



# Techno-distress and parental burnout: The impact of home facilitating conditions and the system quality

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## Abstract

The incorporation of Information and Communications Technology (ICT) in educational environments has generated diverse effects. The literature has established that the use of ICT can generate techno-distress in both teachers and students. However, the techno-distress and burnout caused in parents who help their children to use technological platforms have not been analyzed in depth. To contribute to closing this theoretical gap, we conducted a study with 131 parents who helped their children to use technological platforms, considering two antecedents of techno-distress and its effect on parental burnout. Our results demonstrate that both the home facilitating conditions and the system quality influence parental techno-distress. Additionally, it was possible to demonstrate that techno-distress has a significant effect on parental burnout. The use of technology in educational environments is increasing at all educational levels. Therefore, the present study provides relevant information that schools can use to reduce the impact of the negative effects generated by technology.

**Keywords** Home facilitating conditions · System quality · Techno-distress · Parental burnout

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# 1 Introduction

The objective of this study is to develop and validate an integrated model of techno-distress/burnout in parents who help their children to use technology for remote classes. During the COVID-19 pandemic, students at all levels had to attend classes online due to pandemic restrictions. For this reason, institutions used various technological tools and platforms to conduct online classes in synchronous or asynchronous modalities (Kanetaki et al., 2022). Although the pandemic is ebbing and students have returned to the classroom, some researchers argue that blended learning and online learning are part of the new post-pandemic normal (Chattaraj & Vijayaraghavan, 2021).

Students at higher levels have managed to adapt to this new normality and the use of technological platforms for online or hybrid classes relatively quickly. However, in the case of younger students, the situation is different. These students have not developed the skills to use these platforms autonomously, so the collaboration and supervision of their parents are essential (Han et al., 2022). However, in some cases, parents do not have enough knowledge and experience to support their children in this way. Parents facing this situation could develop techno-distress.

Despite several studies in educational contexts on the techno-distress caused by technological platforms in online or hybrid classes (Chou & Chou, 2021; Penado-Abilleira et al., 2021; Qi, 2019; Zhao et al., 2022), the techno-distress caused in parents who help their children to use these platforms has not been studied. Moreover, there is ample evidence that techno-distress can lead to burnout in workers (Khedhaouria & Cucchi, 2019; Mahapatra & Pati, 2018; Srivastava et al., 2015; Ya'acob & Aziz, 2021), but how the use of these technologies influences parental burnout has not been addressed in detail. Therefore, this paper seeks to answer two questions: how does the techno-distress caused by the technological platforms used by young children affect their parents, and how does this techno-distress cause burnout in parents?

Based on the transactional model of techno-distress (Ayyagari et al., 2011; Ragu-Nathan et al., 2008), we studied the effect of two antecedents of techno-distress in parents who help their young children to use technology for remote classes. Additionally, we analyzed the influence of this techno-distress on parental burnout. A structural equation model was used in this research, with data from 131 respondents.

This article is divided into five sections. In the next section, we summarize some of the most relevant work on techno-distress and develop the research hypotheses. In the third section, we describe the methodology applied in this study. The fourth section presents the results of the research. In the fifth section, we discuss these results. Finally, the last section summarizes the main conclusions of this research and provides some ideas for future research.

## 2 Theoretical framework and development of research hypotheses

### 2.1 Techno-distress

Techno-distress was defined by Brod (1984) as the inability to use technology in a psychologically healthy way. Years later, Tarafdar et al. (2007) defined techno-distress as stress arising because of attempts to use technology. Additionally, Salanova et al. (2014) established that techno-distress is a negative psychological state that is associated with ICT use.

The literature states that there are different stressors that can cause techno-distress. These stressors can be classified into individual characteristics, characteristics of the organizational environment, and technological characteristics (Kotek & Vranjes, 2022). Individual characteristics include age (Hauk et al., 2019; Nimrod, 2022), gender (De Giovanni & Catania, 2018; Marchiori et al., 2019; Ragu-Nathan et al., 2008), income level (Şahin & Çoklar, 2009), educational level (Ragu-Nathan et al., 2008; Shu et al., 2011), and ICT-related factors (Ishola et al., 2019; Tarafdar et al., 2011). Characteristics of the organizational environment include aspects related to the tasks to be performed (Leung & Zhang, 2017; Molino et al., 2020), the support mechanisms provided by the organization (Li & Wang, 2021), and the culture of the organization (Spagnoli et al., 2020). Finally, technological characteristics include usability features (Ayyagari et al., 2011; Liu et al., 2019), intrusive features (Ayyagari et al., 2011), and dynamic features (Suh & Lee, 2017).

As previously mentioned, research studies have established several factors that can generate techno-distress, including technological characteristics. These characteristics include usability characteristics, intrusive characteristics, and dynamic characteristics (Ayyagari et al., 2011; Liu et al., 2019; Suh & Lee, 2017). Usability characteristics refer to the complexity, usefulness, and reliability of ICT. According to Ayyagari et al. (2011), complexity relates to the effort and training that will be needed to use the technology. Usefulness refers to the fact that, by using ICT, individuals can perform their tasks more efficiently. If the perceived usefulness is not optimal, the use of these technologies will likely decrease (Liu et al., 2019). Reliability refers to how available and reliable the technology is; however, today, ICT in organizational contexts is more complex, as it encompasses various components of the organization. When these technologies fail, they tend to generate distrust in workers, resulting in various consequences (Ayyagari et al., 2011). Intrusive characteristics prevent an individual from being able to generate distance between their work and their personal or private life. On several occasions, workers perceive that ICT generates conflicts between home and work (Suh & Lee, 2017). Finally, there are the dynamic characteristics, which are related to the constant changes or modifications of ICT. In many cases, individuals are not able to adapt quickly to these changes, which have various consequences (Ayyagari et al., 2011; Suh & Lee, 2017).

Additionally, the literature defines five techno-stressors: techno-overload, techno-insecurity, techno-invasion, techno-uncertainty, and techno-complexity. These stressors were first defined by (Tarafdar et al., 2007). Techno-overload

occurs when a person perceives that he/she must work faster due to the incorporation or use of technology. Techno-insecurity occurs when individuals are afraid of losing their jobs because they perceive that their co-workers are better prepared to deal with the use of ICT. Techno-invasion occurs when workers perceive an invasion in their personal lives when they use ICT in work environments; this invasion causes confusion between their work assignments and personal or family activities. Techno-uncertainty tends to be perceived by individuals when ICT devices present changes or are constantly updated, which causes uncertainty regarding these devices. Techno-complexity occurs when individuals perceive that they must spend more time and expend more effort to use a technology.

In addition, researchers have found several consequences of techno-distress in both professional and non-professional settings (La Torre et al., 2019). The main consequences in professional contexts are related to job satisfaction (Khan et al., 2013; Ragu-Nathan et al., 2008), organizational commitment (Ahmad et al., 2014), and job performance (Saganuwan et al., 2015; Tarafdar et al., 2011). In non-professional contexts, the consequences can include anxiety, anger, depression, perceived social pressure, and burnout (Lee, 2016; Reinecke et al., 2017).

The present research studies the effect of two stressors, the home facilitating conditions and the quality of the system, on techno-distress, and in turn, it considers the effect of techno-distress on parental burnout. The literature establishes that stressors can include technological characteristics, which affect the use and adoption of ICT and can increase an individual's level of techno-distress (Ayyagari et al., 2011; Liu et al., 2019; Tu et al., 2005). Two specific technological characteristics, the home facilitating conditions and the system quality, are considered in this study. The home facilitating conditions are defined as the necessary components that must be in the home for a child to be able to use a technology platform. An account with an appropriate Internet connection, a good physical space, and a sufficient number of digital devices are important for parents with younger children. Parents responsible for one or more children must be able to support them technically so that they can connect to their classes. In addition, they must simultaneously fulfill their own tasks, which often include work responsibilities. This situation can be stressful, especially if these parents live in homes with Internet connection problems or must share their digital devices with their children. If this situation is permanent, this technological stress, or techno-distress, will evolve into burnout.

On the other hand, the system quality is related to the desirable characteristics of a system or platform, such as its ease of use, flexibility, and reliability (DeLone & McLean, 1992; Tam & Oliveira, 2016). The quality of the system is also important when a young child is using a technological platform, since the parents will have to help the child to use it properly. If this platform does not meet the minimum system quality requirements, it will be very challenging for parents to complete this task successfully.

As for the consequences of techno-distress, one of those previously mentioned in the literature is burnout. Burnout is a response to emotional and interpersonal stressors and has been studied mainly in work contexts (Maslach et al., 2001; Yener et al., 2020). In the present study, the concept of parental burnout is used, as the

study population consists of parents who assist their young children in the use of technological platforms.

## 2.2 Parental burnout

Burnout is a psychological syndrome that arises in response to various chronic stressors in work contexts (Maslach et al., 2001). It has been defined as a negative psychological state that arises because of stress in work environments (Wu et al., 2022). Burnout usually occurs when there is a mismatch between the demands of a person's job and his or her capabilities (Baranik & Eby, 2016; Wu et al., 2019). Various factors can generate burnout, and in many cases, it will depend on the type of work being performed. However, some of the factors that have been identified are overload, control, rewards, role conflicts, planning problems, and time pressure (Maslach & Leiter, 2016; Schaufeli & Taris, 2014). Burnout has three dimensions: exhaustion, feelings of cynicism and detachment from the job, and a sense of ineffectiveness and lack of accomplishment. It is usually associated with various negative outcomes such as absenteeism, low job satisfaction, and low organizational commitment (Maslach & Leiter, 2016).

Parental burnout is a particular form of burnout. Parental burnout has been defined as “a state of intense exhaustion related to one's parental role, in which one becomes emotionally detached from one's children and doubtful of one's capacity to be a good parent” (Mikolajczak et al., 2019). Parental burnout is characterized by intense exhaustion related to parenting, emotional distancing from children, and a loss of parental fulfillment (Mikolajczak & Roskam, 2020). Parental burnout was initially studied in hospitals, where there was a significant number of parents with children with serious medical diagnoses. These studies established that these parents were exposed to high levels of stress, which led to signs of burnout (Norberg, 2007, 2010; Norberg et al., 2014).

Several factors can cause parental burnout, including the psychological characteristics of the father and mother, a lack of stress management skills, the characteristics of the children, the type of parenting, how the family functions, external support networks, the organization of daily life, and demographic factors (Lindström et al., 2011; Mikolajczak et al., 2018; Sorkkila & Aunola, 2020; Vigouroux & Scola, 2018).

Parental burnout can have various consequences that affect physical and psychological health and the development of family dynamics. On the physical level, it has been found that parents with burnout present elevated cortisol levels, headaches, sleep problems, and blood pressure problems. On the psychological level, parents tend to feel shame and to display addictive behaviors, neglect, and even various levels of violence (Mikolajczak et al., 2019). In terms of family dynamics, the relationship between parents with parental burnout tends to wear down due to constant confrontations (Mikolajczak & Roskam, 2020). These consequences not only affect the parents but can also affect their children. Based on the above, the literature proposes various actions to reduce the effect of parental burnout. From the individual point of view, the literature recommends modifying the perceptions of individuals to reduce stress and developing

individual resources to help people better cope with the stress associated with the parental role. From the collective point of view, the literature recommends creating a less stressful society and providing more external support for parents (Mikolajczak et al., 2021).

There are two validated instruments that can be used to measure parental burnout. The first is known as the Parental Burnout Inventory (PBI), which measures three symptoms: burnout related to one's parental role, emotional distancing from children, and the loss of parental efficiency (Roskam et al., 2017). The second instrument is the Parental Burnout Assessment (PBA), which was created because the PBI was found to fail to reflect the full experience of parental burnout. The PBA establishes four main factors: burnout related to one's own parental role, emotional distancing from children, feelings of being fed up with one's own parental role, and a contrast with how the parent used to and wanted to be (Roskam et al., 2018).

### 2.3 Theoretical gap and hypothesis development

There have been extensive studies concerning the causes and effects of techno-distress. These studies have been developed mainly in work contexts (La Torre et al., 2019; Tarafdar et al., 2019). Over the last few years, there has been a considerable increase in studies related to techno-distress in students and teachers due to online classes (Bravo-Adasme & Cataldo, 2022; Li & Wang, 2021; Penado-Abilleira et al., 2021; Upadhyaya, 2021). However, research about techno-distress in parents due to online classes is limited.

Different family situations can cause techno-distress in parents. In the case of younger children, they still need help from one of their parents to be able to connect to online classes, as they have not yet developed the skills to do this themselves. Furthermore, in some cases, parents have limited or no technical skills, making it difficult for them to help their children. In other cases, the online platforms being used are complex. Another typical situation is that the parent is working online simultaneously and must worry about helping her/his child and fulfilling her/his work duties at the same time. A final typical scenario is that the parent must simultaneously help several children connect to their online classes. All these situations could cause techno-distress in parents, even though they are not the main users of the online platforms being considered.

Additionally, in work and educational contexts, the effect of techno-distress on job burnout has been analyzed (Califf & Brooks, 2020; Mahapatra & Pati, 2018; Srivastava et al., 2015). However, some researchers have stated that it is not yet clear how techno-distress affects burnout. Likewise, the relationship between the use of technology and burnout is also not defined (Berg-Beckhoff et al., 2017). If we consider this relationship in the context of fathers or mothers, the literature is even more limited.

### 2.4 Home facilitating conditions and techno-distress in parents

Facilitating conditions refer to an individual's perception of the resources that facilitate the use of a system. In work contexts, facilitating conditions can include the availability of training and assistance or the provision of support (Lu et al., 2005; Venkatesh et al., 2003, 2012). Due to the limited literature on facilitating conditions in the home context, in this

research, this construct is referred to as home facilitating conditions and is defined as the degree to which parents consider that the necessary technological infrastructure (Internet, physical space, and devices) exists and is available in their home, allowing their child to participate in online classes or activities.

The literature has established that the availability of adequate resources tends to facilitate the use of new technologies (Bervell & Arkorful, 2020; Bervell & Umar, 2018). Additionally, it has been shown that problems with devices, a slow Internet connection, slow devices, and expensive devices can cause problems with the adoption of technology and techno-distress (Çoklar et al., 2017; Şahin & Çoklar, 2009).

Studies in an educational context have shown that there is a significant relationship between the number of devices that a student possesses and techno-distress. That is, students who own more than one device have a higher level of techno-distress, indicating that the number of devices has an important influence on techno-overload and techno-invasion (Essel et al., 2021). On the other hand, a poor Internet connection and constant Internet interruptions make it difficult to perform activities properly and create stressful environments (Chuang et al., 2016). Researchers have established that a slow Internet connection is the factor that contributes the most to techno-distress levels (Okonoda et al., 2017). Additionally, a low-quality Wi-Fi connection has been shown to significantly influence techno-complexity, techno-overload, and techno-invasion (Gabr et al., 2021).

The literature regarding home facilitating conditions and techno-distress in parents is limited. However, it would be expected that a stable Internet connection, sufficient physical space, and an adequate number of devices would allow parents to better help young children to use technological platforms. Having a good perception of this type of infrastructure at home could cause a parent to have a lower level of techno-distress. Considering this, the first hypothesis is proposed.

H1: The home facilitating conditions influence techno-distress in parents who help their young children to use technological platforms.

## 2.5 System quality and techno-distress in parents

Quality is the most desirable characteristic that any system can have, and it is primarily related to usability (DeLone & McLean, 1992, 2003; Gable et al., 2008). The system quality is measurable through the system's ease of use, system flexibility, system reliability, and features associated with intuitiveness, sophistication, and response times. All of these are critical to the decision to use an information system (Aldholay et al., 2018; DeLone & McLean, 2003; Dreheeb et al., 2016; Tam & Oliveira, 2016). In an educational context, the system quality includes features such as usability, flexibility, chat functions, forums, or videos (Alksasbeh et al., 2019; Almaiah et al., 2020).

The literature on the effect of the system quality on techno-distress is limited. However, there are studies that have analyzed the effects on techno-distress of some aspects related to the system quality, such as the ease of use or reliability. These studies show that men experience more techno-distress than women, mainly because men use technology more than women (Gefen & Straub, 2000; Jena & Mahanti, 2014). Additionally, it has been established that usability and



reliability features contribute to reducing the stressful impacts of technology (Ayyagari et al., 2011; Fischer et al., 2019). The quality of an information system is relevant because a low system quality can have a strong influence both inside and outside of an organization. When the system quality is low, system-specific problems can affect employee techno-distress. Researchers have found that the system quality has a significant effect on techno-uncertainty (Yim & Han, 2013).

In educational contexts, it has been possible to establish the importance of the system quality when it comes to incorporating technology and encouraging the use of technology. Additionally, it was found that the system quality is one of the important factors that influence the usability of mobile devices (Almaiah et al., 2022). In the case of parents who help their children to connect to online classes, it would be expected that the quality of the platform used would affect the level of techno-distress. Furthermore, a lower system quality would lead to higher techno-distress. This leads us to the second hypothesis.

H2: The system quality influences techno-distress in parents who help their young children to use technological platforms.

## 2.6 Techno-distress and parental burnout

Burnout is related to a negative outcome that is produced in response to factors that cause stress over a prolonged period in work contexts (Maslach et al., 2001). Several factors can generate job burnout, including stress (Berg-Beckhoff et al., 2017; Lee & Ashforth, 1996; Reinecke et al., 2017). Regarding the stress generated by the use of technology, several studies have determined that a high level of techno-distress in a work context can cause job burnout (Srivastava et al., 2015; Wang et al., 2020).

Several studies that demonstrated the effects of techno-distress on burnout have been conducted for diverse populations, such as workers (Califf & Brooks, 2020; Mahapatra & Pati, 2018), business managers (Srivastava et al., 2015), and students (Upadhyaya, 2021; Zhao et al., 2022). Observations of workers have shown that techno-invasion and techno-insecurity generate burnout and that techno-complexity is not directly related to burnout (Mahapatra & Pati, 2018). For teachers, it has also been possible to confirm that the use of smartphones generates techno-distress and burnout (Isiakpona & Adebayo, 2011; Varanasi et al., 2021). For college students, it has been found that techno-distress significantly affects burnout (Zhao et al., 2022; Upadhyaya, 2021) found that technology-assisted learning causes techno-distress in students, and this leads to learning burnout.

However, research on the influence of techno-distress on parental burnout is very limited. Harris et al. (2021) found that techno-overload and techno-invasion are associated with a high level of work-home conflict and family burnout. Therefore, our third hypothesis is the following.

H3: Techno-distress positively influences parental burnout in parents who help their young children to use technological platforms.

Figure 1 shows the hypothesis model proposed for this research.



### 3 Methodology

Data collection was performed through a self-administered questionnaire, which was distributed online through the QuestionPro platform (<https://www.questionpro.com/>). The questionnaire was constructed with questions that were adapted from and validated in previous research (Table 1).

The total survey consists of 55 questions, including six on home facilitating conditions, five on the system quality, 18 on the four dimensions of techno-distress, and 23 on parental burnout. In addition, three demographic questions were included. Finally, security questions were incorporated to ensure the consistency of the responses. The questions incorporated into the questionnaire to measure the platform quality, techno-distress, and parental burnout were carefully translated to preserve their original meaning.

A scale was developed to measure the home facilitating conditions, because no appropriate scale was found in the literature. For this purpose, a comparison was made between several studies that evaluated technological challenges and obstacles in remote learning contexts (Aboagye et al., 2021; Fabito et al., 2020; Lassoued et al., 2020; Rahiem, 2020). From these investigations, it was possible to identify three main categories: Internet connection and access, the physical space to participate in activities, and devices. The category “Internet connection and access” is mainly associated with a lack of adequate internet, slow connection speeds, and the cost of the Internet plan at home. The category “Physical space” is related to the physical space in the home that can be used for study, work, or online activities. Finally, the category “Devices” is related to the devices that can be used for online activities (computers, telephones, or tablets) and the availability of these devices when one is participating in online activities. Based on these categories, six items were proposed to measure this category: three questions were defined for “Internet connection and access”, one question was defined for “Physical space”, and two questions were defined for “Devices” (Table 9).

Subsequently, to ensure that the participants understood the questions, a pre-test was given to seven parents and guardians. Based on the comments from the pre-test, minor corrections were made, mainly to clarify the meaning of some items. The answers obtained in the pre-test period were not incorporated into the final sample

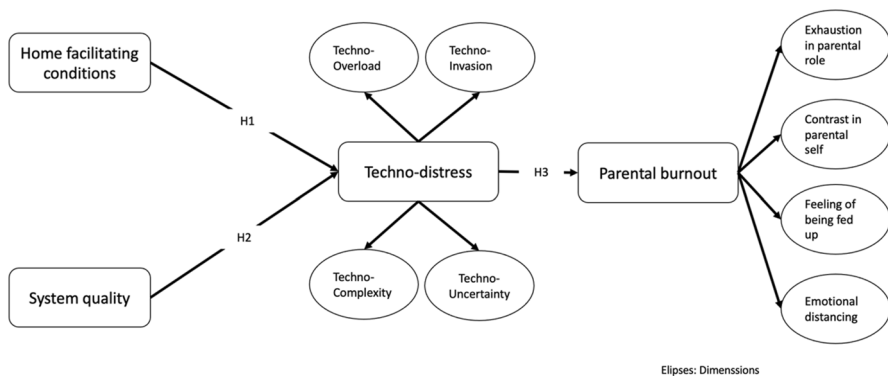


Fig. 1 Proposed hypothesis model

**Table 1** Questions by construct and reference source

| Construct                    | Dimension                   | Number of questions | Reference  |
|------------------------------|-----------------------------|---------------------|--|
| Home facilitating conditions |                             | 6                   | Own elaboration based on (Lassoued et al., 2020; Fabito et al., 2020; Rahiem, 2020; Aboagye et al., 2021). |
| System Quality               |                             | 5                   | (DeLone & McLean, 1992.; DeLone & McLean, 2003; Tam & Oliveira, 2016).                                     |
| Techno-distress              | Techno-overload             | 5                   | (Qi, 2019; Maier et al., 2019).  |
|                              | Techno-invasion             | 4                   |  |
|                              | Techno-complexity           | 5                   |  |
|                              | Techno-uncertainty          | 4                   |  |
|                              | Exhaustion in Parental role | 9                   |  |
| Parental Burnout             | Contrast in parental self   | 6                   | (Roskam et al., 2018).   |
|                              | Feelings of being fed up    | 5                   |  |
|                              | Emotional Distancing        | 3                   |  |

that was analyzed. After modifications were made according to the results of the pre-test, the relevant information was collected by distributing the survey online. A sample of 131 questionnaires was analyzed.

For the analysis, we used a second-order structural equation model (PLS-SEM). Various researchers have highlighted the advantages of PLS-SEM over other methods, such as CB-SEM. PLS-SEM should be used when (a) a small population restricts the sample size; (b) distribution issues, such as lack of normality, are a concern; (c) the analysis is concerned with testing a theoretical framework from a prediction perspective; or (d) the structural model is complex (Hair et al., 2019, 2016).

The techno-distress (TS) construct was modeled as a second-order reflexive-reflexive construct consisting of four first-order constructs, which correspond to the four dimensions of techno-distress: techno-overload (OL), techno-invasion (IN), techno-complexity (CO), and techno-uncertainty (UN). Burnout (BO) was also modeled as a second-order reflexive-reflexive construct and consisted of three dimensions: exhaustion with the parental role (EPR), contrast in the parental self (CPS), a feeling of being fed up (FBFU), and emotional distancing (ED).

## 4 Results

A total of 131 surveys were received (94.65% of the respondents were women). Table 2 shows the descriptive statistics of the respondents.

Two separate criteria suggest that the sample is large enough. According to the 10-times rule, the sample size exceeds the recommended minimum (30 cases). Second, the sample size also exceeds the criteria that must be met to achieve a statistical power of 80% when detecting  $R^2$  values of at least 0.10 with a 5% significance level (103 cases) (Hair et al., 2016). The sample size exceeds both thresholds.

Two measures were taken to decrease the common method bias risk in the questionnaire: different scales were used for the techno-distress and parental burnout constructs; and questions were reversed in the items of both constructs. Furthermore, to check the common method bias, we ran Harman's single-factor test. The results confirm there is no problem with common method bias in the data since the total variance extracted by one factor is 27.5%, which is less than the recommended threshold of 50%.

Our analysis of the second-order model was based on a two-stage process, according to the recommendations of (Hair et al., 2019). In the first stage, we used the repeated indicator approach to obtain the latent variable scores for the first-order constructs. In addition, we adjusted the outer model to achieve an acceptable level of reliability and validity at this stage. In the second stage, we used the latent variable scores as manifest variables in the second-order measurement model (Hair et al., 2019).

**Table 2** Descriptive results (mean score, median, and standard deviation for each construct and gender)

| Construct                    | Dimension                   | N |     | Mean |      | Median |      | Standard deviation |      |
|------------------------------|-----------------------------|---|-----|------|------|--------|------|--------------------|------|
|                              |                             | M | F   | M    | F    | M      | F    | M                  | F    |
| Home facilitating conditions |                             | 7 | 124 | 3,67 | 3,38 | 4,00   | 3,75 | 0,37               | 0,37 |
| System Quality               |                             |   |     | 4,09 | 3,73 | 4,00   | 4,00 | 0,39               | 0,42 |
| Techno-distress              | Techno-overload             |   |     | 3,43 | 3,64 | 3,00   | 4,00 | 0,25               | 0,45 |
|                              | Techno-invasion             |   |     | 3,14 | 3,19 | 3,00   | 3,00 | 0,51               | 0,55 |
|                              | Techno-complexity           |   |     | 2,69 | 2,58 | 3,00   | 2,00 | 0,43               | 0,43 |
|                              | Tecno-uncertainty           |   |     | 2,57 | 2,83 | 2,50   | 3,00 | 0,41               | 0,48 |
| Parental Burnout             | Exhaustion in Parental role |   |     | 2,08 | 2,83 | 1,00   | 2,00 | 1,23               | 0,74 |
|                              | Contrast in parental self   |   |     | 1,10 | 2,17 | 1,00   | 1,00 | 0,32               | 0,87 |
|                              | Feelings of being fed up    |   |     | 1,34 | 1,52 | 1,00   | 1,00 | 1,31               | 0,90 |
|                              | Emotional Distancing        |   |     | 1,33 | 1,84 | 1,00   | 1,00 | 0,99               | 1,30 |

#### 4.1 First-stage analysis

We first examined all first-order reflexive constructs (home facilitating conditions and the system quality) based on the factor loadings (where loads should be greater than 0.6–0.7 for exploratory studies), composite reliability (which should be greater than 0.7), and average variance extracted (AVE) (which should be greater than 0.5) (Hair et al., 2016). Only one item (HFC3) was removed because its load was below the acceptable threshold. Next, we adjusted the second-order constructs, i.e., techno-distress and burnout (Hair et al., 2019). After the examination of the factor loadings, reliability, and validity criteria, two items were removed from the techno-distress category (TECHINV3 and TECHUN2). Similarly, four items were removed from the parental burnout category (CPS4, FU4, FU5, and ED1). In total, seven items out of 49 (14.3% of the items) were removed from the entire model. This is below the maximum acceptable limit for the number of items removed (20%) that must be met to avoid problems in measuring the constructs. Table 10 (Appendix 2) shows estimates for all first-order constructs.

The discriminant validity was assessed using the heterotrait-monotrait ratio criterion (HTMT); an HTMT value of lower than 0.90 was found, which suggests a good discriminant validity. In the first-stage analysis, discriminant validity must be established between all first-order constructs, and it is not necessary to achieve discriminant validity between first-order and second-order constructs (Hair et al., 2019). Table 10 shows estimates for all constructs, and it can be seen that all indicators are within the acceptable range.

Hair et al. (2019) recommend that the second-order assessment reliability and validity should be manually calculated. In reflective-reflective constructs, path coefficients correspond to loadings (Hair et al., 2017). As shown in Table 10 (Appendix 2), the reliability and validity of techno-distress and burnout were above the suggested threshold, i.e., the composite and Cronbach's alpha values were greater than 0.7 and the AVE was greater than 0.5, thus confirming the reliability and validity of the outer model. Next, we advanced to the second stage of the analysis.

**Table 3** Validity, and reliability estimates for the second-order model

| Construct | CA    | CR    | AVE   | HTMT  |       |       |
|-----------|-------|-------|-------|-------|-------|-------|
|           |       |       |       | HFC   | BO    | QUAL  |
| HFC       | 0.786 | 0.856 | 0.547 |       |       |       |
| BO        | 0.812 | 0.866 | 0.620 | 0.329 |       |       |
| QUAL      | 0.887 | 0.917 | 0.691 | 0.674 | 0.257 |       |
| TD        | 0.766 | 0.850 | 0.587 | 0.693 | 0.543 | 0.595 |

HFC: Home facilitating conditions; BO: Burnout; QUAL: Quality system; TD: Techno-distress  
 CA: Cronbach's Alpha; CR: Composite Reliability; AVE: Average variance extracted; HTMT: Heterotrait-Monotrait Ratio

**Table 4** Main results for the structural model: Hypothesis assessment, coefficient of determination, and predictive validity

| Relationship   | Original | Mean   | STDEV | T-Statistics | P-Values | CI     |        | Conclusion |
|----------------|----------|--------|-------|--------------|----------|--------|--------|------------|
|                |          |        |       |              |          | 2.50%  | 97.50% |            |
| H1: HFC -> TD  | -0.403   | -0.410 | 0.086 | 4.662        | 0.000    | -0.568 | -0.235 | Supported  |
| H2: QUAL -> TD | -0.278   | -0.280 | 0.076 | 3.661        | 0.000    | -0.427 | -0.129 | Supported  |
| H3: TD -> BO   | 0.473    | 0.487  | 0.058 | 8.114        | 0.000    | 0.372  | 0.600  | Supported  |

HFC: Home facilitating conditions; BO: Burnout; QUAL: Quality system; TD: Techno-distress

## 4.2 Second-stage analysis

First, the first-order scores served as manifest variables for the two second-order constructs (i.e., techno-distress and parental burnout) of the measurement model. Table 3 shows the validity and reliability estimates for the second-order model. As can be seen, all constructs are within the recommended thresholds, which indicates that the second-order outer model meets the validity and reliability requirements.

After evaluating the external model, we assessed the structural model by implementing a bootstrapping method (5,000 sub-samples, BCa bootstrap method, two-tailed test, 5% significance level, factor weighting scheme). Tables 4 and 5 presents the assessment of the hypotheses, path coefficients, and the size effects ( $f^2$ ).

Table 6 presents the coefficients of determination ( $R^2$ ).  $R^2$  values above 0.200 indicate that the model's endogenous variables have a good explanatory power (Benitez et al., 2018). Table 7 presents the Q2 value (Stone-Geisser's Q2) indicates the model's out-of-sample predictive power.

Table 4 shows that our three hypotheses are confirmed. Home facilitating conditions and the system quality influence techno-distress (H1 and H2, respectively). Table 6 shows that both constructs explain 36.5% of the variance of techno-distress. The most influential construct of techno-distress is the home facilitating conditions. On the other hand, techno-distress positively influences burnout in parents (H3), explaining 22.4% of the variance of burnout caused by technology.

**Table 5** Main results for the structural model: Size effect

| Relationship   | Size effect |             |
|----------------|-------------|-------------|
|                | $f^2$       | Effect size |
| H1: HFC -> TD  | 0.175       | Medium      |
| H2: QUAL -> TD | 0.083       | Small       |
| H3: TD -> BO   | 0.289       | Medium      |

HFC: Home facilitating conditions; BO: Burnout; QUAL: Quality system; TD: Techno-distress

The effect size  $f^2$  allowed us to assess the contribution of each exogenous construct to the value of  $R^2$  for an endogenous latent variable (Hair et al., 2016). The results show that the effect size ranges from small to medium (see Tables 5, 6 and 7). The  $Q^2$  value indicates the model's out-of-sample predictive power (Hair et al., 2016); values of  $Q^2$  that are larger than zero indicate that the exogenous constructs have predictive relevance for the endogenous construct being considered (Hair et al., 2016). The results show that the model has predictive relevance for the two endogenous constructs.

Figure 2 shows the final model and the results of the hypothesis analysis.

### 4.3 Post-hoc analysis

We performed a post-hoc analysis to measure the mediation effect of the techno-distress.

#### 4.3.1 Mediation effect

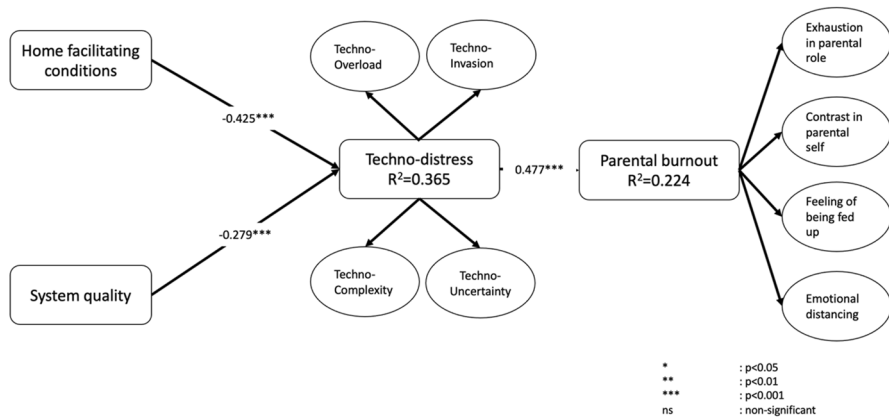
We decided to conduct a mediation analysis on burnout to measure the indirect and direct effects of the facilitating home conditions and system quality. Following the procedure described by Benitez et al. (2018), we added a link to the proposed model between the home facilitating conditions and system quality and burnout. A significant indirect effect is the only requirement for mediation (Benitez et al., 2018; Zhao et al., 2010) identify four

**Table 6** Coefficient of determination ( $R^2$ ) of endogenous constructs

| Construct       | $R^2$ | $R^2$ adjusted | Conclusion |
|-----------------|-------|----------------|------------|
| Techno-distress | 0.365 | 0.355          | Moderate   |
| Burnout         | 0.224 | 0.218          | Weak       |

**Table 7** Predictive power ( $Q^2$ ) of endogenous constructs

| Construct       | $Q^2$ (> 0.0) | Predictive relevance? |
|-----------------|---------------|-----------------------|
| Techno-distress | 0.193         | Confirmed             |
| Burnout         | 0.106         | Confirmed             |



**Fig. 2** Final model with the results of the hypothesis analysis

scenarios that can arise in mediation analysis: (i) if the indirect effect is significant but the direct effect is not, there is indirect-only mediation; (ii) if the indirect effect is not significant but the direct effect is, there is direct-only mediation; (iii) if both the indirect and direct effects are not significant, there is no mediation (no effect); and (iv) if both the indirect and direct effects are significant, there is complementary or competitive mediation.

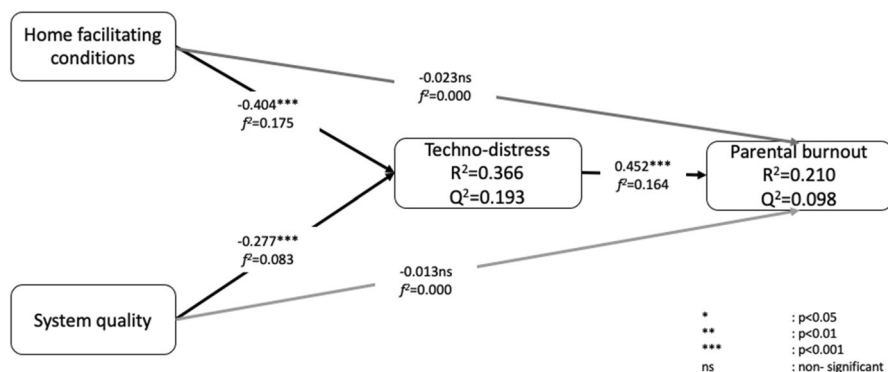
We performed a mediation analysis by following the procedure described by Hair et al. (2016). Table 8. presents the results of the mediation analysis. Our analysis shows that the direct effects of the home facilitating conditions and system quality are not significant, but their indirect effects are significant. Therefore, we find the first scenario mentioned by Benitez et al. (2018) and Zhao et al. (2010), i.e., the home facilitating conditions and system quality fully affect burnout in parents through techno-distress. Therefore, we conclude that techno-distress fully mediates the relationship between the home facilitating conditions (HFC) and burnout (BO). Additionally, techno-distress fully mediates the relationship between facilitating home conditions (HFC) and burnout (BO).

**Table 8** Direct and indirect effect of home facilitating conditions and System quality on Burnout

|            | Direct effect | P Values | Significance<br>( $p < 0.05$ ) | Indirect<br>effect | P Values | Significance<br>( $p < 0.05$ ) |
|------------|---------------|----------|--------------------------------|--------------------|----------|--------------------------------|
| HFC-> BO   | -0.023        | 0.839    | No                             | -0.182             | 0.003    | Yes                            |
| QUAL -> BO | 0.013         | 0.899    | No                             | -0.125             | 0.001    | Yes                            |

HFC: Home facilitating conditions; BO: Burnout; QUAL: Quality system





**Fig. 3** Final model with the direct and undirect effects and all estimates of the model

Figure 3 illustrates the direct and indirect effects and all estimates from the model.

Our findings provide empirical support for the mediating role of techno-distress in the burnout model. More specifically, techno-distress represents a mechanism that underlies the relationships between the home facilitating conditions and burnout and the system quality and burnout. Better home facilitating conditions lead to a lower level of techno-distress, and a lower level of techno-distress leads to lower burnout. Similarly, better systems lead to a lower level of techno-distress, and a lower level of techno-distress leads to lower burnout.

The results of the mediation analysis have implications for theory. Since techno-distress fully mediates the relationship between the home facilitating conditions and burnout and the system quality and burnout, this suggests that techno-distress entirely complies with the hypothesized theoretical framework (Hair et al., 2016). Furthermore, since the direct effects of the facilitating home conditions and system quality are non-significant, it is unlikely that another mediator has been omitted in our model (Zhao et al., 2010).

## 5 Discussion

The main purpose of this research was to analyze the causes and effects of techno-distress in parents who help their children to connect to online classes. To achieve this, the home facilitating conditions and platform quality were analyzed as predictors of techno-distress. It was possible to demonstrate that both had influence on techno-distress, explaining 36.5% of the variance. The construct with the greatest influence on techno-distress is the home facilitating conditions.

As mentioned above, the results show that the home facilitating conditions have the strongest influence on techno-distress in parents who help their children to use technological platforms. These results are consistent with those presented in the literature in educational contexts. They indicate that

attributes associated with the home facilitating conditions, such as the Internet connection, physical space, and devices, have a significant influence on techno-distress when the Internet connection is slow, the devices are not adequate, or the performance of the devices is poor (Chuang et al., 2016; Çoklar et al., 2017; Essel et al., 2021). In the case of parents helping their children to connect to online classes, a stable Internet connection and the devices that are needed to participate in classes are relevant. The absence or failure of any of these factors can generate techno-distress in parents despite the fact that they are not the primary users of the technology. If the connection fails or is slow, the child will start to complain to the parent that they cannot hear or see what they are meant to hear or see on the platform. Similarly, this will happen with devices that are not appropriate for the task at hand, have a low performance, or must be shared with another family member; this will worry the parent.

In terms of the system quality, the results confirm that it also influences parental techno-distress. This is consistent with the literature (Ayyagari et al., 2011; Fischer et al., 2019; Jena & Mahanti, 2014; Yim & Han, 2013). Previous research shows that when the system quality is low, this causes techno-distress in individuals (Ayyagari et al., 2011; Fischer et al., 2019; Jena & Mahanti, 2014; Yim & Han, 2013). In educational contexts, it has been found that the quality of the system is relevant when the use of information platforms or systems is incorporated and encouraged (Almaiah et al., 2022). The results show that the quality of the platform used for online classes influences techno-distress. In the case of parents, the quality of the system is very important, especially if the parent has knowledge or basic ideas concerning the technological platforms used by their children. A platform that is easy to use and well-structured and has the appropriate functionalities will allow parents to help their children to use it more quickly, and the child can even gradually learn to use it themselves. For a platform with these attributes, a parent should not have any difficulty in solving any problems arising from the use of the platform, which will reduce their level of techno-distress.

The results confirm that techno-distress affects parental burnout. Techno-distress positively influences parental burnout, explaining 22.4% of the variance in parental burnout. This is also consistent with the literature on the effect of techno-distress on burnout in educational contexts, which indicates that the use of devices can cause techno-distress and burnout in teachers and students (Varanasi et al., 2021; Zhao et al., 2022). In this case, techno-stressed parents also exhibit a high level of parental burnout. This is because the parent not only has to learn how to use the technological platform that allows his or her child to participate in classes but also must help the child to use it. In many situations, parents do not have the technical skills required to be able to solve these problems, leading to techno-distress. This can also cause parents to question their parental role and believe that they can no longer deal with the situation.

## 5.1 Theoretical and practical implications

Although there are several studies in educational contexts on techno-distress in students and teachers, the techno-distress in parents had not previously been studied, nor had antecedents such as the facilitating home conditions or system quality been incorporated into this type of research. Therefore, the present research makes the following theoretical contributions:

- The study of the facilitating home conditions as an antecedent of techno-distress is limited. The present research proposes a scale of five items that can be used to measure the level of facilitating home conditions in the use of technological platforms. The results show that facilitating home conditions has a significant influence on parental techno-distress. That is, a parent who does not have a stable Internet connection, appropriate physical spaces, or a sufficient number of devices for their children will present higher levels of techno-distress.
- To the best of our knowledge, the quality of the system has not been studied as a predictor of techno-distress. The current literature includes studies of the effect of some characteristics of the system quality on techno-distress, indicating that it may influence techno-distress. Our results confirm that the system quality influences parental techno-distress.
- Various papers have studied the effect of techno-distress on burnout. However, papers studying the effect of techno-distress on parental burnout are limited. Our results demonstrate the direct effect of techno-distress on parental burnout when parents help their young children to use technological platforms. If a parent finds it stressful to use technology or is stressed due to the complications of using technology, they will not be able to properly assist their children in the use of technology. As a result, the parent will begin to question his or her role, since he or she will not be able to help the child use the platforms; this will generate negative feelings and exhaustion. While these results are a first approximation, more research is needed to understand this relationship in depth.

Additionally, this study has some practical implications. The pandemic increased the use of technology in learning environments. Trends show that these online or hybrid learning methods are part of the new normal. Our results show that the incorporation of these technologies has adverse effects on parents. Therefore, this study helps educational institutions to better understand the reality of learning and teaching environments that incorporate technology. For this reason, the present study is aimed at those who make decisions regarding the use and implementation of technologies in learning processes. The assignment of activities through technological platforms, whether they are for

online classes, hybrid classes, or even complementary activities, should consider the fact that young children require additional support to be able to perform these activities.

## 6 Conclusions

The main objective of this research was to understand how the use of technological platforms by young children affects parental techno-distress and parental burnout. Our main conclusion is that the facilitating home conditions and system quality significantly affect parental techno-distress, and techno-distress has a significant effect on parental burnout. We found that both the facilitating home conditions, and the system quality are antecedents that affect parental techno-distress. The facilitating home conditions is the most influential antecedent of techno-distress. Attributes such as the quality of the Internet connection, an appropriate space, and devices are highly relevant to reducing the level of parental techno-distress when parents help their children to use technological platforms. Likewise, the quality of the system also has an influence on techno-distress, but it has less of an influence than the home facilitating conditions. The system quality is related to the ease of use, flexibility, and reliability of the technological platforms used by children for online activities.

Moreover, our results show that techno-distress is a mediator between the facilitating home conditions and system quality and parental burnout; it is an explanatory mechanism for the effect of technological conditions on the psychological conditions of parents. Although parents are not the direct users of technological platforms, they play a fundamental role when these platforms are used by their young children, since young children lack the skills to be able to use these platforms autonomously.

Among the actions that can be taken to reduce the levels of techno-distress and parental burnout due to the use of technological platforms are the following: (1) establish a record of each student's situation in terms of the type of connectivity, physical space, and availability of devices; (2) provide workshops or limited courses on the use of technological platforms or tools to parents, so that parents with less knowledge or fewer skills can reinforce these skills to better help their children; and (3) when planning activities that use technological platforms, consider that parents have additional activities or work to complete, and therefore, these activities should not be too extensive or numerous.

## Appendix 1

**Table 9** Bibliographic sources for building facilitating home conditions scale

| Category                       | Fabito et al., 2020  | Aboagye et al., 2021                         | Lassoued et al., 2020   | Rahiem, 2020  | Proposed item  |
|--------------------------------|--|--|---|---|--|
| Internet connection and access | I do not have a good Internet connection to participate in online activities | Lack of adequate Internet access             | Weak Internet flow (speed).   |   | In our house, the internet connection speed is good enough for my children to participate in online activities.<br><br>The internet connection in my home is stable enough for my children to participate in online activities.<br><br>The total cost of the internet connection needed for my children to participate in online activities is too high (Reverse). |
| Physical space                 | I don't have a good study or work area to do my online activities.           | The cost of the internet package is too high | The home environment is not suitable for distance learning.                       |   | My children have a good study or work area for online activities.  |
| Devices                        | I lack the appropriate device to participate in online activities            | Some phones and laptops are not compatible   | Lack of remote communication capabilities (devices, Internet applications, etc.). | Device issues - Incompatible device<br><br>Device issues - Device sharing with other family members | I have the appropriate devices for my children to participate in online activities.<br><br>My children must share devices with other family members when they are in activities (INV).   |

## Appendix 2

**Table 10** Assessment of the measurement model of first order and second-order constructs (external loadings, validity, and reliability)

| Latent variable                | Indicator | Loading | CA    | CR    | AVE   | HTMT  |       |       |       |     |      |      |
|--------------------------------|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-----|------|------|
|                                |           |         |       |       |       | HFC   | BO    | CPS   | ED    | EPR | FBFU | QUAL |
| Burnout (Second-order)         |           |         | 0.835 | 0.862 | 0.614 |       |       |       |       |     |      |      |
| Techno-distress (Second-order) |           |         | 0.784 | 0.858 | 0.602 |       |       |       |       |     |      |      |
| Home facilitating conditions   |           |         | 0.786 | 0.856 | 0.547 |       |       |       |       |     |      |      |
|                                | HFC1      | 0.801   |       |       |       |       |       |       |       |     |      |      |
|                                | HFC2      | 0.841   |       |       |       |       |       |       |       |     |      |      |
|                                | HFC4      | 0.557   |       |       |       |       |       |       |       |     |      |      |
|                                | HFC5      | 0.772   |       |       |       |       |       |       |       |     |      |      |
|                                | HFC6      | 0.694   |       |       |       |       |       |       |       |     |      |      |
| CPS                            |           |         | 0.899 | 0.926 | 0.715 | 0.301 | 0.951 |       |       |     |      |      |
|                                | CPS1      | 0.798   |       |       |       |       |       |       |       |     |      |      |
|                                | CPS2      | 0.918   |       |       |       |       |       |       |       |     |      |      |
|                                | CPS3      | 0.868   |       |       |       |       |       |       |       |     |      |      |
|                                | CPS5      | 0.850   |       |       |       |       |       |       |       |     |      |      |
|                                | CPS6      | 0.787   |       |       |       |       |       |       |       |     |      |      |
| ED                             |           |         | 0.676 | 0.860 | 0.755 | 0.249 | 0.847 | 0.854 |       |     |      |      |
|                                | ED2       | 0.887   |       |       |       |       |       |       |       |     |      |      |
|                                | ED3       | 0.850   |       |       |       |       |       |       |       |     |      |      |
| EPR                            |           |         | 0.938 | 0.948 | 0.670 | 0.265 | 0.959 | 0.717 | 0.528 |     |      |      |

 Springer[illegible]



**Table 10** (continued)

| Latent variable    | Indicator | Loading | CA    | CR    | AVE   | HTMT  |       |       |       |       |       |       |       |       |       |
|--------------------|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                    |           |         |       |       |       | HFC   | BO    | CPS   | ED    | EPR   | FBFU  | QUAL  | TC    | TD    | TI    |
| Techno-invasion    | TECHCO4   | 0.857   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                    | TECHCO5   | 0.766   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                    | TECHINV1  | 0.884   | 0.712 | 0.837 | 0.637 | 0.396 | 0.618 | 0.452 | 0.337 | 0.663 | 0.412 | 0.336 | 0.386 | 0.957 |       |
|                    | TECHINV2  | 0.630   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                    | TECHINV4  | 0.855   |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Techno-overload    | TECHOV1   | 0.871   | 0.917 | 0.938 | 0.752 | 0.352 | 0.588 | 0.378 | 0.185 | 0.721 | 0.303 | 0.329 | 0.330 | 0.907 | 0.924 |
|                    | TECHOV2   | 0.849   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                    | TECHOV3   | 0.887   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                    | TECHOV4   | 0.814   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                    | TECHOV5   | 0.911   |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Techno-uncertainty | TECHUN1   | 0.868   | 0.687 | 0.822 | 0.610 | 0.816 | 0.322 | 0.262 | 0.174 | 0.334 | 0.209 | 0.677 | 0.691 | 0.928 | 0.550 |
|                    | TECHUN2   | 0.647   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                    | TECHUN4   | 0.811   |       |       |       |       |       |       |       |       |       |       |       |       |       |

EPR: Exhaustion in parental role; CPS: Contrast in parental self; FBFU: Feeling of being fed up; ED: Emotional distancing  
 CA: Cronbach's Alpha; CR: Composite Reliability; AVE: Average variance extracted; HTMT: Heterotrait-Monotrait Ratio

**Data availability** The data that support the findings of this study are available from the corresponding author, upon reasonable request.

## Declarations

**Conflict of interest** None.

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