

Technostress: A Systematic Review Of The Impact Of Technology On The Mental Health Of Education Professionals

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Abstract:

The aim of this article was to analyse the impact of the intensive use of Digital Information and Communication Technologies (DICTs) on teachers' mental health. To this end, a systematic review was carried out on the Scielo and Google Scholar platforms, under the guidance of the PRISMA guidelines. As an inclusion criterion, only articles of Brazilian nationality and published between 2019 and 2023 were selected. The survey involved the use of keywords in association with Boolean operators "AND" and "OR", resulting in a sample made up of 6 scientific articles. As a result, it was found that there is a complex dynamic between Higher Education Institutions (HEIs) and teachers, showing that, despite the efforts of HEIs to provide support, the adverse effects associated with the constant use of online platforms are notable, manifesting themselves in anxiety and communication fatigue. A direct association was observed between the impaired mental health of higher education teachers and the stress resulting from the use of Information and Communication Technologies (ICT). Techno-stress, identified as a significant component of this dynamic, highlights the urgent need to implement institutional policies and practices aimed at mitigating these stress factors, promoting healthier and more sustainable working environments for teachers.

Key Word: Technostress; technologies; mental health; teachers; education.

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I. Introduction

Techno-stress, an increasingly present phenomenon in contemporary society, refers to the stress caused by constant interaction with digital technologies. The ubiquity of electronic devices and the growing dependence on digital tools in work, education and everyday life contribute to the emergence of this specific type of stress. Incessant connectivity, combined with the pressure to always be online and available, can lead to a state of cognitive and emotional overload (SALLA; STICCA; CARLOTTO, 2022; ALEVATO, 2009).

According to Pereira, Silva and Novello (2018), the instantaneous nature of digital communications creates a sense of urgency, resulting in difficulties in disconnecting and relaxing. Continuous exposure to bright screens and the need to process large volumes of information can contribute to sleep problems, mental fatigue and anxiety. Techno-stress is also related to expectations of being constantly updated and the feeling of being under constant surveillance, negatively impacting mental health and general well-being.

In the educational context, this technological transformation can be particularly challenging for teachers. The pressure to adapt to new digital tools, the demand to constantly update teaching methodologies and information overload can create an environment conducive to technostress. The need to balance the traditional demands of teaching with the increasing expectations of technology integration can be exhausting for educators (GONÇALVES et al., 2022).

Constant connectivity, whether through emails, online teaching platforms or educational social networks, can lead to a feeling of always being "on", contributing to the difficulty of switching off and, consequently, to technostress. In addition, the pressure to keep up to date in an increasingly digitalised educational environment can generate anxiety and negatively impact teachers' emotional wellbeing (GIMENEZ; MACHADO; JIMENEZ, 2017).

Thus, considering the growing presence of digital technologies in the educational environment, it is crucial to understand how these changes affect the emotional and psychological well-being of educators. Faced with this problem, this research aimed to analyze the impact of the intensive use of Digital Information and Communication Technologies (DICTs) on teachers' mental health.

II. Material And Methods

This research was characterized as a systematic review, given the need to comprehensively analyze the available evidence on the impact of the intensive use of Digital Information and Communication Technologies (DICTs) on teachers' mental health. According to Galvão and Ricarte (2019), a systematic review is a research methodology that seeks to systematically identify, evaluate and synthesize the available evidence in relation to a specific research question, providing a more comprehensive and grounded analysis of the topic in question.

As Donato and Donato (2019) point out, a systematic review is a type of research that aims to minimize bias and provide an impartial synthesis of the existing evidence on a given topic. This method is especially relevant when you want to examine a substantial body of literature, as is the case with the relationship between the use of DICTs and teachers' mental health.

In this study, the systematic review was carried out under the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. PRISMA establishes a series of steps and criteria for conducting and transparently reporting systematic reviews, guaranteeing the methodological quality of the process and the replicability of the study (GALVÃO; TIGUMAN; SARKIS-ONOFRE, 2022).

The articles were searched on the Scielo and Google Scholar platforms, with the aim of covering national and international sources. This approach seeks to ensure a comprehensive and representative view of the research available on the subject, considering the relevance of including both local and international studies to understand the impact of DICTs on teachers' mental health in different contexts. Keywords such as "mental health", "teachers", "Digital Technologies", "technostress", among others, were used to direct the search and ensure the inclusion of studies pertinent to the scope of the research.

The careful choice of keywords contributes to the accuracy and comprehensiveness of the survey, ensuring that the studies included are truly relevant to the topic at hand. The keywords were associated with Boolean operators "AND" and "OR", providing a more targeted search strategy. The "AND" operator was used to ensure that the articles retrieved contain all the keywords specified, refining the search and ensuring that the studies selected simultaneously address aspects related to mental health, teachers and Digital Information and Communication Technologies (DICTs).

On the other hand, the "OR" operator was used to expand the search to include synonyms, related terms and conceptual variations of the keywords. This broadened the search coverage, considering that different studies use different terminologies to refer to the same concepts. The efficient combination of these operators allowed for a balanced search, ensuring both precision in the selection of studies and the necessary breadth of coverage to contemplate different perspectives on the topic.

As for the inclusion criteria, it was decided to use time criteria to select the articles, limiting the search to publications between 2019 and 2023. This choice was justified by the need to cover recent studies, considering that the rapid evolution of digital technologies can significantly impact the dynamics of teachers' mental health in a short period of time. As an inclusion criterion, only Brazilian and scientific articles associated with the research topic were considered. This delimitation aimed to ensure a more specific and contextual analysis in relation to the Brazilian reality, taking into account specific cultural, structural and educational aspects of the national context.

In this way, theses, monographs, duplicate articles, articles of other nationalities and those not associated with the topic of this research were discarded. The careful exclusion of these types of documents and the refined screening of articles are crucial steps in ensuring the quality and relevance of the systematic review.

Theses and monographs were discarded based on the inclusion criterion of scientific articles, in order to maintain a more specific focus on research that has undergone the rigorous peer review process characteristic of scientific production. The exclusion of these types of documents contributes to the robustness of the analysis, prioritizing evidence from more careful and academically validated studies.

Removing duplicate articles avoids redundancy in the systematic review, ensuring that each study is only counted once. This contributes to the integrity and transparency of the selection process, avoiding distortions in the results due to repeated information.

The exclusion of articles from other nationalities, combined with the criterion of including only Brazilian studies, allows for a more contextual analysis in relation to the reality of the Brazilian educational environment.

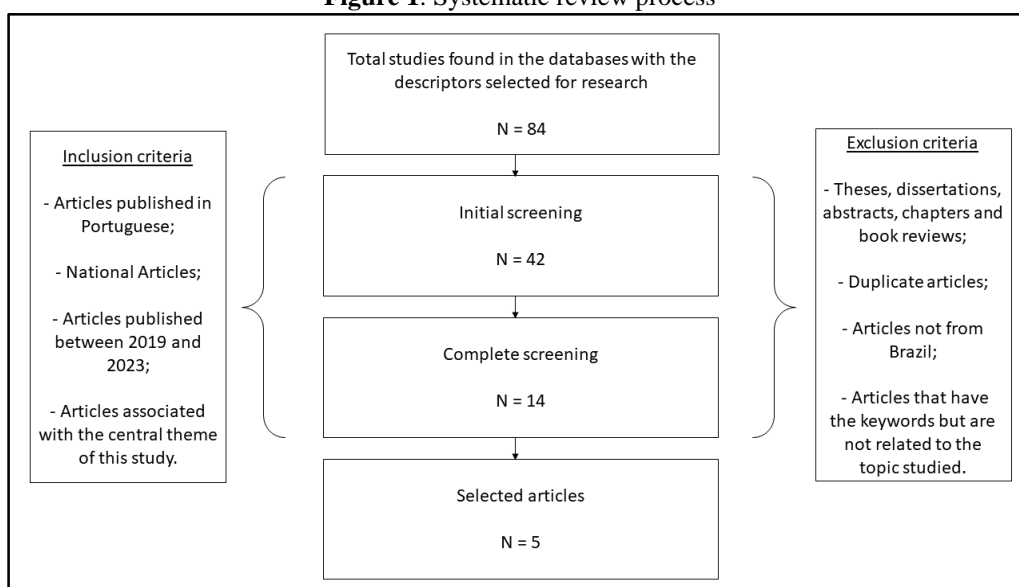
This delimitation is relevant, considering the specific cultural, structural and educational particularities of the national context.

In addition, the elimination of studies not associated with the research topic is essential to maintain the coherence and relevance of the scope of the systematic review. This measure ensures that all the articles included are aligned with the research objectives, contributing to a more consistent analysis centered on the specific theme of the relationship between the use of DICTs and teachers' mental health.

The articles were analyzed in two stages: initial screening and full screening. In the initial screening, the titles and abstracts of the articles were assessed to determine their preliminary relevance in relation to the research objectives. This stage allowed for a quick and efficient selection, discarding articles that clearly did not meet the established inclusion criteria.

In the full screening, the articles selected in the previous stage were subjected to a more detailed analysis, involving a full reading of the content. During this phase, aspects such as the methodology used, the results obtained and the conclusions of the studies were checked. This more in-depth approach enabled a more careful assessment of the methodological quality and scientific contribution of each article. As a result, a sample of 5 articles was obtained, as shown in figure 1.

Figure 1. Systematic review process



Source: Research data (2023).

III. Result

As a result of this systematic review, five articles were selected, as shown in Table 1.

Table 1. Articles selected in the systematic review

Authors	Research objective	Methodology	Conclusion of the research
Jesus and Rebolo (2023)	To present the results of a study into the relationship between malaise, more specifically the levels of teacher stress and technostress, and the excessive use of Digital Information and Communication Technologies.	Quanti-qualitative, descriptive and exploratory research	The research addresses the challenges faced by teachers during Emergency Remote Education (ERE) and highlights the technostress resulting from the intensive use of Digital Information and Communication Technologies (DICTs). Despite the efforts of Higher Education Institutions (HEIs) to offer support, the study reveals negative effects, such as anxiety and communication fatigue, associated with the constant use of online platforms. However, ERE has also provided positive experiences, introducing new teaching and learning approaches, especially through continuing training. The conclusion highlights that technology is not neutral in the pedagogical relationship, emphasizing the importance of continuous training to deal with technological demands. The inclusion of subsidies in initial teacher training is recommended. HEIs are urged to invest in continuing training, addressing technological and socio-emotional aspects in order to balance pre-pandemic teaching models with innovative resources experimented with during ERE. The research highlights the ongoing need for studies on teacher well-being, adapting teaching

			practice to the demands of contemporary society.
Pereira, Hecktheuer and Neto (2021)	Understanding the state of the art through studies on burnout and technostress in university teaching in Brazil	Literature review	The results show that, despite the conceptual complexities related to burnout and technostress, transformations in the world of work, uncertainty in the face of pressure for productivity, competition and precarious labor relations make up the contemporary context. This context suggests the manifestation of indicators that compromise the mental health of higher education teachers, as observed through multiple methodological approaches in the studies analyzed. This impairment is associated with the stress induced by the use of Information and Communication Technologies (ICT). The material gathered is especially relevant given the increase in the use of technological tools, the intensification of remote working and the general scenario of constantly changing variables in the work environment, including salary, workload and number of students. These factors are related to the suffering and illness of university lecturers.
Rosa, Junior and Zumstein (2022)	Deepen studies on technostress to broaden understanding of this phenomenon in the field of education	Literature review	The advance of the Internet has resulted in the creation of an extensive network between humans and machines, transforming relationships through Digital Information and Communication Technologies (DICTs). These technologies, such as email, social networks, smartphones and other devices, have revolutionized habits and lifestyles. However, excessive exposure to these technologies can lead to technostress, a phenomenon that often goes unnoticed due to constant immersion in social networks and applications. It is crucial to promote awareness of technostress in society, since symptoms can be treated in isolation without considering the influence of DICTs. Psychoeducation is key to helping people recognise the limits of hyperconnectivity. Mental health campaigns can also play a vital role in reducing technological stress. The article contributes to understanding the phenomenon of technostress, seeking to promote reflection on the relationship between humans and new technologies, especially in the face of the increased use of these technologies during the Covid-19 pandemic.
Goebel and Carlotto (2019)	To identify the predictive power of psychosocial variables (perception of occupational stressors and contextual stressors) for the two dimensions of Techno-stress, Techno-anxiety and Technofatigue, in distance learning teachers	Quantitative research	The study identified a predictive model for the impact of technology on teachers' mental health, highlighting variables such as lack of autonomy, need for updating, relationship with students and work-family balance. The use of a consistent theoretical model and adapted instruments, with good reliability in the sample, are strengths of the study. However, limitations such as the cross-sectional design and the non-probabilistic sample are recognised. The study suggests replication with a stratified national sample and the inclusion of new variables. The findings can inform preventive actions, focussing on time management, the use of technology and improving relationships between teachers and students. The participation of teachers in planning their professional practices is also recommended.
Pereira, Grutzmann and Novello (2019)	Map academic studies carried out in the context of dissertations, theses and articles on technostress in math teachers	Bibliographical survey with a qualitative approach	The study revealed the scarcity of research on "technostress in mathematics teachers" in postgraduate programmes, with only one study identified focusing on undergraduates. However, all the studies analyzed addressed aspects related to the dimensions of technostress, indicating that teachers are susceptible to the symptoms of stress associated with digital technologies. Despite the lack of academic research on technostress in Brazil, the need to continue investigating this topic is highlighted, as such studies contribute to the development of strategies aimed at teachers' well-being in the digital age.

Source: Research data (2023).

The research conducted by Jesus and Rebolo (2023) proposes an in-depth analysis of the relationship between malaise, specifically levels of stress and technostress among teachers, and the excessive use of Digital

Information and Communication Technologies (DICTs). By adopting a quantitative-qualitative, descriptive and exploratory approach, the researchers seek to understand the challenges faced by teachers during Emergency Remote Teaching (ERT) and highlight the impacts of technostress resulting from the intensive use of DICTs.

The results of the authors' research reveal a complex dynamic between Higher Education Institutions (HEIs) and teachers where, despite HEIs' efforts to offer support, the negative effects associated with the constant use of online platforms are evident. Anxiety and communication fatigue emerge as consequences of the remote teaching scenario, indicating the need for a critical analysis of the methods and tools implemented during this period.

However, the research also highlights positive aspects resulting from RSE, such as the introduction of new teaching and learning approaches, especially through continuing training. These positive experiences suggest that, despite the challenges, remote learning can provide innovative opportunities for the educational field.

The study's conclusion highlights the non-neutrality of technology in the pedagogical relationship, emphasizing the crucial importance of ongoing training to deal effectively with technological demands. The recommendation to include subsidies in initial teacher training emphasizes the need to prepare educators to face technological challenges from the start of their careers. In addition, HEIs are urged to invest substantially in continuing education, addressing both technological and socio-emotional aspects.

In this scenario, the proposal is to seek a balance between pre-pandemic teaching models and the innovative resources experimented with during ERE. This approach aims not only to adapt teaching practice to the demands of contemporary society, but also to promote a healthier and more sustainable educational environment. The research highlights the ongoing need for studies on teacher well-being, suggesting that adapting teaching practice to the evolutions of contemporary society should be a constant endeavor. This implies a proactive approach to understanding and facing emerging challenges, ensuring that educators are prepared to offer quality teaching in increasingly technological and dynamic contexts.

According to Pereira, Hecktheuer and Neto (2021), in the contemporary context of university teaching work in Brazil, transformations in the world of work play a significant role. Pressure for productivity, competition and precarious labor relations emerge as key factors that negatively influence teachers' mental state. These elements are contextualized in an environment characterized by uncertainty, intensification of remote work or teleworking, and a series of constantly changing variables such as salary, workload and number of students.

There is a direct association between the mental health of higher education teachers and the stress induced by the use of Information and Communication Technologies (ICT). The increased use of technological tools in teaching, the intensification of remote working and the constant changes in the work environment contribute to a situation of suffering and illness among university teachers. The research highlights the importance of considering not only the traditional manifestations of Burnout, but also the specific impacts of technostress.

The scenario described reinforces the need for institutional policies and practices aimed at mitigating these stress factors, promoting healthier and more sustainable working environments for teachers. The study provides a solid basis for understanding the complex interactions between working conditions, technological demands and the well-being of university lecturers in the Brazilian context.

The study carried out by Rosa, Junior and Zumstein (2022) highlights the importance of deepening studies into technostress, with a view to broadening understanding of this phenomenon in the educational context. The initial literature review presents the transformative scenario brought about by the advance of the Internet and the consequent formation of an extensive network between humans and machines, notably through Digital Information and Communication Technologies (DICTs).

These technologies include email, social networks, smartphones and other devices, which have significantly revolutionized habits and lifestyles. The authors emphasize that, despite the benefits provided by these technologies, excessive exposure to them can result in the phenomenon of technostress, an aspect that is often overlooked due to constant immersion in social networks and applications. The importance of promoting awareness of technostress is highlighted, emphasizing that symptoms can be treated in isolation, without considering the influence of DICTs, if there is no broader understanding of the phenomenon.

The proposal to use psychoeducation as a fundamental tool to help people recognise the limits of hyperconnectivity is presented in the text. In addition, mental health campaigns are mentioned as vital tools in reducing technological stress. These strategies aim not only to treat symptoms, but also to create a deeper awareness of the impacts of DICTs on mental health, providing a preventative and educational approach.

The article makes a significant contribution to understanding the phenomenon of technostress by seeking to promote reflection on the relationship between human beings and new technologies. This endeavor becomes even more relevant in the context of the Covid-19 pandemic, during which the use of these technologies has increased substantially. Thus, the study provides a critical and contextual analysis of technostress, considering not only the individual aspects, but also the social and cultural impacts of these technological transformations.

The results of the study by Pereira, Grutzmann and Novello (2019) reveal a significant lack of specific research on "technostress in mathematics teachers" in postgraduate programmes. The identification of only one

study focused on undergraduate students emphasizes the lack of attention given to this specific topic within the academic field. However, it is noteworthy that all the studies analyzed, although scarce, addressed aspects related to the dimensions of technostress, indicating that teachers of this subject are susceptible to the symptoms of stress associated with digital technologies.

The text points to the lack of academic research on technostress in Brazil, but emphasizes the importance of continuing to investigate this subject. This conclusion is based on the realization that such studies contribute significantly to the development of strategies aimed at teacher well-being in the digital age. The finding that math teachers are vulnerable to the effects of technostress highlights the relevance of future research to provide valuable insights and support the creation of policies and practices that promote the mental health of these professionals in the context of the growing use of digital technologies in teaching.

Ultimately, the study not only identifies a gap in research, but also emphasizes the ongoing need to address technostress, particularly in the specific field of mathematics teachers, in order to improve working conditions and promote well-being in this professional category.

IV. Conclusion

The systematic review of studies on the impact of the intensive use of Digital Information and Communication Technologies (DICTs) on teachers' mental health, especially during the period of Emergency Remote Teaching (ERE), reveals a complex dynamic between Higher Education Institutions (HEIs) and teachers. The results indicate that, despite the efforts of HEIs to offer support, the negative effects associated with the constant use of online platforms are evident, manifesting themselves in anxiety and communication fatigue. At the same time, positive aspects are highlighted, such as the introduction of new teaching and learning approaches through continuing training.

The review highlights the direct association between the compromised mental health of higher education lecturers and the stress induced by the use of Information and Communication Technologies (ICT). This context reinforces the need for institutional policies and practices aimed at mitigating these stress factors, promoting healthier and more sustainable working environments for teachers.

The overall conclusion points to the non-neutrality of technology in the pedagogical relationship, emphasizing the crucial importance of ongoing training to deal effectively with technological demands. Recommendations include subsidies in initial teacher training and substantial investment in continuing training, addressing both technological and socio-emotional aspects. The proposal is to seek a balance between pre-pandemic teaching models and the innovative resources experimented with during ERE, with the aim of promoting a healthier and more sustainable educational environment.

As such, the review emphasizes the importance of raising awareness about the impacts of excessive use of technology, suggesting tools such as psychoeducation and mental health campaigns to reduce technological stress. The research highlights the ongoing need for studies on teacher well-being, indicating that adapting teaching practice to the evolutions of contemporary society must be a constant endeavor. This panorama implies a proactive approach to understanding and facing emerging challenges, ensuring that educators are prepared to offer quality teaching in increasingly technological and dynamic contexts.

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