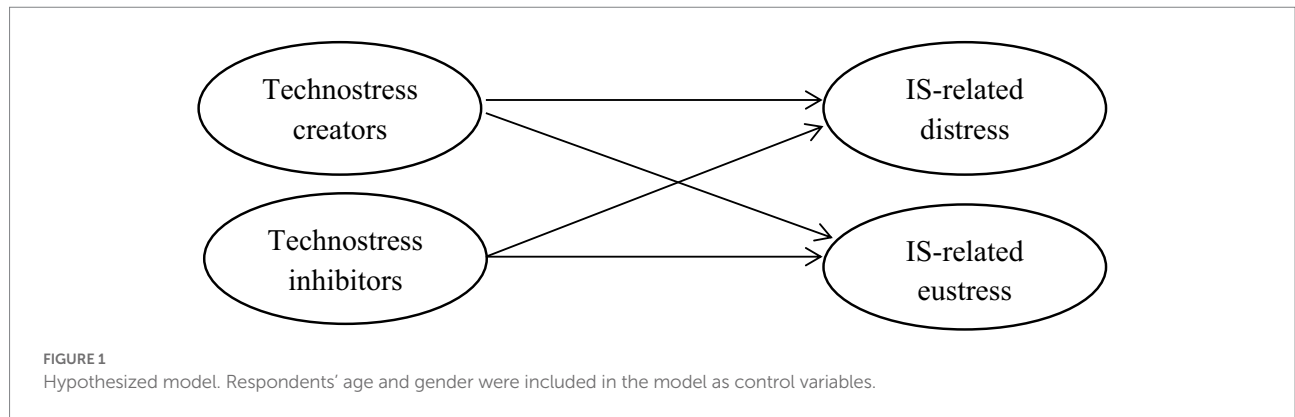
FIGURE 1
Hypothesized model. Respondents' age and gender were included in the model as control variables.

TABLE 1 Summary of reliability indices, descriptive statistics, and correlations.

Variables	ω	*M*	*SD*	1	2	3	4	5
1. Technostress creators	0.95	4.20[a]	0.97	–				
2. Technostress inhibitors	0.91	4.38[a]	1.11	−0.143*	–			
3. IS-related distress	0.93	3.04[a]	1.25	0.570***	−0.242***	–		
4. IS-related eustress	0.91	3.90[a]	1.47	−0.298***	0.430***	−0.314***	–	
5. Age	–	50.20[b]	8.87	0.191***	−0.062	0.111	−0.064	–
6. Gender (1 = *female*)	–	–	–	0.151*	−0.085	0.034	0.010	0.093

n = 237. [a]1–7 range scale; [b]26–66 range. ***$p < 0.001$ (two-tailed); *$p < 0.05$ (two-tailed). ω, McDonald's omega; M, mean; SD, standard deviation; IS, information systems.

TABLE 2 Model results.

Paths	*B* (SE)	BC 95% CI
Control effects		
Age → Technostress creators	0.01 *** (0.004)	[0.01, 0.02]
Age → Technostress inhibitors	−0.01 (0.01)	[−0.02, 0.01]
Age → IS-related eustress	0.02 (0.02)	[−0.02, 0.07]
Age → IS-related distress	−0.02 (0.01)	[−0.04, 0.001]
Gender (1 = *female*) → Technostress creators	0.18 * (0.09)	[0.03, 0.39]
Gender (1 = *female*) → Technostress inhibitors	−0.05 (0.19)	[−0.39, 0.01]
Gender (1 = *female*) → IS-related eustress	0.30 (0.46)	[−0.53, 1.18]
Gender (1 = *female*) → IS-related distress	0.28 (0.24)	[−0.76, 0.15]
Main effects		
Technostress creators → IS-related distress	2.21 *** (0.69)	[1.41, 3.84]
Technostress creators → IS-related eustress	−0.99 * (0.43)	[−1.93, −0.34]
Technostress inhibitors → IS-related distress	−0.61 * (0.61)	[−2.59, −0.15]
Technostress inhibitors → IS-related eustress	1.87 * (1.64)	[0.76, 7.75]

n = 237. ***$p < 0.001$ (two-tailed); *$p < 0.05$ (two-tailed). SE, standard error; BC, bias-corrected; CI, confidence interval; IS, information systems.

reference to technostress creators, technostress inhibitors, IS-related distress and IS-related eustress. Additionally, the article deepens the role technostress creators and inhibitors played as to teachers' IS-related distress and eustress rates and the effect of their gender and age. The results show that the age and gender only had a relationship with respondents' perception of technostress creators – that is, of the organizational factors, which could foster the negative experience of stress stemming from the introduction of IS in teachers' work activities and procedures. Specifically, older women showed a heavier perception of technostress creators. Further, they displayed that the higher the perception of technostress creators, the higher the reported rates

of IS-related distress and the lower the ones of IS-related eustress; conversely, the higher the perception of technostress inhibitors, the higher the rates of IS-related eustress and the lower those of IS-related distress.

On the one hand, the first result echoes previous ones suggesting that women experience more difficulties and anxiety than men when it comes to using computers (Whitley, 1997; La Torre et al., 2020) and that younger generations are still more familiar and able to cope with new technologies (Dimock, 2019), despite years have passed by and technologies have become an integral part of people's daily lives (Gatti and Procentese, 2020, 2021). However, it is also to mention that the present results might be context-specific since data were gathered during the months of nationwide lockdown. Indeed, the latter – which represented an unprecedented life condition in Italy – blurred the boundaries between work and family domains (Carvalho et al., 2021), making them both collapse into private houses and increasing the interferences between them (Anderson and Kelliher, 2020; Rudolph et al., 2021). Due to gender roles and stereotypes, such interferences may have produced more negative experiences for women, who had to face work-related as well as family-related requests simultaneously (Almeida et al., 2020; Gattino et al., 2022).

On the other hand, the second results support the potentially positive role that technologies can play in individuals' daily and work activities (Brivio et al., 2018). Indeed, they show that an aware, well-prepared and adequately supported employment of technologies can make individuals feel that the latter can represent a valuable and stimulating resource favoring daily activities, relationships and processes, also reducing the distress rates. Conversely, an unprepared and unsupported shift to the use of new technologies produces overload, anxiety and uncertainty. This change requires workers to spend more time on their job activities in order to figure out the best way to run them through such technologies. Consequently, the shift ends in workers feeling more and more stressed and not appreciating the potential advantages and easing stemming from such shift.

Some limitations of this study should be acknowledged. First, the sample was small, non-probabilistic and non-representative, which reduces the possibility to generalize the results. However, the sampling procedures and the online distribution of the questionnaire allowed to gather data from Italian teachers and carry out this investigation during the first stage of the pandemic, while complying with the related restrictions. Second, the correlational nature of the analyses and the cross-sectional design of the study do not allow further inferences, rather offering a portrait of IS-related stress experiences in a sample of Italian teachers. Further details about which technostress creators were particularly influential in teachers' experience – with specific reference to older and female ones, consistently with the present results – and how teachers were able to face them are needed to better understand this phenomenon. Future studies might further deepen these experiences by addressing the psychosocial dimensions, which could have burdened or, rather, lightened IS-related stress

among teachers – be it during forced but temporary shifts to ERT or during their normal work activities.

Indeed, in the face of the broad increases in remote working brought about by COVID-19 pandemic, the awareness of IS-related stress experiences represents a key factor for the evaluation of work-related risks as well as for the prevention of stress-related problems. Overall, the scores reported by the respondents reveal that a broad use of technologies for work activities can represent both a resource for personal enrichment and a threat to one's well-being, providing individuals with opportunities they would have not had otherwise, but also causing them negative emotional experiences. In this sense, the stress related to the introduction of new technologies into work activities and practices without proper training can produce negative emotions such as: anger and anxiety, as well as poor concentration, skepticism, irritability, and memory problems (Salanova et al., 2007; Ragu-Nathan et al., 2008; Brivio et al., 2018).

To summarize, the COVID-19 pandemic forced Italian schools to adopt ERT without preparedness – that is, "not seek to prevent the occurrence of a disastrous event but rather assumes that the event will happen. Instead of constraining action in the face of uncertainty, preparedness turns potentially catastrophic threats into vulnerabilities to be mitigated" (Lakoff, 2007, p. 253). Consequently, the lack of preparedness prevented the Italian schools and teachers from being involved in a positive technology approach – that is, "the scientific and applied approach to the use of technology for improving the quality of our personal experience" (Riva et al., 2012, p. 70). This approach, if applied to organizational contexts (such as the Italian schools) suggests planning the work processes that will be realized through technology usage; and training the organizational members -mainly teachers – in dealing with them. In conclusion, an effective strategy to prevent IS-related stress and ensure workers' psychophysical well-being could be positive technology (Brivio et al., 2018). In this vein, when a new platform is needed and introduced into teachers' work activities (e.g., a videoconferencing program), it could be useful to set up specific trainings, spread information about the changes in work practices and tools, and provide adequate support on them, in order to ensure the proper understanding and usage of the software (Kniffin et al., 2021). Additionally, in order to enhance the opportunities to also rely on support among colleagues – which proved its effectiveness in sustaining teachers' efficacy during the months of COVID-19-related lockdown (Guidetti and Albanesi, 2021; Procentese et al., 2022) – community building interventions might represent another effective strategy.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study involving human participants was reviewed and approved by the Commissione Etica per la Ricerca in Psicologia (CERPS), Università Cattolica del Sacro Cuore. The patients/participants provided their written informed consent to participate in this study.

Author contributions

IV, FG, GB, GM, AS, and CG: conceptualization, writing—original draft preparation, and writing—review and editing. IV, FG, and CG: methodology. FG: formal analysis and data curation. CG: supervision and project administration. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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