Paweł Kot*
Marcin Wojtasiński
Sylwia Gwiazdowska-Stańczak
Przemysław Tużnik

The Mediating Impact of Burnout in the Relationship Between Technostress, Technostress Inhibitors, and Mental Health

ABSTRACT

New technologies are present in almost every workplace. Constant work with the information and communication technologies can turn into a source of stress for employees. Functioning in stressful conditions, in turn, means a higher risk of burnout and deterioration of mental health. The primary goal of this study is to demonstrate that burnout is a mediator in the relationship between technostress and mental health. The study was carried out on a sample of 602 participants (50.3% women) who use technology in their daily work. They were aged $M = 43.32$, $SD = 12.31$. We used the following measures: the Technostress Creators and Technostress Inhibitors Scale, the General Health Questionnaire, and the Link Burnout Questionnaire. Technostress served as a predictor for both general mental health and burnout; specifically, higher levels of technostress were associated with increased levels of burnout and decreased general mental health. Burnout was a significant mediator of the relationship between

* Correspondence regarding this paper should be sent to Paweł Kot (ORCID: 0000-0003-1471-1228), Institute of Psychology, John Paul II Catholic University of Lublin, e-mail: kotpawel@o2.pl; or Marcin Wojtasiński (ORCID: 0000-0001-7581-5659), Institute of Psychology, John Paul II Catholic University of Lublin, e-mail: wojtasinskimarcin@gmail.com; or Sylwia Gwiazdowska-Stańczak (ORCID: 0000-0002-4664-881X), Institute of Psychology, John Paul II Catholic University of Lublin, e-mail: sylwia.gwiazdowska@onet.pl; or Przemysław Tużnik (ORCID: 0000-0003-2956-5454), Institute of Psychology, John Paul II Catholic University of Lublin, e-mail: przemyslaw.tuznik@kul.pl.

technostress and general mental health. The obtained results can be used to prevent technostress, occupational burnout and mental health deterioration in employees using new technologies at work.

KEYWORDS: technostress; mental health; occupational burnout; technostress inhibitors; mediation analysis

INTRODUCTION

The contemporary work environment increasingly calls for the extensive use of new technologies, introducing stressful factors for some employees (Dutta & Mishra, 2024; Golz et al., 2021). For a growing number of people using modern technologies on a daily basis, the effective use of them and coping with the chaotic influx of large amounts of various data, its simultaneous processing and use have all become a significant challenge (Borle et al., 2021; Dragano & Lunau, 2020; Rożnowski, 2020). This situation has been exacerbated by the COVID-19 pandemic, which made it necessary for almost every sphere of our lives to transfer to a virtual space that is accessible only through various information and communication technologies (ICT) (Christian et al., 2020). Digital technologies have become pervasive in almost all sectors and professions, with serious consequences for both individual employees and entire organisations (Corvello et al., 2022).

Technology as a source of stress has not been a direct subject of studies on stress at work for a long time (Dragano & Lunau, 2020). A change came with digital transformation (Corvello et al., 2022). It is currently recognized that stress associated with these work-related aspects, like other forms of occupational stress, leads, among other things, to decreased job satisfaction (Kot, 2022), declining health (Califf et al., 2015; Dragano & Lunau, 2020) and occupational burnout (Yates, 2020).

The aim of the article is to present the results of studies on the relationship between technostress and factors protecting against

it, and the mental health of people working in positions requiring the use of ICT on a daily basis. In addition, the analyses will take into account the mediating role of occupational burnout.

Mental health

Work-related stress is strongly associated with adverse psychological outcomes, including job burnout and depression (Lara-Cabrera et al., 2021; Ruini et al., 2024). In response, research and preventive initiatives increasingly emphasize the importance of supporting employees' mental health within organizations. According to the World Health Organization, mental health constitutes a fundamental component of overall health. It is defined as a state of well-being in which individuals recognize their abilities, are able to cope effectively with everyday stressors, and work productively. Mental health is therefore essential for personal well-being as well as for effective functioning within society (Nouri et al., 2021).

Various models have been developed to explain the determinants of mental health. The biomedical model, which is the oldest, assumed that health was the absence of disease. This is a very reductionist approach, because mental health means much more than the lack of mental disorders. The biopsychosocial model was proposed by Engel (1977) in response to the limitations of the previously biomedical model. The biopsychosocial model is more intricate yet more effective in elucidating mental health and mental disorders (Bolton & Gillett, 2019). According to the assumptions of the biopsychosocial model, health or illness results from a diverse range of factors. These factors include biological, psychological, and social factors. These factors operate simultaneously and influence each other (Lehman et al., 2017). A person can actively influence their health by affecting these factors (Bolton & Gillett, 2019). Additionally, it can be considered that mental health is related not only to the individual but to the surrounding society and environment. The microsystems that will affect human

mental health will include family, work, peers, and community (Lehman et al., 2017). Therefore, it can be inferred that workplace-related factors constitute a significant element influencing adult mental health.

People spend a large part of their day at work. What they experience there also affects their mental health (Čartolovni et al., 2021). Work-related stress and burnout are important factors for employees' mental health (Maslach, 1996; Rożnowski, 2020). Working in demanding conditions, including the need to use ICT, and the lack of appropriate protective and supportive factors, constitute a burden on the mental health of employees (Giorgi et al., 2020).

Technostress
Brod (1984) defined technostress as a modern adaptation-related disease caused by an inability to cope with the new computer technologies in a healthy manner. Technostress encompasses the psychological stress experienced by employees due to factors like multitasking, constant communication, information overload, frequent system updates, associated uncertainty, the need for ongoing learning, job-related uncertainty, and technical issues related to the organizational use of new technologies (Ragu-Nathan et al., 2008). In this article, technostress is defined as a state of agitation observed in employees whose work is closely tied to the operation of new technologies, as proposed by Tarafdar et al. (2019) and Tarafdar et al. (2017). As already mentioned, due to the dynamic development of new technologies, employees deal with such technological solutions at almost every workplace (Corvello et al., 2022). Especially during the COVID-19 pandemic, when many organisations switched to remote or hybrid work, the intensity of negative phenomena occurring in employees increased (Dragano & Lunau, 2020).

Technostress creators

Ragu-Nathan et al. (2008) identified five groups of technostress creators.

1. Overloading technology refers to a situation in which the use of a new technology requires longer, faster and more labor-intensive work than before it was introduced. Instead of supporting the work process, the technological park accumulated at the workplace (e.g. faxes, printers, telephones, computers) becomes distracting and often takes up an employee's time instead of saving it. The applied technology provides far more information than an employee can absorb and use effectively. This creates information overload and enforced multitasking, so that job responsibilities are carried out in a rush and with inadequate levels of concentration (Tarafdar et al., 2015).

2. Technoinvasion refers to a context in which, due to technology (e.g., laptops, smartphones, high-speed data transmission), employees can be available to their workplace employer at any time, even outside working hours and locations. This requires constant readiness to perform responsibilities, even beyond regular working hours and locations, which in turn interferes with work–life balance (Jena, 2015).

3. Technological complexity is a situation in which the technology used in an organization changes very rapidly. New modifications and updates are introduced, making it increasingly complex and requiring more and more competent employees. This makes employees feel that their skills are inadequate due to the increasing complexity of the technological solutions being implemented, they feel stressed about what they do not know or understand. This exceeds their ability to cope (Hwang & Cha, 2018).

4. Techno-insecurity is a situation in which employees are fearful of being replaced by more skilled workers or robots. This happens due to the progressive development of information and

communication technologies in the organization. Others may be better able to use new technologies at work. Machines and various apparatus are seen as threatening. They are causing more and more automated production and service processes, thus reducing the need for human work. Nowadays, there are emerging lists of professions that can be successfully replaced by artificial intelligence (De Kock et al., 2022; Kot, 2022).

5. Technological uncertainty refers to the need for continuous learning and updating of knowledge. It is related to the short life cycles of solutions used in high-tech sectors. Users' knowledge quickly becomes outdated which can lead to frustration. This forces them to constantly learn and update their knowledge to keep up with the technological innovations used in the organization (Jena, 2015; Marchiori et al., 2019).

Technostress inhibitors

In addition to the creators of technostress, Tarafdar et al. (2015) have also identified inhibitors of technostress. Their goal is to protect workers from experiencing technology stress and to offset the intensity and effects of technostress. They can counterbalance the intensity and effects of the technostress creator. They include technostress creator literacy facilitation, technical support provision, and involvement facilitation.

1. Literacy facilitation involves equipping employees with the necessary knowledge, skills and competencies needed to cope effectively with a new technology in their workplace. Employees are protected through training, practices and apprenticeships that prepare workers for the introduction of new technological solutions. Systematic sharing of knowledge within the realm of emerging technological advancements reduces apprehension about introduced changes. Employees who have received adequate training and are given the necessary resources feel less stressed and more prepared for change, which

helps the process of implementing change run more easily and with fewer employee errors. We should also consider the organizational promotion of unofficial assistance from more qualified and experienced staff members given to workers who are copying less efficiently with new technologies. This is in addition to the formal help of pertinent departments. Coworkers often achieve superior results by sharing their technological knowledge within the company rather than attending formal training. This approach offers a more accessible format that mitigates the impact of the technostress generator and enhances learning.

2. Technical support consists in the organization offering timely and efficient assistance from the technical support department. The knowledge that an employee can access through help desk assistance while carrying out their everyday tasks lessens technological anxiety and apprehension. When an employee knows they can rely on helpful technical support, they are more likely to use it and avoid trying to help themselves, which could lead to further issues. Establishing a positive working relationship with the technical department minimizes the risk of work process disruptions and alleviates potential downtime (Berg-Beckhoff et al., 2017).

3. Involvement facilitation builds employee engagement by motivating and involving people at various stages of introducing new technology at work. In order to avoid surprises when new solutions are implemented, the first step is to train the staff on how to use them. This is accomplished by telling staff members ahead of time about the changes that are anticipated, their scope, and how these changes would impact not just their work but also the effectiveness of each department and the entire organization. The ideal scenario is when improvements arise from bottom-up recommendations and needs identified by the staff members themselves who use these technologies on a daily basis and are the best qualified to identify where they

need improvement. Employees that feel personally invested in the adoption and use of new technologies rate them more favorably, use them more eagerly, and are less anxious using them (Golz et al., 2021).

Too much new technology in the workplace may have negative consequences (Ragu-Nathan et al., 2008). Working in an environment with multiple sources of technostress adversely affects employees' psychophysical well-being (Hwang & Cha, 2018; Jena, 2015; Li & Wang, 2021; Marchiori et al., 2019; Tarafdar et al., 2010). Additionally, the lack or insufficient level of protective factors may increase the level of stress experienced and result in a decrease in employee well-being and job satisfaction, which are important elements of mental health (Bulińska-Stangrecka & Bagieńska, 2021).

Burnout

The concept of burnout has been a recurring topic throughout history, but it was often described in colloquial terms. In 1974, we encountered a scientific elucidation of this term, thanks to Herbert Freudenberger. Previous failures regarding its introduction were probably related to an excessively literary approach to description and the lack of a proper methodological framework. Nevertheless, it is unquestionable that the phenomenon of individuals losing work-related energy, becoming tired and exhausted at work had already been pointed out before (Bakker et al., 2014). The theoretical development of burnout conceptualizes it as a multi-dimensional phenomenon, primarily comprising exhaustion and disengagement from work (Demerouti et al., 2003). Exhaustion reflects the depletion of emotional and physical resources due to prolonged exposure to work-related stressors, while disengagement denotes psychological distancing from one's job, including cynicism or reduced involvement. More recent refinements of this model highlight additional dimensions, including mental distance, impaired professional efficacy, and lack of energy (Schaufeli

et al., 2020). Complementing this perspective, Maslach proposed a classic model of burnout, identifying three core dimensions: emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach, 1996). Emotional exhaustion is characterised by fatigue and a lack of enthusiasm and willingness to work. People affected by exhaustion feel the need to put more and more energy into the task they are performing (Chang & Engelhard, 2016). Depersonalisation is associated with distancing from people, ignoring their humanity, and a lack of empathy and compassion. Decreased sense of personal achievement involves perceiving one's competence as inadequate, is linked to a perceived lack of success or is linked to feeling unsuccessful (Maslach, 1996).

Professional burnout syndrome affects mainly social professions. They are characterised by emotional involvement and the need to have interpersonal skills such as attentive listening, empathy, negotiation, effective problem solving, patience, etc. (Santinello, 2008). For individuals in this type of profession, coping with the demands of professional life is very emotionally and psychologically draining (Maslach & Leiter, 2016). The syndrome of work burnout has been the subject of research most often in the group of emergency service workers (Chirico et al., 2021). However, today we know that the issue concerns all types of professions (De Kock et al., 2022). Another proposal, taking into account four dimensions, has been developed by Massimo Santinello (2008), who created a method to study work burnout, but in a group of professions related to helping other people (LBQ). These dimensions are: psycho-physical exhaustion, lack of engagement with clients, feeling of professional ineffectiveness, and disappointment. Psychophysical exhaustion is related to the assessment of one's resources in this particular space. Lack of commitment is associated with the quality of relationships with clients. The feeling of ineffectiveness refers to the evaluation of one's professional competence. The last element, disappointment,

refers to existential expectations. Taking into account the multitude of definitions of the phenomenon of professional burnout, it is important to distinguish professional burnout from related phenomena, such as work-related stress, alienation, fatigue, or existential crisis. The burnout phenomenon is the end result of a process in which an individual has lost hope of finding meaning in their work (Hillert et al., 2020). In the latter part of this study, we will refer to the proposal of burnout proposed by Santinello (2008).

Regarding the causes of job burnout, variables related to the workplace factors are certainly among them. Organizational factors include bureaucracy, low salaries, and a lack of a sense of agency and opportunity to have an impact on the organization of the workplace, which is often associated with emotional-cognitive overload (Kamarudin et al., 2023). Workplace-related factors also include too little time to fulfill commitments and too much bureaucratization of activities (Santinello, 2008). Seibold (2022) emphasize that reasons for the occurrence of job burnout very often also include work overload, the need to perform many duties at the same time, and the lack of proper remuneration, which is often regulated in a legally inaccessible manner for employees. Apart from the aforementioned, technology itself plays a very important role here, as it constantly evolves and holds a dominant position in most global industries. Apart from factors accelerating professional burnout, there are also factors that may play a protective role in this matter.

Concerning the consequences of job burnout, on the other hand, it can be observed that there are three areas considered the most important: emotional, physical, and psychological. Physical effects include: muscle pain, chronic fatigue, weakness, back pain, sleep disturbances, weight change, decreased immunity, increased susceptibility to infections and colds. Emotional exhaustion is associated with symptoms like depression, feelings of emptiness, disappointment, excitability, loss of perspective

(Rożnowski, 2020). The occurrence of burnout can also lead to a critical self-image. Due to the negative emotions experienced, as well as physical exhaustion, the individual may perceive themselves as incompetent, not fitting into the given environment and position. A burned-out person often uses already established patterns in their work, because their physical and emotional state does not allow them to engage in creative thinking and generation of new solutions (Maslach, 1996).

Internal conflict also results from the effects of burnout. An individual who experiences distressing and intrusive symptoms treats people in a detached or objectified manner. Consequently, an employee experiencing burnout also experiences feelings of guilt on this account. This state is very intense in people who are sensitive and faithful to values. A situation of conflict arises between how the individual behaves and how they should behave in a professional situation (Čartolovni et al., 2021). The experience of burnout also translates into the deterioration of both physical and mental health (Santinello, 2008). Additionally, a person with burnout syndrome is subject to absenteeism, possibly resulting in leaving the profession entirely, which may affect their family and finances. An important consequence of experiencing burnout syndrome by an individual is also the transfer from their professional life spilling over onto their personal and family life. This may lead to disturbances in the family and the closest environment (Rożnowski, 2020).

Present study
Functioning in technostress conditions can have numerous negative consequences both for the employees themselves and for the organization. Work-related stress can result in an overload of interconnected systems: biological, mental and social, which eventually results in the rise of negative mental and physical symptoms (Yates, 2020). Stressful working conditions lead to mental problems (e.g., burnout and anxiety neurosis), health problems

(e.g. fatigue, headaches, neck pain, migraines, hypertension) or negative emotional and cognitive reactions (e.g. irritation, dissatisfaction with work) (Califf et al., 2015; Fuglseth & Sørebø, 2014; Jena, 2015; Khedhaouria & Cucchi, 2019; Tarafdar et al., 2010; Yao et al., 2015; Zipf, 2025). Therefore, the first research hypothesis is:

H1. Technostress is negatively related to mental health.

Apart from technostress creators Tarafdar et al. (2015) have also identified technostress inhibitors that protect employees from experiencing technological stress. The presence of these factors prevents the emergence of stress or minimizes its experience. Functioning in stress-free conditions is a factor conducive to mental health (Golz et al., 2021; Nouri et al., 2021). Therefore, the second research hypothesis is:

H2. Technostress inhibitors are positively related to mental health.

Functioning under stressful conditions is one of the conditions conducive to occupational burnout (Maslach, 1996; Yates, 2020). In the case of technostress, the research results so far are ambiguous, because some of them confirm a direct relationship between technostress and occupational burnout (Niu et al., 2022; Yener et al., 2021), and some do not reveal such a direct relationship (Berg-Beckhoff et al., 2017; Tarafdar et al., 2019). Therefore the following hypothesis will be re-evaluated:

H3. Technostress is positively related to occupational burnout.

However, not all people using ICT at work suffer from technostress or experience occupational burnout (Niu et al., 2022). Ensuring an adequate level of technical competence, along with

administrative and peer support provided by organizations, reduces the risk of occupational burnout (Califf et al., 2015; Zhao et al., 2022). Therefore, the fourth research hypothesis was formulated:

H4. Technostress inhibitors are negatively related to occupational burnout.

As mentioned earlier, the relationship between technostress and occupational burnout is not simple. Authors such as Yener et al. (2021) or Zipf (2025) revealed in their research that occupational burnout is a mediator of the relationship between technostress and other psychological variables, such as self-efficacy or employee performance. Similarly, in this study, technostress can only partially account for health problems, and the noticeable effect may be explained by the presence of occupational burnout. Therefore, it was decided to verify whether

H5. Occupational burnout is a mediator of the relationship between technostress and mental health.

As in the case of the relationship between technostress and mental health, it is possible that

H6. Occupational burnout is a mediator of the relationship between technostress inhibitors and mental health.

EMPIRICAL STRATEGY

Participants and procedure
The study was conducted with the help of the nationwide on-line research panel Ariadna (https://panelariadna.pl), which has over 110,000 active members aged 15 and older. The participants were

awarded points by the panel organizers for participating in the survey, which the panel members can later freely exchange for the prizes from the pool of several hundred products offered by the panel organizers. All research procedures were carried out in accordance with the ethical principles of the 1964 Declaration of Helsinki. The surveys were approved by the University Bioethics Committee. All participants gave their consent to participate in the survey, which was conducted anonymously. The inclusion criterion was the use of information and communication technologies. The survey consisted in completing on-line questionnaires described later, taking approximately 15 minutes.

Overall, 602 subjects were surveyed, 303 women (50.3%) and 299 men (49.7%). The age of the subjects ranged from 20 to 64 (M = 43.32, SD = 12.31). The respondents are economically active people who use technology in their daily work (computers, the Internet, mobile phones). In terms of professional experience, 126 (20.1%) respondents worked in the positions using technology for up to one year. 220 (36.5%) respondents worked in such positions from one to five years, and 141 (23.3%) from five to ten years. 115 respondents worked in the positions using technology for over ten years, which accounts for 19.1% of the surveyed group.

Measures
Three questionnaires and a metric to collect demographic data were used in the survey. The Polish version of the Technostress Creators and Technostress Inhibitors Scale (Kot, 2022) was used to measure technostress. It consists of 36 statements grouped within 8 scales: Techno-overload, Techno-invasion, Techno-complexity, Techno-insecurity, Techno-uncertainty. The technostress inhibitors that define the factors counteracting experiencing of technostress in the organisation include: Literacy facilitation, Technical support provision, Involvement facilitation. In the study, moderate and high intercorrelations were revealed between the subscales of Technostress Creators and Technostress Inhibitors. Therefore,

our analyses will be carried out taking into account the results on these two scales.

The subject is asked to indicate to what extent they agree with each of the statements. The answers are provided on a scale from 0 to 5, with 0 = *not applicable*, 1 = *strongly disagree* to 5 = *strongly agree*. The result in each of the scales is the quotient of the sum of points obtained from the answers to the questions on that scale, divided by the number of questions included in the scale. Thanks to this method of calculating the results regardless of the number of statements in the scale, it is possible to easily compare the intensity of technostress creators and technostress inhibitors. The higher the score, the higher the level of technostress creators and technostress inhibitors. The Polish adaptation is characterized by good psychometric properties – the reliability of Technostress Creators is α = .93 and α = .86 to Technostress Inhibitors.

The General Health Questionnaire GHQ-28 is used to assess mental health in the general population. It allows for the identification of people whose mental state has undergone a temporary or long-term breakdown as a result of experienced difficulties, problems or as a result of a mental illness, and those who are at a significant risk of mental health disorders. The questionnaire consists of 28 items (Goldberg & Williams, 2001). In addition to the overall score, it has four scales: somatic symptoms; anxiety, insomnia; functioning disorders and depression symptoms. The scale also allows to calculate the overall score as the sum of points awarded for each question. In this research, the overall result will be analyzed. The Polish version of GHQ-28 has satisfactory psychometric properties. Cronbach's alpha of internal consistency was 0.92 for the whole scale (Makowska & Merecz, 2001). Answers are rated on a scale from 0 = *less than usual* to 3 = *much more than usual*. A maximum score of 21 points can be obtained from each part of the questionnaire, and 84 points from the whole questionnaire. The higher the overall score and the score in individual

subscales, the higher the severity of mental health difficulties. In this study, the overall result will be used in the analyses.

The Link Burnout Questionnaire is a Polish adaptation (Jaworowska, 2014) of the Italian Link Burnout Questionnaire (Santinello, 2008). It was designed to measure occupational burnout in people working in professions related to helping other people and teaching. The questionnaire consists of 24 items describing the respondents' feelings about their professional work. The respondents give answers on a 6-point scale, the individual items of which refer to the frequency of feelings (never, rarely, once or more times a month, more or less once a week, several times a week, every day). In addition to the overall result, LBQ allows for the assessment of four aspects of occupational burnout: Psychophysical exhaustion (dimension referring to self-assessment of one's own psychophysical resources), Lack of involvement in relations with clients (dimension describing the quality of relations with clients), Feeling a lack of professional efficiency (dimension relating to self- assessment of one's own professional competences) and Disappointment (dimension of existential expectations). Because of the medium and high inter-correlations between the subscales included in the Link Burnout Questionnaire, the overall score on this questionnaire was used for further analysis. Cronbach's alpha of internal consistency is for the whole scale $\alpha = 0.83$.

Data analysis
Basic statistical analyses used to calculate descriptive statistics for the collected data have been used for data analysis. In order to verify the hypotheses, Pearson's *r* correlation tests, mediation analyses with the relevant principles of interpretation have been applied (Field et al., 2012). The calculations were performed in RStudio with packages: flexplot (Fife, 2019), ggplot2 (Wickham et al., 2023), haven (Wickham, Miller et al., 2023), lavaan (Rosseel et al., 2023), psych (Revelle, 2023), readxl (Wickham, Bryan

et al., 2023), semPlot (Epskamp et al., 2022), vtable (Huntington-Klein, 2023).

RESULTS

In the first part of the analysis, Pearson's *r* correlation coefficients were used to verify the relationships between the main variables included in the mediation models: technostress creators, technostress inhibitors, occupational burnout, and general mental health (Table 1).

Table 1. Intercorrelations between variables included
in the mediation models.

Variable	1	2	3	4
GHQ-28 total score	–			
TS creators	.39***	–		
TS inhibitors	.04	.61***	–	
Burnout	.55***	.28***	−.14***	–

Note. *p* < .05, **p* < .01, ***p* < .001; TS = technostress.

Technostress creators correlate significantly positive and moderate with the GHQ-28 total score. The correlation indicates that the higher technostress creators, the higher the severity of mental health difficulties. On the other hand, the correlation between technostress inhibitors and the GHQ-28 total score happens to be not significant. Both technostress creators and inhibitors correlate significantly with burnout. The technostress creators–burnout correlation is positive and low, and the technostress inhibitors-burnout correlation is negative and very low.

Burnout correlates significantly positively and moderately with the GHQ-28 total score. The correlation indicates that with increasing burnout the severity of mental health difficulties increases, too.
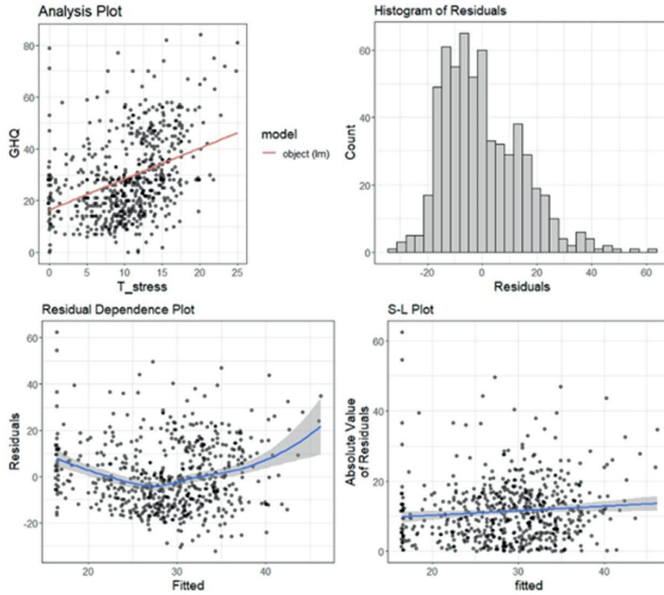
An examination of the correlation matrix (see Table 1) indicates that technostress inhibitors cannot be tested in the mediation model as a predictor of the general mental health status. The only mediation model which can be tested assume burnout as a mediator of the relationship between technostress creators (predictor) and the general mental health (outcome). All intercorrelations between the variables included in the meditation model are significant.

The next step of the analysis was testing linear model assumptions for the relationships between variables included in the meditation model. In the case of each pair of variables we checked a set of diagnostic plots and results of the global test of linear model assumptions. Firstly, the main relationship (total effect) between the predictor (technostress creators) and the outcome (general mental health) was considered. An inspection of the diagnostic plots and results of the general test shows that assumptions of normality, linearity and homoscedasticity are not met in relationship between predictor and outcome variables (see Figure 1 and Table 2).

Table 2. Global test on 4 degrees-of-freedom for linear model assumptions between technostress creators and GHQ-28 total score.

Parameter	Value	p-value
Global statistic	128.72	< .001
Skewness	66.12	< .001
Kurtosis	17.89	< .001
Link function	39.97	< .001
Heteroscedasticity	4.74	< .001

Figure 1. Diagnostic plots of linear model assumptions for relationship between technostress creators and GHQ-28 total score.

Secondly, we checked the assumptions of linear models for the relationship between the predictor (technostress creators) and the mediator (burnout). In the case of the predictor–mediator relationship, normality and heteroscedasticity assumptions are met but linearity seems to be violated (see Figure 2 and Table 3).

Figure 2. Diagnostic plots of linear model assumptions for relationship between technostress creators and burnout.
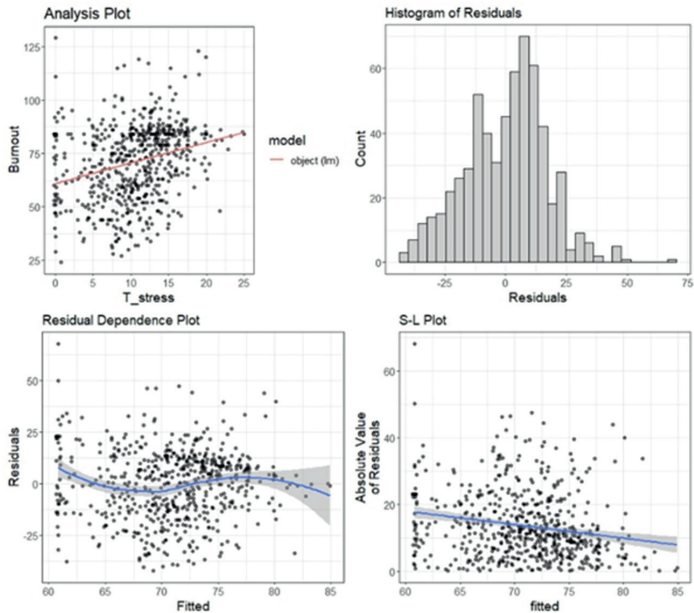

Table 3. Global test on 4 degrees of freedom for linear model assumptions between technostress creators and burnout.

Parameter	Value	p-value
Global statistic	10.71	.030
Skewness	0.05	.821
Kurtosis	1.02	.312
Link function	9.45	.002
Heteroscedasticity	0.18	.670

In the next step, the assumptions of the linear models were tested for a relationship between the mediator (burnout) and the outcome (general mental health). An inspection of the diagnostic

plots and results of the general test showed that assumptions of normality, linearity and homoscedasticity are not met in relationship between mediator and outcome variables (see Figure 3 and Table 4).

Figure 3. Diagnostic plots of linear model assumptions for relationship between burnout and GHQ-28 total score.
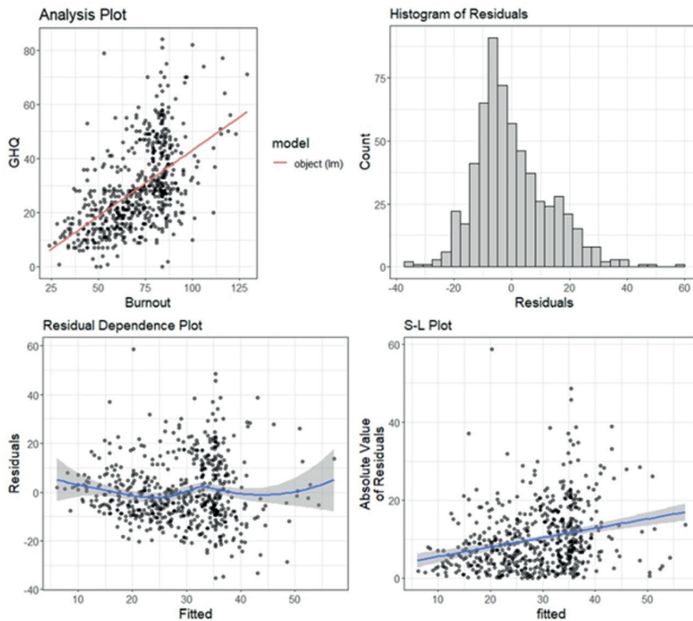

Table 4. Global test on 4 degrees of freedom for linear model assumptions between burnout and GHQ-28 total score.

Parameter	Value	p-value
Global statistic	87.85	< .001
Skewness	55.72	< .001
Kurtosis	25.01	< .001
Link function	0.48	< .001
Heteroscedasticity	6.64	< .001

The final step of checking the linear models assumptions was made for regression model including both, technostress creators and burnout as predictors of the general mental health. The results of the general test indicate that assumptions of normality, linearity and homoscedasticity are not met in relationship between predictors and outcome variable (see Table 5).
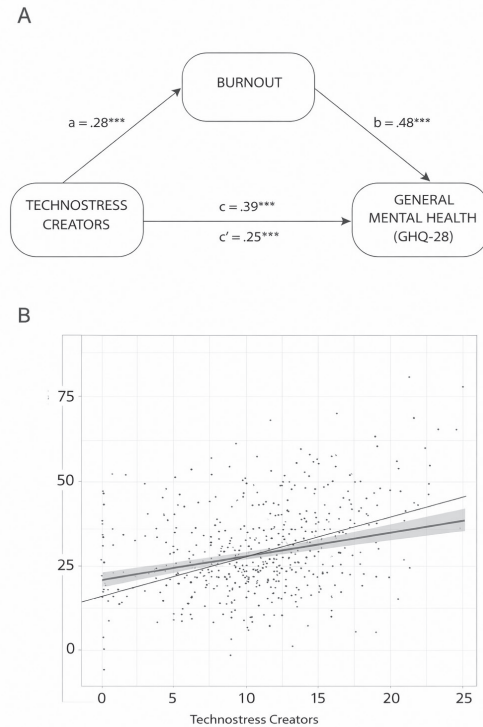
Table 5. Global test on 4 degrees of freedom for linear model assumptions between technostress creators, burnout and GHQ-28 total score.

Parameter	Value	p-value
Global statistic	116.06	< .001
Skewness	56.49	< .001
Kurtosis	41.02	< .001
Link Function	10.91	< .001
Heteroscedasticity	7.66	< .001

Since the not met linear models assumptions were not confirmed in most analyses reported above, the classical mediation analysis should be interpreted with a caution. We also conducted an additional non-parametric alternative analysis, utilizing the causal mediation bootstrap technique and quasi-Bayesian confidence intervals. We decided to compare the results obtained from both techniques: classical and non-parametric.

The classical mediation analysis revealed a significant mediation effect, as well as significant indirect and direct effects (Figure 4). After including the mediator in the model, the strength of the relationship (slope) for technostress creators explaining general mental health decreased (see Figure 4B). However, the predictor remained statistically significant (see Figure 4A). The analysis let us to confirm partial mediation effect.
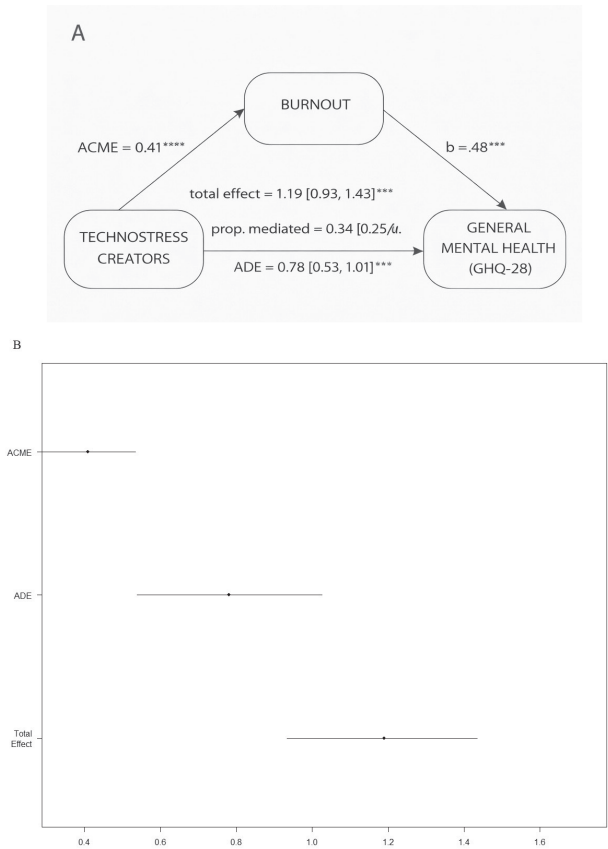
Figure 4. Classical mediation analysis results: (A) mediation model with standardized path coefficients and (B) partial mediation effect of burnout in relationship between technostress creators and general mental health.

*** $p < .001$.

The causal mediation analysis with non-parametric bootstrapping and the percentile method (999 simulations; Figure 5) showed a significant Average Direct Effect of technostress creators on general mental health (ADE = 0.58, $p < .001$), a significant Average Causal Mediation Effect via burnout (ACME = 0.41, $p < .001$), and a significant total effect of ACME and ADE (total effect = 1.19, $p < .001$) (see Figure 5A and 5B).

Figure 5. Results of non-parametric causal mediation analysis: (A) path diagram with estimates of Average Causal Mediated Effect (ACME), Average Direct Effect (ADE), total effect, and the proportion mediated; and (B) visual representation of causal mediation of burnout; vertical axis represents ACME, ADE of technostress creators on general mental health (GHQ-28), and the total effect of ACME and ADE.

Note. Horizontal axis represents the regression weights (effect estimates).

*** $p < .001$.

DISCUSSION

The results of the correlation analysis revealed positive relationships between technostress creators and general mental health. Because of the design of the mental health measurement scale, a positive correlation indicates the co-occurrence of technostress and increased intensity of symptoms indicating mental health deterioration. Therefore, the first research hypothesis has been confirmed. The presence of stimuli that are perceived as exceeding the individual's capabilities leads to stress (Lazarus & Folkman, 1984). For a growing number of people, such stressors include the inability to meet the increasingly higher demands for technology use (Ragu-Nathan et al., 2008). Instead of making employees' lives easier, the presence of digital technologies is a source of stress for them. Prolonged functioning under technostress can result in a decline in health (Atanasoff & Venable, 2017). Employees exposed to the presence of technostress creators experience greater intensity of somatic symptoms, anxiety, insomnia, functioning disorders and depression symptoms. Technostress creators (techno-overload, techno-invasion, techno-complexity, techno-insecurity, techno-uncertainty) not only mean worse mental health, but also make it difficult to function at work; they affect performance and reduce job satisfaction (Dragano & Lunau, 2020; Lee et al., 2016). However, according to the Transactional Theory of Stress and Coping (Lazarus & Folkman, 1984), the mere presence of technostress creators does not necessarily mean the occurrence of technostress (Ragu-Nathan et al., 2008). Employees who believe that they are able to cope with the challenges of working with new technologies or who receive adequate organizational support should not experience technostress (Borle et al., 2021; Dragano & Lunau, 2020; Lehman et al., 2017; Yener et al., 2021).

In order to counteract the negative effects of the presence of a technostress creator, from the employee's perspective it is important to provide technostress inhibitors (Christian et al., 2020;

Lara-Cabrera et al., 2021; Ruini et al., 2024). Unfortunately, the correlation analyses performed in this study did not confirm the relationship between technostress inhibitors and general mental health. Therefore, the second research hypothesis was not confirmed. The surveyed employees believe that the technostress inhibitors provided by their employers inadequately protect them against technostress, so their mental health does not remain at a higher level. Taking action to protect against excessive effects of stressors is an important way to counteract the accumulation of stress in employees, including technostress (Califf et al., 2015; Hwang & Cha, 2018). In the concept analyzed by Ragu-Nathan and colleagues (2008) in order for technostress inhibitors to begin to have an impact in a work situation require a certain amount of effort on the part of employees (e.g., continuing education, training, involving employees at various stages of ITC implementation or seeking support from the technical department). Not always every employee wants to make such an effort on their own, preferring instead to choose more escape or emotional coping strategies to deal with stress (Lazarus & Folkman, 1984). In addition, technostress inhibitors do not remove the source of technostress itself, but it does help in acquiring new competencies for coping with ITC (Pansini et al., 2023).

Later on, positive, low correlations between Technostress creators and Burnout were revealed. Therefore, the third hypothesis assuming that technostress is positively related to occupational burnout was confirmed. Also previous studies (Khedhaouria & Cucchi, 2019; Mahapatra & Pati, 2018; Yao et al., 2015; Zhao et al., 2022) confirm that there is a positive link between technostress and burnout. Excessive exposure to stress at work caused by the use of technologies may increase the risk of occupational burnout. Experiencing technostress in a long-time perspective can manifest itself in the sense of withdrawal, cynicism and reduced professional effectiveness (Hillert et al., 2020; Niu et al., 2022; Tarafdar et al., 2015; Yates, 2020).

We managed to confirm weak negative correlations between Technostress inhibitors and Burnout. Therefore, Hypothesis 4 assuming that factors protecting against technostress are negatively related to burnout was confirmed. This time, therefore, technostress inhibitors turned out to really be factors protecting employees using ICT in their work against the negative consequences of technostress, such as occupational burnout (Hwang & Cha, 2018; Jena, 2015; Niu et al., 2022). Equipping employees with knowledge, skills and competencies enabling them to effectively deal with ICT and providing both professional and less formal, friendly technical support protects employees from perceiving Technostress creators as impossible to overcome (Li & Wang, 2021; Marchiori et al., 2019; Tarafdar et al., 2019). Adequately prepared and supported employees are able to work effectively and efficiently without the risk of burnout, even if technostress creators appear (Yener et al., 2021). And they will almost inevitably occur with current technological progress, however, it is important that technostress inhibitors appear simultaneously to minimize the negative consequences for individual employees (Li & Wang, 2021; Tarafdar et al., 2015).

The conducted analyses confirmed that including burnout as a mediator partially mitigates the strength of the relationship between technostress creators and general mental health. Hypothesis 5 was confirmed but the mediation effect was only partial, suggesting that both the direct and indirect pathways are significant in the context of health. The mental health of employees using ICT in their work is also largely explained by the symptoms of occupational burnout. Both mental health and burnout clearly have clinical characteristics, confirmed in previous research (Bolton & Gillett, 2019; Yates, 2020). Technostress creators have a limited impact on the current level of health of employees, leading to a temporary deterioration of the individual's disposition and well-being (Atanasoff & Venable, 2017; Borle et al., 2021; Dutta & Mishra, 2024; Yener et al., 2021). However, its long-term impact

on health is much more serious by exacerbating symptoms that are characteristic of burnout (Zhao et al., 2022). Long-term subjection to various technostress creators (such as techno-overload, techno-invasion, techno-complexity, techno-insecurity, techno-uncertainty) may accelerate the development of subsequent stages of burnout with the sense of withdrawal, cynicism and reduced professional effectiveness, which has also serious consequences for the health, e.g. somatic symptoms, anxiety, insomnia, functioning disorders, depression symptoms (Niu et al., 2022; Tarafdar et al., 2015; Yates, 2020).

Hypothesis 6, assuming that burnout acts as a mediator between the relationship of technostress inhibitors and general mental health, was not supported. In this case, despite the relationship between protective factors and the mediator (burnout), there was no relationship between factors protecting against technostress and the increased intensity of symptoms indicating a mental health disorder. In this case, it is rather the relationship between burnout and mental health that occurs directly, not via protective factors. It is possible that the nature of the organizations of the surveyed employees influenced the inadequacy of the technostress inhibitors provided in safeguarding mental health (Bakker et al., 2014; Demerouti et al., 2003; Dutta & Mishra, 2024).

LIMITATIONS AND FUTURE STUDIES

While this study has revealed some interesting links between technostress, occupational burnout and mental health, it has its limitations. Considering a change of questionnaires may be necessary, as the ones used exhibited high intercorrelations among factors, resulting in the use of only general measures. An obvious limitation of the study is the use of only a single measurement. Of course, it provides reliable results from the surveyed sample, but it limits the possibility of drawing cause-and-effect conclusions. It

would be advisable to take into account repeated measurements of variables, thanks to which it would be possible to observe possible changes, the intensity of technostress, occupational burnout or state of mental health. It is also not possible to take into account the realistic manipulation of variables. However, using manipulation, e.g. with the intensity of experienced technostress in the workplace, seems to be an inappropriate procedure from the ethical point of view. As already mentioned, the research concerns people who are in contact with sources of technostress in the workplace (e.g. office and administration employees), which limits the possibility of generalising the results obtained to other groups that may also be affected by technostress. It is becoming common knowledge that the accumulation of new technologies people struggle with in everyday life can be a source of technostress (e.g. on-line consultations, social networking sites, on-line shopping). For the purposes of future research, it would be worth verifying the obtained dependencies in a group of broadly defined users of new technologies. The present study focuses primarily on a general model of associations; however, future research should be conducted to allow for additional analyses that take into account variables such as gender, age, and length of service. It would also be advisable to include factors related not only to the immediate work environment but to the broader organization of work, such as job satisfaction and organizational climate. It would also be interesting to verify the tested model in communities differentiated by the availability and dissemination of new technologies. One would also need to look for other protective factors against technostress, perhaps broadening the model to include personality variables such as self-efficacy or resilience.

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