REIPE Revista de Estudios e Investigación en Psicología y Educación

20252025, Vol. 12, No. (2)

DOI:https://doi.org/10.17979/reipe.2025.12.2.11499

Flexible coping with technostress in higher education teachers: Adaptation and validation of a scale

Coping flexível com o tecnostress em docentes do ensino superior: Adaptação e validação de uma escala

Lígia Nascimento[1,2,3] https://orcid.org/0000-0002-6285-1631

Manuela Faia Correia[1] https://orcid.org/0000-0002-2040-8412

[1] COMEGI – Centro de Investigação em Organizações, Mercados e Gestão Industrial, Universidade Lusíada de Lisboa: https://comegi.ulusiada.pt, Portugal, Lisboa

[2] Intrepid Lab, ISMAT – Instituto Superior Manuel Teixeira Gomes: https://intrepid.ulusofona.pt, Portugal, Portimão

[3] CETRAD – Centre for Transdisciplinary Development Studies, Universidade de Trás-os-Montes e Alto Douro: https://www.cetrad.utad.pt/pt-pt/, Portugal, Porto

This work is funded by national funds through FCT – Fundação para a Ciência e a Tecnologia (Portugal), I.P., under the projects UIDB/04005/2020 (https://doi.org/10.54499/UIDB/04005/2020) and (https://doi.org/10.54499/UIDB/04011/2020).

Correspondence relating to this article: Lígia Nascimento: ligia.nascimento@lis.ulusiada.pt

Abstract

Digital advancements in education have introduced the use of technology as a new source of occupational stress. Theoretical models and research highlight the critical role of coping behaviors in regulating individuals' psychological response to technostress and managing personal well-being. However, there is a lack of measurements of coping with technostress. Grounded in the premise that no single coping strategy is universally optimal - requiring flexibility in its application - this study aims to adapt a measure of flexible coping with stress to technological work contexts, validate its Portuguese version (the Flexible Coping with Technostress Scale, FCTS-PT), and evaluate its psychometric properties. The sample consisted of 1107 Portuguese higher education teachers (HETs). Two distinct subsamples and a follow-up subsample were utilized for exploratory factor analysis, confirmatory factor analysis and reliability testing. Exploratory results indicated one-factor structure similar to the original scale. Internal consistency and test-retest reliabilities were strong. The factor structure was confirmed through good model fit and evidence of factorial, convergent and discriminant validities as well as composite reliability. This study underscores the contribution of the FCTS-PT as a reliable and valid tool for assessing flexible coping with technostress in HETs. It provides a parsimonious measurement that can assist the development, well-being, and productivity of these educators, offering robust data to inform institutional decisions, interventions, and policies.

Palabras clave: technology in education; stress management; coping; college teachers; test validation.

Resumo

Os avanços digitais na educação introduziram a tecnologia como uma nova fonte de stress ocupacional. Modelos teóricos e investigações sublinham o papel fundamental dos comportamentos de coping na regulação da resposta psicológica das pessoas ao tecnostress e na gestão do bem-estar pessoal. Contudo, existe uma escassez de instrumentos que avaliem o coping com o tecnostress. Partindo do pressuposto de que nenhuma estratégia de coping é universalmente ótima - exigindo flexibilidade na sua aplicação - este estudo tem como objetivo adaptar uma medida de coping flexível com o stress (Flexible Coping with Technostress Scale, FCTS-PT) a contextos de trabalho tecnológicos, validar a sua versão portuguesa e avaliar as respetivas propriedades psicométricas. A amostra foi composta por 1107 docentes do ensino superior (DES) português. Foram utilizadas duas subamostras distintas e uma subamostra de seguimento para a análise fatorial exploratória, a análise fatorial confirmatória e os testes de fiabilidade. Os resultados exploratórios indicaram uma estrutura unifatorial semelhante à escala original. A consistência interna e a fiabilidade teste-reteste revelaram-se elevadas. A estrutura fatorial foi confirmada com um bom ajuste do modelo e evidências de validade fatorial, convergente e discriminante, bem como de fiabilidade composta. Este estudo destaca o contributo da FCTS-PT como uma ferramenta fiável e válida para avaliar o coping flexível com o tecnostress em DES. Oferece uma medida parcimoniosa que pode apoiar o desenvolvimento, o bem-estar e a produtividade deste professorado, disponibilizando dados robustos para fundamentar decisões, intervenções e políticas institucionais.

Palavras chave: tecnologia na educação; gestão do stress; coping; docentes universitários; validaçao de teste.

Higher education institutions play a vital role in advancing the development of citizens, society, and the economy (Behari-Leak, 2017; Nascimento & Correia, 2023). Higher Education Teachers (HETs), as key contributors in this purpose, face numerous demands, including constant interaction with students, maintaining high levels of professional performance, achieving goals and meeting deadlines, all while fulfilling regular curricular obligations and other job-related responsibilities. These pressures often expose them to stress (Belarmino et al., 2025; Teles et al., 2020).

Under the transactional model lens, stress is a dynamic process where individuals interact with and respond to their environment (Cooper et al., 2001; Lazarus, 1966). According to this framework, it is the individuals' perception of the threat and their coping abilities that shape the stress experience. Lazarus and Folkman (1984) defined *coping* as the cognitive and behavioral efforts individuals use to manage situations perceived as stressful by reducing, neutralizing, or tolerating their impact. This perspective underscores the active role of individuals in negotiating their well-being, adapting to disruptive events, and determining both the perception of the stressor and the subsequent response throughout the stress process. When HETs face stressfully contexts, they engage in a cognitive appraisal of the situation and the available resources to cope with it.

The widespread advancements in Information and Communication Technologies (ICT) accelerated the digitalization of education and introduced a new source of stress, further complicating the responsibilities of HETS by requiring them to manage a rapidly changing technological environment while developing new competencies and adaptive strategies (Nascimento & Correia, 2023). These new demands have created and added significant stressors that impact HETs well-being and professional effectiveness (Lázaro et al., 2018), which were exacerbated by the COVID-19 pandemic-imposed containment measures since it forced HETs worldwide to work 100% online. The increasing reliance on technology in academia, therefore, exposes HETs to technostress.

Technostress, initially defined as "a modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner" (Brod, 1984, p. 16), has been extensively studied over the last two decades. Research highlights the psychological distress technology can induce, particularly when technology-related stressors —such as overload and complexity— exceed individual's capacity to adapt (Ayyagari et al., 2011; Bravo-Adasme & Cataldo, 2022; Tarafdar et al., 2007). Although technostress is traditionally associated with negative psychological outcomes, recent studies have also highlighted its potential to elicit psychological eustress —positive stress that can foster engagement, motivation, or improved performance— depending on how individuals perceive and deal with technology-related demands (e.g., Califf et al., 2015, 2020).

Specifically in higher education, technostress is commonly framed as a detrimental force that undermines job satisfaction, performance, and well-being (Jena, 2015; Li & Wang, 2021; Özgür, 2020; Stadin et al., 2020; Truta et al., 2023; Zeeshan et al., 2020). Recent research added to this "dark" perspective and evidenced that, when facing technology-related stressors, HETs can also experience positive psychological responses and positive individual and workplace outcomes (Nascimento, Correia, & Califf, 2024; Nascimento et al., 2025). This perspective is well-founded in comprehensive / holistic theoretical frameworks either of stress (e.g., Nelson & Simmons, 2003), either of technostress (e.g., Califf et al., 2020; Tarafdar et al., 2019). In both cases, coping options play a determinant role (Tarafdar et al., 2019).

Coping strategies can be categorized as problem-focused or emotion-focused (Lazarus & Folkman, 1984). *Problem-focused* coping involves efforts to address the source of stress by improving the person-environment relationship, often through concrete and instrumental actions, such as seeking information or help. *Emotion-focused* coping, on the other hand, aims to regulate or alleviate emotional distress through strategies like minimizing the problem, denial, distraction, or openly discussing difficulties with ICT. While emotion-focused coping provides relief, it does not alter the stressor itself and is more common in situations perceived as unchangeable (Lazarus & Folkman, 1984). Problem-focused coping is used when situations are deemed modifiable. The two coping categories are also referred to in ICT-specific contexts as proactive and reactive coping (Weinert et al., 2019). In these contexts, Pirkkalainen et al. (2019) reported that proactive coping strategies leveraged stressors positively and increased productivity and growth opportunities perception.

Traditional coping research focused on the effects of a single coping strategy (whether it reduces or increases stress) rather than considering individual's changeability (Kato, 2020). In practice, stressors typically elicit a combination of strategies, as no single approach is consistently, maximally and universally adaptive (Kato, 2020; Zimmer-Gembeck et al., 2018). Individuals differ in their repertoire, selection, and reliance on coping strategies. This is in line with the transactional model of stress, which states that coping actions can change depending on the situation demands (Lazarus & Folkman, 1987). Different approaches can, however, have drawbacks. For instance, while problem-focused strategies like intense ICT training may initially seem effective, they could inadvertently cause additional distress. Thus, careful selection of coping strategies is crucial to ensure adaptability.

Recognizing that no single strategy guarantees successful adaptation, the concept of *flexible coping* has emerged. This approach focuses on the individuals' beliefs of flexibility, emphasizing that, rather than encompassing a variety of ways to cope, the individual uses a wide range of strategies and selects different strategies tailored to specific stressors (Zimmer-Gembeck et al., 2018). Flexible coping aligns with existing taxonomies of coping strategies,

such as problem-focused/emotion-focused, cognitive/behavioral, proactive/reactive, or direct/indirect approaches (Gaudioso et al., 2015; Pirkkalainen et al., 2019; Wang et al., 2008; Weinert et al., 2019), as it evaluates an individual's ability to effectively alternate and apply the most suitable strategy to a given situation.

Zimmer-Gembeck et al. (2018), in line with definitions from various theories on adaptive and maladaptive stress response patterns, developed and validated the Self-Perceived Flexible Coping with Stress (SFCS) scale, a measure of self-perceived ability to flexibly manage stressful situations. The SFCS comprises three subscales: a) multiple coping strategy use - a broad "toolbox" of options for managing stressors and the ability to switch between strategies as needed; b) situational coping - awareness that not all stressors require the same coping approach and that different strategies may be needed for specific stressors; and c) coping rigidity - the tendency to persist with a particular strategy regardless of the nature of the stressor (Zimmer-Gembeck et al., 2018).

The original validation of the SFCS was conducted across three studies in Australia (total N > 1,500). Two of these studies focused on adults and young adults (ages 17–56), and one on adolescents (ages 12–19). Across all samples, the scale demonstrated strong psychometric properties. Exploratory and confirmatory factor analyses supported the three-factor structure. Internal consistency was high for all subscales: multiple coping strategy use (α = .94–.96), situational coping (α = .88–.91), and coping rigidity (α = .85–.89). The first two subscales were positively associated with well-being, self-esteem and adaptive coping, and negatively with emotional distress (such as anxiety and depression), whereas the third subscale showed the opposite pattern (Zimmer-Gembeck et al., 2018).

To our knowledge, no cross-cultural validations of the SFCS have been published to date.

Given its strong theoretical foundation and robust psychometric properties, the SFCS is a promising tool to assess how individuals manage stress flexibly in complex environments. Its application to technology-related work stress, however, remains unexplored. In particular, HETs represent a relevant target group, as they face increasing exposure to ICT-induced stress and are often required to adapt rapidly to technological changes. Understanding how HETs cope with technostress —both to mitigate negative outcomes and foster positive psychological responses— has become especially relevant. The COVID-19 pandemic significantly accelerated the integration of technologies into academic life, intensifying the demand for reliable tools to assess and support coping strategies. Yet, the literature shows a clear lack of validated instruments tailored to measure coping with technostress, especially among HETs, and even more so among Portuguese HETs.

To address this gap, this study focuses on the adaptation and validation of the “multiple coping strategy use” (MCSU) subscale of the SFCS (Zimmer-Gembeck et al., 2018),

selected for its comprehensiveness —encapsulating the core of the flexible coping concept — and practical applicability. This subscale captures the ability to maintain a repertoire of coping strategies and switch among them effectively when facing ICT-related stressors. The resulting instrument, named the Flexible Coping with Technostress Scale – Portugal (FCTS-PT), was designed to be both robust and concise, offering practical advantages in research and institutional contexts where reducing application time and increasing participation rates are critical.

Specifically, this study aims to adapt the MCSU subscale of the SFCS to technology-related work contexts and validate its Portuguese version (FCTS-PT) in a sample of HETs by examining its psychometric properties.

This contribution is particularly valuable since it addresses the need for validated instruments in coping research, thereby enhancing the field's applicability —especially within technology-driven work environments. Importantly, the scale holds relevance for education, not only in research but also in supporting evidence-based practices across formal and non-formal teacher training contexts. The FCTS-PT can be integrated into teacher professional development programs to help educators manage technostress, fostering adaptability, well-being, and more productive learning environments. Additionally, the scale can contribute to informal education by raising individual awareness and promoting personal strategies for coping with ICT-related stress. It also offers valuable data to inform higher education policies and interventions, supporting the development of a healthy, resilient workforce and contributing to a sustainable education system.

Method

Participants

A non-probabilistic convenience sample of 1107 higher education teachers from Portugal nationwide was used, 51.3% were female and 68.1% aged 40-59 years (M = 50.5; SD = 9.8; minimum = 21 and maximum = 59). Over half of the participants (67.8%) were employed exclusively in teaching, and most (77.6%) were from public higher education institutions. Regarding teaching experience, 21.5% reported < 10 years, 22.9% of 10-19 years, 32.5% of 20-29 years, 18.6% of 30-39 years, and 4.4% stated > 40 years.

Participation was voluntary, with informed consent obtained at the start of the questionnaire. Participants were informed that the data they provided would be securely stored and treated under strict confidentiality, in accordance with data protection regulations and used only for the purposes of the investigation. The study followed the Declaration of Helsinki and national ethical guidelines for this type of research.

Instruments

Besides the FCTS-PT, the questionnaire included four additional measures for construct validity analysis.

Flexible Coping with Technostress Scale

The FCTS-PT is a 6-item scale adapted from the MCSU (multiple coping strategy use) subscale of the Self-perceived Flexible Coping with Stress scale (SFCS; Zimmer-Gembeck et al., 2018), earlier described in the Introduction. This subscale assesses the extent to which individuals possess a diverse "toolbox" of coping strategies and demonstrate flexibility to switch among them effectively when facing stressors. An example of an adapted item to ICT context is "*I can change how I cope with stress that stems from IT use*" (original: "*I can change how I cope with stress.*"). Responses were rated in a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). In the original validation with adolescents and adults, the MCSU subscale showed high internal consistency (Cronbach α = .94–.96).

Techno-eustress Scale

It is a 5-item scale adapted from the original Eustress Scale by O'Sullivan (2011) and tailored to the organizational ICT context (Califf et al., 2015). It was validated for Portuguese HETs by Nascimento et al. (2024), with a reported Cronbach's alpha of .89. It measures the extent to which technology-induced stress is perceived as beneficial or having a positive impact on individual functioning (Califf et al., 2015). An example item is: *"When faced with technology-related stress, how often do you find that the pressure makes you more productive at work?"* Responses were recorded using a 5-point Likert scale (1 = never to 5 = always).

Usefulness Scale

This 4-item scale, adapted from Ayyagari et al. (2011), who reported a Cronbach's alpha of .94, evaluates an individual's perception of how technology features contribute to improving job performance. An example item is: "*Using ICT improves the quality of my work*." Responses were provided on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

IT Mindfulness Scale

This 4-item scale is a shortened version of the original 11-item measure developed by Thatcher et al. (2018). Both scales were validated for Portuguese HETs by Nascimento & Correia (2024), with a reported Cronbach's alpha of .88 in the short version. The construct is a dynamic IT-specific trait and assesses the extent to which individuals pay attention to technology in the workplace. This includes focus on the present, attending to

details, showing openness to alternative uses, and displaying genuine interest in exploring IT features and troubleshooting issues. An example item is: "*I am often open to learning new ways of using information technologies.*" Participants answered on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Job Satisfaction Scale

This is a 3-item scale proposed by Ragu-Nathan et al. (2008) to measure respondents' levels of job satisfaction by evaluating the positive or pleasurable emotional state derived from their assessment of work or work experiences. An example item is: "*My job is enjoyable.*" Responses were given on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The authors reported a Cronbach's alpha of .87.

Procedure

To the authors' knowledge, the MCSU scale has not, to date, been translated, adapted, or validated in Portuguese samples. First, permission to use the scale in this study was obtained from the original authors. The translation-back translation method was applied, with an English language specialist and a content expert adapting wording to the ICT study context. During translation, item clarity was prioritized by removing inconsistencies and preserving semantic equivalence, considering cultural context and respecting Portuguese grammar (Borsa et al., 2012; Khouri & Silva, 2019). A native English-speaking professional residing in Portugal for several years completed the back translation. Content validity was further confirmed by two Portuguese HETs who regularly used ICT in teaching. The original 7-point Likert scale was adjusted to a 5-point format to align with other scales used within a larger research study, where point standardization was a goal. Research suggests minor changes in response formats do not affect reliability (Aybek & Toraman, 2022). The 5-point format was also chosen to reduce the *status quo* effect, which can lead participants to select the same option when faced with too many choices (Vieira & Dalmoro, 2013).

Data were collected in higher education institution settings and via informal networks. An online questionnaire was created on Google Forms for HETs to self-administer. Direct contact through the authors' networks, combined with snowball sampling, amplified reach across personal and digital channels. Heads of higher education institutions and departments were briefed via email and asked to distribute the study to faculty. HETs were also directly emailed using publicly available contacts on institutional websites.

As scale validation relies solely on self-report as the measurement method, several procedures were implemented to reduce common-method biases —defined as "the variance that is attributable to the measurement method rather than to the construct the measures represent" (Podsakoff et al., 2003, p. 879). These included careful translation, clear item

phrasing to avoid ambiguity, ensuring no right or wrong answers, and guaranteeing confidentiality.

Data analysis

To address the study objectives, a series of statistical analyses were conducted using IBM SPSS Statistics 29 and IBM AMOS Structural Equation Modelling 28.

First, to uncover the underlying factor structure of the scale, an exploratory factor analysis (EFA) was performed on a randomly selected subsample (sample 1, n = 559), using principal components extraction method, robust to multivariate non-normality (Marôco, 2021), and oblique Promax rotation which allows factors not to be independent - more realistic in social sciences (Hair et al., 2019) and suitable for larger datasets (Marôco, 2021).

Next, to confirm the factorial structure, a confirmatory factor analysis (CFA) was conducted on an independent subsample (sample 2, n = 548), using maximum likelihood estimation. Model fit was assessed through the chi-square (χ^2 and χ^2/df) and the Comparative Fit Index (CFI) as relative fit indices, and the Goodness of Fit Index (GFI), Root Mean Square Residual (RMR), and Root Mean Square Error of Approximation (RMSEA, $p \geq 0.05$) as absolute fit indices.

To assess reliability, internal consistency was evaluated using Cronbach's alpha, and temporal stability was tested using test-retest procedures on a follow-up sample (sample 3, n = 712).

To verify construct validity, composite reliability (CR), average variance extracted (AVE), and maximum shared variance (MSV) were calculated. Discriminant validity was further examined by correlating the Flexible Coping with Technostress Scale with other four relevant variables –techno-eustress, (IT) usefulness, IT mindfulness, and job satisfaction. These scales were selected because they have a theoretical and conceptual connection to flexible coping, as adaptive and positive responses to stress in work contexts.

All samples were free of missing data, and item sensitivity was evaluated by analyzing skewness and kurtosis values.

Results

This study aimed to validate the FCTS-PT by examining its psychometric properties in a sample of HETs in Portugal. The results are presented accordingly, covering item sensitivity and distribution properties, factor structure (EFA and CFA), reliability, and validity evidence.

Before conducting EFA, data were screened for normality and outliers. The Kolmogorov-Smirnov test (p > .05) with Lilliefors correction indicated p < .001. However, this test is highly sensitive in large samples (> 200) and often results in p < .05, rendering the impact of non-normality negligible (Hair et al., 2019). Pallant (2020) notes that such

occurrences are typical in social sciences. Skewness ranged from -0.48 to -0.19, and kurtosis ranged from -0.50 to -0.11, all within the acceptable limits of |2.58| (Hair et al., 2019), suggesting good sensitivity. Outliers were controlled by comparing the original mean with the 5% trimmed mean, revealing only slight differences (from .02 to .04), so these cases were retained in the dataset (Pallant, 2020).

Exploratory factor analysis and reliability

The Kaiser–Mayer–Olkin (KMO) was .92 and the Barlett test for sphericity reached statistical significance: $\chi^2(15) = 3487.28$, $p < .001$, demonstrating that sample 1 dataset (n = 559) was appropriate for factor analysis. EFA results are shown in Table 1.

Table 1

Descriptive statistics and EFA results for the FCTS-PT

Item	*M*	*SD*	λ	h^2
1 I can easily find new ways to cope with stress that stems from IT use if needed.	3.42	1.06	.87	.75
[Se necessário, consigo encontrar facilmente novas maneiras de lidar com o stress que advém do uso das TIC.]				
2 Even when the stress that stems from IT use is new to me, I can come up with a way to deal with it.	3.57	0.99	.91	.82
[Mesmo quando o stress originado pelo uso das TIC é novo para mim, encontro uma maneira de lidar com ele.]				
3 When I need to, I can change how I deal with stress that stems from IT use.	3.52	1.00	.93	.86
[Quando necessito, consigo mudar a forma como lido com o stress que vem do uso das TIC.]				
4 I can use many different ways to cope with a new stressor that stems from IT use.	3.37	0.99	.92	.84
[Consigo usar muitas maneiras diferentes de lidar com um novo stressor proveniente das TIC.]				
5 When stress that stems from IT use has not improved, I can find new ways to try to cope.	3.43	0.96	.89	.79
[Quando o stress que advém do uso das TIC não melhora, consigo encontrar novas maneiras de procurar lidar com ele.]				
6 I can change how I cope with stress that stems from IT use.	3.51	0.94	.90	.82
[Consigo mudar a maneira como lido com o stress originado pelas TIC.]				

Note: Each item includes its Portuguese version underneath.

Eigenvalues = 4.89; % of Variance = 81.43; Cronbach α = .95

λ = item factor loading; h^2 = communalities

All items loaded onto a single factor, accounting for 81.4% of the total variance, with strong factor loadings and communalities well above the recommended cutoffs of λ > .5 and h^2 > .5 (Hair et al., 2019). Internal consistency of α = .95 was high (Hair et al., 2019).

Although the recommended interval for test-retest reliability is 15–30 days, this study collected within-subject data from 712 participants (sample 3, n = 712) who completed the Flexible Coping with Technostress Scale nine months later as part of a separate study. This extended time gap could have reduced correlations; however, strong and significant correlations were observed between scores from both administrations (r = .61; p < .001). This result confirms the temporal stability of the scale.

Confirmatory factor analysis

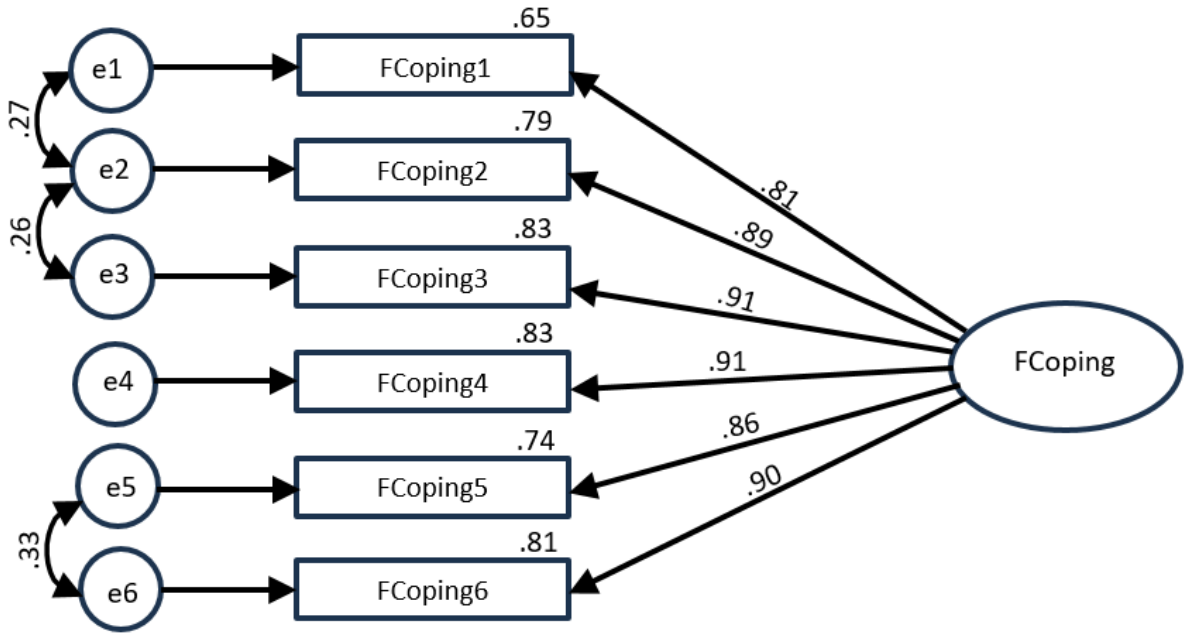
Using sample 2 (n = 548), CFA tested if the factorial structure of the Flexible Coping with Technostress Scale was appropriate for the Portuguese data. Normality assumptions were assessed using skewness ($|Sk| \leq 0.52$) and kurtosis ($|Ku| \leq 0.52$), both within the recommended thresholds of $|Sk| < 2$ and $|Ku| < 7$ (Finney & DiStefano, 2006).

The initial model did not appropriately fit the data: $\chi^2(9) = 118.67$, p = .001; χ^2/df = 13.19; CFI = .97; GFI = .93; RMR = .021 and RMSEA = .15, p < .001. Since the modification indices suggested indications for the model improvement, covariances between three error pairs comprising consecutive items with comparable content were added (see Figure 1). An acceptable model fit was then obtained: $\chi^2(6) = 9.37$, p = .154; χ^2/df = 1.56; CFI = .99; GFI = .99; RMR = .01; RMSEA = .03, p = .746.

As for local adjustment, factorial validity was supported by R^2 values > .65 and by item factor loadings between .81 and .91, thus exceeding the .50 threshold (Hair et al., 2019). Convergent validity was confirmed by an AVE of .78, surpassing the .50 cutoff, while composite reliability reached .96, well above the .70 standard (Fornell & Larker, 1981; Hair et al., 2019). The CFA results are presented in Figure 1.

Figure 1

CFA results for the FCTS-PT



Discriminant validity was also confirmed (Table 2). In all cases, $\sqrt{\text{AVE}}$ exceeded the correlations between constructs, the MSV was lower than the AVE (Hair et al., 2019), and all correlations were ≤ .54 (i.e., below .80). These findings indicate that the FCTS-PT distinguish itself from related constructs.

Table 2

Discriminant validity evidence for the FCTS-PT

	CR	AVE	MSV	FCop	TEu	Usef	ITM	JSat
FCop	.96	.78	.24	**.86**				
TEu	.89	.63	.29	.44***	**.79**			
Usef	.93	.76	.24	.30***	.40***	**.87**		
ITM	.93	.58	.29	.49***	.54***	.49***	**.76**	
JSat	.85	.65	.14	.36***	.17***	.23***	.38***	**.81**

Note: CR = Composite reliability; AVE = Average variance extracted; MSV = Maximum shared variance; FCop = Flexible coping with technostress; TEu = Techno-eustress; Usef = IT Usefulness; ITM = IT Mindfulness; JSat = Job satisfaction.

Square-root of the AVEs is reported in bold along the diagonal of the correlation of constructs.

*** $p < .001$.

Discussion

Digital education initiatives have profoundly transformed the work of HETs, requiring the integration of more technology into teaching, research and other job-related tasks. While these initiatives aim to enhance education and drive societal progress, they also introduce challenges - particularly the need to manage technostress. The adverse effects of this stress are widely recognized as threats to HETs' well-being. However, consistent with a holistic understanding of technostress, recent cross-sectional (Nascimento, Correia, & Califf, 2024) and longitudinal (Nascimento et al., 2025) research in HETs suggests that ICT-induced stress can also produce positive outcomes, especially when flexible coping strategies are used. Therefore, exploring how HETs cope with both the negative and positive sides of technostress is essential to fostering meaningful and satisfying professional experiences.

Grounded in the theoretical perspective that no single coping approach is universally effective, this study adapted and validated the MCSU (multiple coping strategy use) subscale of the Self-Perceived Flexible Coping with Stress Scale (SFCS; Zimmer-Gembeck et al., 2018) for Portuguese HETs in ICT-based work contexts. To our knowledge, this is the first adaptation and validation of any part of the SFCS to a different linguistic, cultural, or professional setting - and specifically the first instrument assessing flexible coping with technostress among the Portuguese population.

Using data from 1107 Portuguese HETs, the resulting scale – the Flexible Coping with Technostress Scale (FCTS-PT) demonstrated strong psychometric properties. Exploratory and confirmatory factor analyses supported a one-dimensional structure, consistent with the original model (Zimmer-Gembeck et al., 2018). All six items loaded highly onto a single factor explaining over 80% of the variance, the model's fit was adequate, and construct validity was established. Internal consistency was excellent, matching the α = .94–.96 range found in the original validation. This indicate that the scale captures the construct of flexible coping in the specific context of ICT stressors.

As no cross-cultural validations of the SFCS exist to date, comparison with other country's data was not possible. However, the findings are consistent with the original Australian results, suggesting the MCSU subscale retains its conceptual integrity in new cultural and professional contexts —thus reinforcing its robustness.

Importantly, while the original validation included adolescents and university students, this study applied the measurement on adult professionals in demanding work environments, providing a concise and empirically robust tool for assessing how HETs cope with ICT-related stress.

This study holds significant relevance for both teacher training and higher education policy. The FCTS-PT is a practical tool that can guide interventions supporting educators'

professional development, offering a parsimonious evidence-based measure to assess coping flexibility when facing ICT challenges. Integrating this scale into training programs can help HETs better manage technostress, fostering resilience and well-being. By equipping teachers with the skills to flexibly adapt to technostressors, the FCTS-PT contributes to a more supportive and productive educational environment. In the context of ongoing reforms and challenges in higher education, the instrument also offers valuable data to inform policies aimed at building a healthy, resilient workforce. Understanding how educators cope with technostress is crucial for developing strategies to prevent burnout and increase job satisfaction, ultimately enhancing conditions for a sustainable and thriving higher education system. Therefore, the FCTS-PT has potential for psychological and educational impact in formal and non-formal education settings, and in informal educational contexts where individuals engage in self-regulated learning to adapt to digital demands, serving as a valuable resource across diverse educational environments.

Moreover, the FCTS-PT lays the groundwork for future application across Portuguese-speaking countries and contributes to advancing the Sustainable Development Goals (United Nations, 2015), particularly in domains such as education and health.

Limitations and future research directions

Some limitations should be mentioned regarding this study. Despite the careful translation and adaptation procedures, common-method bias may still be present, as data were collected solely through self-report measures. Moreover, the study focused on a specific population –HETs– which limits the generalizability of the findings to other professional or cultural contexts.

Future studies could benefit from using time-lagged data collection or longitudinal designs to assess the predictive validity of the FCTS-PT in relation to work outcomes. It would also be valuable to extend the validation of the FCTS-PT to other occupational groups, to the general Portuguese population, and across different national and culture settings.

Financial support

This work is funded by national funds through FCT – Fundação para a Ciência e a Tecnologia (Portugal), I.P., under the projects UIDB/04005/2020 (https://doi.org/10.54499/UIDB/04005/2020) and (https://doi.org/10.54499/UIDB/04011/2020).

References

AYBEK, Eren C.; & TORAMAN, Cetin (2022). How many response categories are sufficient for Likert type scales? An empirical study based on the Item Response Theory. *International Journal of Assessment Tools in Education, 9*(2), 534–547. https://doi.org/10.21449/ijate.1132931

AYYAGARI, Ramakrishna; GROVER, Varun; & PURVIS, Russel (2011). Technostress: Technological antecedents and implications. *MIS Quarterly: Management Information Systems, 35*(4), 831–858. https://doi.org/10.2307/41409963

BEHARI-LEAK, Kasturi (2017). New academics, new higher education contexts: A critical perspective on professional development. *Teaching in Higher Education, 22*(5), 485–500. https://doi.org/10.1080/13562517.2016.1273215

BELARMINO, John P.; RESMA, Jeson; SENIAL, Camelle R.; & SARSALE, Jackylou (2025). Depression, anxiety, and stress: Prevalence and narratives among Filipino pre-service teachers. *Revista de Estudios e Investigación en Psicología y Educación*, *12*(1). https://doi.org/10.17979/reipe.2025.12.1.11168

BORSA, Juliane C.; DAMÁSIO, Bruno F.; & BANDEIRA, Denise R. (2012). Adaptação e validação de instrumentos psicológicos entre culturas: Algumas considerações [Cross-cultural adaptation and validation of psychological instruments: Some considerations]. *Paidéia*, *22*(53), 423–432. https://doi.org/10.1590/S0103-863X2012000300014

BRAVO-ADASME, Natalia; & CATALDO, Alejandro (2022). Understanding techno-distress and its influence on educational communities: A two-wave study with multiple data samples. *Technology in Society*, *70*, Article 102045. https://doi.org/10.1016/j.techsoc.2022.102045

BROD, Craig (1984). *Technostress: The human side of the computer revolution*. Addison-Wesley.

CALIFF, Christopher B.; SARKER, Saonee; & SARKER, Suprateek (2020). The bright and dark sides of technostress: A mixed-methods study involving healthcare IT. *MIS Quarterly: Management Information Systems*, *44*(2), 809–856. https://doi.org/10.25300/MISQ/2020/14818

CALIFF, Christopher B.; SARKER, Saonee; SARKER, Suprateek; & FITZGERALD, Cynthia (2015). The bright and dark sides of technostress: An empirical study of healthcare workers. *Thirty Sixth International Conference on Information Systems*, 1–13. https://aisel.aisnet.org/icis2015/proceedings/IShealth/15

COOPER, Cary L.; DEWE, Philip J.; & O'DRISCOLL, Michael P. (2001). *Organizational stress. A review and critique of theory, research and applications*. Sage. https://doi.org/10.4135/9781452231235

FINNEY, Sara J.; & DISTEFANO, Christine (2006). Non-normal and categorical data in structural equation modeling. In de Gregory R. Hancock & Ralph O. Mueller (Eds.), *Structural Equation Modeling: A second course* (pp. 269–314). Information Age Publishing.

FORNELL, Claes; & LARKER, David F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *8*(1), 39–50. https://doi.org/10.2307/3151312

GAUDIOSO, Fulvio; TUREL, Ofir; & GALIMBERTI, Carlo (2015). Explaining work exhaustion from a coping theory perspective: Roles of techno-stressors and technology-specific coping strategies. *Annual Review of CyberTherapy and Telemedicine*, *13*, 14–20. https://doi.org/10.3233/978-1-61499-595-1-14

HAIR, Joseph F.; BLACK, William C.; BABIN, Barry J.; & ANDERSON, Rolph E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

JENA, Rabindra K. (2015). Technostress in ICT enabled collaborative learning environment: An empirical study among Indian academician. *Computers in Human Behavior*, *51*, 1116–1123. https://doi.org/10.1016/j.chb.2015.03.020

KATO, T. (2020). Examination of the Coping Flexibility Hypothesis using the Coping Flexibility Scale-Revised. *Frontiers in Psychology*, *11*, Article 561731. https://doi.org/10.3389/fpsyg.2020.561731

KHOURI, Nayara; & SILVA, Jonas C. (2019). Revisão narrativa: Metodologias de adaptação e validação de instrumentos psicológicos [Literature review: Methodologies of adaptation and validation of psychological instruments]. *Revista Eixo*, *8*(2), 220–229. https://arquivorevistaeixo.ifb.edu.br/index.php/RevistaEixo/article/view/588

LÁZARO, Adriana; SATO, Milena; & TEZANI, Thais (2018). Metodologias ativas no ensino superior: O papel do docente no ensino presencial. *Anais CIET:EnPED:2018*. https://cietenped.ufscar.br/submissao/index.php/2018/article/view/234

LAZARUS, Richard S. (1966). *Psychological stress and the coping process*. McGraw-Hill.

LAZARUS, Richard S.; & FOLKMAN, Susan (1984). *Stress, appraisal and coping*. Springer.

LAZARUS, Richard S.; & FOLKMAN, Susan (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, *1*(3), 141–170. https://doi.org/10.1002/per.2410010304

LI, Lu; & WANG, Xinghua (2021). Technostress inhibitors and creators and their impacts on university teachers' work performance in higher education. *Cognition, Technology and Work*, *23*(2), 315–330. https://doi.org/10.1007/s10111-020-00625-0

MARÔCO, João (2021). *Statistical analysis with SPSS Statistics [Análise estatística com o SPSS Statistics]* (8th ed.). Report Number.

MONAT, Alan; & LAZARUS, Richard S. (Eds.). (1991). *Stress and coping: An anthology* (3rd ed.). Columbia University Press.

NASCIMENTO, Lígia; & CORREIA, Manuela F. (2023). Evolution drivers for the higher education teacher. In M. V. Kaya; & S. Bayrakdar (Eds.), *Social and economic studies within the framework of emerging global developments* (Vol. 3, pp. 307–318). Peter Lang Publishing. https://doi.org/10.3726/b20968

NASCIMENTO, Lígia; & CORREIA, Manuela F. (2024). Validação portuguesa da escala de IT Mindfulness [Portuguese validation of the IT Mindfulness scale]. *RISTI - Revista Ibérica de Sistemas e Tecnologias de Informação*, *55*, 71–86. https://doi.org/10.17013/risti.55.71-86

NASCIMENTO, Lígia; CORREIA, Manuela F.; & CALIFF, Christopher B. (2024). Towards a bright side of technostress in higher education teachers: Identifying several antecedents and outcomes of techno-eustress. *Technology in Society*, *76*, Article 102428. https://doi.org/10.1016/j.techsoc.2023.102428

NASCIMENTO, Lígia; CORREIA, Manuela F.; & CALIFF, Chistopher B. (2025). Techno-eustress under remote work: A longitudinal study in higher education teachers. *Education and Information Technologies*. https://doi.org/10.1007/s10639-025-13459-y

NASCIMENTO, Lígia; CORREIA, Manuela F.; & O'SULLIVAN, Geraldine (2024). The upside of teachers' technostress: Adaptation and validation of a techno-eustress scale. *International Journal of Instruction*, *17*(4), 1–18. https://doi.org/10.29333/iji.2024.1741a

NELSON, Debra L.; & SIMMONS, Bret L. (2003). Health psychology and work stress: A more positive approach. In J. C. Quick; & L. E. Tetrick (Eds.), *Handbook of occupational health psychology.* (pp. 97–119). American Psychological Association. https://doi.org/10.1037/10474-005

O'SULLIVAN, Geraldine (2011). The relationship between hope, eustress, self-efficacy, and life satisfaction among undergraduates. *Social Indicators Research*, *101*(1), 155–172. https://doi.org/10.1007/s11205-010-9662-z

ÖZGÜR, Hasan (2020). Relationships between teachers' technostress, technological pedagogical content knowledge (TPACK), school support and demographic variables: A structural equation modeling. *Computers in Human Behavior*, 112, Article 106468. https://doi.org/10.1016/j.chb.2020.106468

PALLANT, Julie (2020). *SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS* (7th ed.). Routledge.

PIRKKALAINEN, Henri; SALO, Markus; TARAFDAR, Monideepa; & MAKKONEN, Markus (2019). Deliberate or instinctive? Proactive and reactive coping for technostress. *Journal of Management Information Systems*, *36*(4), 1179–1212. https://doi.org/10.1080/07421222.2019.1661092

PODSAKOFF, Philip M.; MACKENZIE, Scott B.; LEE, Jeong Y.; & PODSAKOFF, Nathan P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

RAGU-NATHAN, T. S.; TARAFDAR, Monideepa; RAGU-NATHAN, Bhanu S.; & TU, Qiang (2008). The consequences of technostress for end users in organizations: Conceptual development and validation. *Information Systems Research*, *19*(4), 417–433. https://doi.org/10.1287/isre.1070.0165

STADIN, Magdalena; NORDIN, Maria; ANDERS, Brostrom; MAGNUSSON HANSON, Linda L.; WESTERLUND, Hugo; & FRANSSON, Eleonor I. (2020). Technostress operationalised as information and communication technology (ICT) demands among managers and other occupational groups - Results from the Swedish Longitudinal Occupational Survey of Health (SLOSH). *Computers in Human Behavior, 114*, Article 106486. https://doi.org/10.1016/j.chb.2020.106486

TARAFDAR, Monideepa; COOPER, Cary L.; & STICH, Jean-François. (2019). The technostress trifecta - techno eustress, techno distress and design: Theoretical directions and an agenda for research. *Information Systems Journal*, *29*(1), 6–42. https://doi.org/10.1111/isj.12169

TARAFDAR, Monideepa; TU, Qiang; RAGU-NATHAN, Bhanu S.; & RAGU-NATHAN, T. S. (2007). The impact of technostress on role stress and productivity. *Journal of Management Information Systems*, *24*(1), 301–328. https://doi.org/10.2753/mis0742-1222240109

TELES, Renata; VALLE, Antonio; RODRÍGUEZ, Susana; PIÑEIRO, Isabel; & REGUEIRO, Babiana (2020). Perceived stress and indicators of burnout in teachers at Portuguese higher education institutions (HEI). *International Journal of Environmental Research and Public Health*, *17*(9). https://doi.org/10.3390/ijerph17093248

THATCHER, Jason B.; WRIGHT, Ryan T.; SUN, Heshan; ZAGENCZYK, Thomas J.; & KLEIN, Richard (2018). Mindfulness in information technology use: Definitions, distinctions, and a new measure. *MIS Quarterly: Management Information Systems*, *42*(3), 831–847. https://doi.org/10.25300/MISQ/2018/11881

TRUTA, Camelia; MAICAN, Catalin I.; CAZAN, Ana-Maria; LIXĂNDROIU, Radu C.; DOVLEAC, Lavinia; & MAICAN, Maria A. (2023). Always connected @ work. Technostress and well-being with academics. *Computers in Human Behavior*, *143*, Article 107675. https://doi.org/10.1016/j.chb.2023.107675

UNITED NATIONS. (2015). *Transforming our world: The 2030 agenda for sustainable development. Resolution adopted by the General Assembly*. https://sdgs.un.org/2030agenda

VIEIRA, Kelmara M.; & DALMORO, Marlon (2013). Dilemas na construção de escalas tipo likert: O número de itens e a disposição influenciam nos resultados? *Revista Gestão Organizacional*, *6*(3), 161–174. https://doi.org/10.22277/rgo.v6i3.1386

WANG, Kanliang; SHU, Qin; & TU, Qiang (2008). Technostress under different organizational environments: An empirical investigation. *Computers in Human Behaviour*, *24*(6) 3002-3013. https://doi.org/10.1016/j.chb.2008.05.007

WEINERT, Christoph; MAIER, Christian; LAUMER, Sven; & WEITZEL, Tim (2019). How do users respond to technostress? An empirical analysis of proactive and reactive coping. *Proceedings of the 52nd Hawaii International Conference on System Sciences*, 5103–5112. https://doi.org/10.24251/hicss.2019.613

ZEESHAN, M.; CHAUDHRY, Abid G.; & KHAN, Shaheer E. (2020). Pandemic preparedness and techno stress among faculty of DAIs in Covid-19. *Sir Syed Journal of Education; & Social Research*, *3*(2), 383–396. https://doi.org/10.36902/sjesr-vol3-iss2-2020(383-396)

ZIMMER-GEMBECK, Melanie J.; SKINNER, Ellen A.; MODECKI, Kathrin L.; WEBB, Haley J.; GARDNER, Alex A.; HAWES, Tanya; & RAPEE, Ronald M. (2018). The self-perception of flexible coping with stress: A new measure and relations with emotional adjustment. *Cogent Psychology*, *5*(1), Article 1537908. https://doi.org/10.1080/23311908.2018.1537908

Receipt date: 22 December 2024
Review date: 22 July 2025
Acceptance date: 27 July 2025
Publication date: 18 August 2025