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Leadership and technostress: a systematic literature review

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Abstract
With the growing use of digital technologies at work, employees are facing new demands. Digital technologies are also changing how leaders and followers interact. Leadership must adapt to these changes and find ways to reduce the demands of digital work for their followers so they maintain their capacity for and motivation to work. Against this background, we analyze the impact leadership has on technostress by conducting a systematic literature review. An electronic search was based on 13 databases (ACM Digital, AIS eLibrary, APA PsychInfo, EBSCO, Emerald Insight, Jstor, Pubmed, SAGE, ScienceDirect, Scopus, Taylor & Francis Online, WISO, and Web of Science) and was carried out in October 2023. We identified 1725 articles—31 of which met the selection criteria. Thirteen more were identified in a backward search, leaving 44 articles for analysis. The conceptual analysis reveals that empowering and supportive leadership can decrease follower technostress. Leadership that emphasizes high availability expectations, task orientation and control can increase technostress and technostress-related outcomes. Furthermore, leadership's impact on follower technostress is influenced by how ICTs are being used to convey leadership. We synthesize seven analytical themes of leadership among the technostress literature and derive them into the three aggregated dimensions which serve as the foundation of a conceptual model of leadership's impact on follower technostress: technostress-increasing leadership, technostress-decreasing leadership, and technology-enabled leadership. Furthermore, we formulate avenues for future research.

Keywords Technostress · Digital stress · Leadership · Followership · Digital work · Systematic literature review

JEL Classification O330 · M540 · I190

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1 Introduction

Work is constantly changing, but there are some technological developments that have groundbreaking effects on work, like the steam engine or the assembly line. Information and communication technologies (ICTs) can join the ranks of these technologies when it comes to changing work (e.g., Kamarul Bahrin et al. 2016). Like the other technologies, the digital penetration of the workplace bears great potential for improvement of work, as the use of ICTs can enhance productivity and flexibility with an increasing number of tasks that had been done offline moving to the digital sphere (Schmidtner et al. 2021; Vargo et al. 2021). However, digitalization also poses risks for employees, including increased strain by blurring boundaries between the work sphere and private life or by overwhelming employees with the inherent complexity of digital technology (Ragu-Nathan et al. 2008). The mechanisms of strain triggered by digital technology—often termed *technostress*—can have a significant impact on employees' health, as technostress is associated with emotional exhaustion (Brown et al. 2014; Kim et al. 2015; Turel and Gaudioso 2018), burnout (Leung 2011; Srivastava et al. 2015), and depression (Torales et al. 2022). Besides workers' health, work-related factors like productivity (Tarafdar et al. 2007, 2011), commitment and engagement (Ragu-Nathan et al. 2008; Srivastava et al. 2015), and job satisfaction (Ragu-Nathan et al. 2008; Suh and Lee 2017) can be negatively affected by technostress.

Researchers ascribe leadership—understood here as "a process whereby an individual influences a group of individuals to achieve a common goal" (Northouse 2019)—an increasingly important role in the context of digitalization (Cortellazzo et al. 2019) and technostress (Fischer and Riedl 2017; Salazar-Concha et al. 2021). According to Cortellazzo et al. (2019), leaders take an active part in the digitalization by supporting and motivating followers, who face challenges like the ongoing requirement to learn how to use new technologies. Leadership itself is also affected by digital technologies. As teams become locally decentralized and increasing amounts of work are done outside the traditional office environment, ICTs influence the interactions between leaders and followers. Leaders should adapt to these changes to be able to lead their followers through the ongoing change process related to digitalization and maintain their capacity for and motivation to work (Cortellazzo et al. 2019). Not incidentally, in view of the potential impact of technostress on employees' health, health management has also become an important part of successful leadership (Schwarzmüller et al. 2018).

Empirical studies (e.g., Felfe et al. 2014; Weiß and Süß 2016) and literature reviews and meta-analyses (Harms et al. 2017; Skakon et al. 2010) suggest a link between leadership and followers' health and leadership and variables that affect health, such as followers' self-efficacy (Perko et al. 2014), which can buffer technostress and technostress-related outcomes (e.g., Shu et al. 2011; Yener et al. 2021). Further, there are empirical studies that analyze the relationship between leadership and technostress (Çiçek and Kılınç 2021; Harris and Marett 2009). Still, previous reviews that address technostress do not focus on the impact of

leadership (Agogo and Hess 2018; Borle et al. 2021a; La Torre et al. 2019; Saganuwan et al. 2015; Sarabadani et al. 2018), or deal with it only in passing (Berg-Beckhoff et al. 2017; Gualano et al. 2023; Marsh et al. 2022; Pflügner 2022; Rohwer et al. 2022; Shirmohammadi et al. 2022). Similar blind spots in the systematization of the connection between leadership and technostress are evident in the leadership literature, as literature reviews and meta-analyses that deal with leadership and digitalization often miss considerations related to followers' health (e. g. Jakubik and Berazhny 2017) or deal with the relationship between leadership and well-being or health without considering the role of digital technology (Harms et al. 2017; Inceoglu et al. 2018; Kuoppala et al. 2008; Montano et al. 2017; Skakon et al. 2010). Marsh et al. (2022) integrative review of the dark side of digital work is an exception, as they identify two studies that address the role of transformational leadership as a resource for coping with technostrain (Salanova et al. 2013) and the quality of leader-member exchange as a moderator of the relationship between technology overload and work-family conflict (Harris et al. 2013). Given these initial findings, the authors call for further research on the role of leadership "as potential dark side effects moderators" (Marsh et al. 2022, p. 13).

Against this background, a systematic examination and elaboration of the relationship between leadership and technostress is necessary to systemize the link between leadership and technostress; thus, enriching technostress research by means of systematic insights into the effect of leadership on technostress and strengthening the technostress perspective in the leadership literature. Given the increasing prevalence of digital technology in the workplace, with the COVID-19 pandemic catalyzing this process (Amankwah-Amoah et al. 2021), and the associated risks of technostress, understanding the conditions that influence the occurrence of technostress and its consequences is of both scientific and practical value. Therefore, the *aim of our study* is to identify and analyze research regarding the influence of leadership on the emergence of technostress and its outcomes in the workplace. To achieve this goal, we conducted a systematic literature review. The well-structured method allows us to screen, collect, and analyze relevant studies systematically and reliably (Atkinson et al. 2015; Siddaway et al. 2019; Snyder 2019) and to provide avenues for future research in leadership and technostress based on an overview of the current literature.

Our review offers several contributions to research and practice. First, as most existing studies only provide insights into the effects of certain aspects of leadership in certain digital settings, a summary of these studies is a logical next step in establishing the status quo and connecting these fragmental insights to form a cohesive picture of how leadership affects followers' health in a digitalized work environment. Hereby we answer the call of Sarabadani et al. (2018) to consider new inhibitors of technostress identified in the technostress literature by systematically collecting and analyzing studies on leadership's influence on technostress. Second, we derive a conceptual framework of leadership's impact on follower technostress. Third, the limitations and gaps in the current research identified in the review can be a foundation for future research on the adaption of leadership to the challenges of digitalization and can provide researchers easy access to existing knowledge in

this research area (Siddaway et al. 2019). The remainder of the study is structured as follows: First, the conceptual background on technostress and leadership and derivations of the research questions that guide this review are provided in Sect. 2. Section 3 presents the methodological approach applied in conducting the systematical literature review. Section 4 presents the results of the analysis. These serve as the basis for the discussion and the derivation of avenues for future research in Sect. 5. The study concludes with limitations (Sect. 6) and a short conclusion (Sect. 7).

2 Conceptional background and research questions

2.1 Technostress and the transaction-based model of stress

As early as 1982, Brod identifies the risks entailed in digitalization by introducing the phenomenon of *technostress* as "the inability of an individual or organization to adapt to the introduction and operation of new technology" (Brod 1982). Brod offers this concept even before the wide use of personal computers or the commercial use of the internet. The digital penetration of the workplace has continued ever since, and stress induced by ICT has become increasingly relevant in research, as current reviews and bibliometric analyses of technostress point out (Fischer and Riedl 2017; Salazar-Concha et al. 2021). As new technology emerged, the definition of technostress also changed, with the most recent and widely accepted definition (La Torre et al. 2019) of technostress being "stress experienced by end users of information and communication technologies" (Ragu-Nathan et al. 2008). This definition is also applied in this work.

According to the *transaction-based model of stress* (Lazarus and Folkman 1984), stress is the result of a transaction between individual and environmental dispositions that occurs in two appraisal processes that precede coping (Lazarus 2012). Several central publications on technostress (e. g. Bondanini et al. 2020; Fuglseth and Sørebø 2014; Ragu-Nathan et al. 2008; Tarafdar et al. 2010) use the transaction-based model of stress as a theoretical framework. In the primary appraisal process, the individual assesses the extent of demands an environmental situation may present, and in the secondary appraisal process, the individual assesses its coping options in dealing with these demands (Lazarus 2012). Applied to the context of technostress, the focus of the primary appraisal is on the transaction between digital technology and the technology-user, evaluating whether digital technologies present a potential demand. The second appraisal process represents a consideration between the user's options for coping and these digital demands. The transaction-based model of stress served in several central publications on technostress (e. g. Bondanini et al. 2020; Fuglseth and Sørebø 2014; Ragu-Nathan et al. 2008; Tarafdar et al. 2010) as a theoretical framework.

Digital technologies in the professional context can be perceived as demanding in many ways, but five typical stressors established by Ragu-Nathan et al. (2008), often referred to as *technostressors*, are well established in technostress research and provide the conceptual basis for many articles (Grummeck-Braamt et al. 2021): (1) techno-invasion, which describes digital technology's potential to cross

the boundary between work and personal life; (2) techno-overload, which refers to digital technology's potential to accelerate work and increase workload; (3) techno-insecurity, which refers to digital technology's potential to create feelings of insecurity about one's own capabilities in dealing with technology and the fear of being replaced by technology or more qualified employees; (4) techno-uncertainty, which refers to the fast pace of digital technology, with its frequent updates and system changes that can overwhelm its users and (5) techno-complexity, which refers to the complexity inherent in ICT that can evoke feelings of inadequacy (Ragu-Nathan et al. 2008).

Following the transaction-based model of stress, even when technology is perceived as a stressor, strain does not necessarily result, as personal dispositions like individuals' traits or states can influence their appraisal of technology or the resources they have to cope with these stressors. Previous studies identify individual factors like techno-affinity and techno-efficacy, age, gender, and resistance to IT-induced change (Koo and Wati 2011; Shu et al. 2011), as well as contextual factors like task complexity (Koo and Wati 2011), embeddedness in ICT-mediated communication networks, centralization of power, and corporate propensity to innovate (La Torre et al. 2019), literacy facilitation (Califf and Brooks 2020), and involvement and innovation support (Califf et al. 2015) as factors that can influence individuals' appraisal of digital technology as a stressor and moderate the impacts it has.

2.2 Leadership and stress

The diverse history of leadership research is reflected in the multitude of definitions of leadership. According to Northouse's (2019) definition of leadership, which is widely used in leadership research and comparatively inclusive, *leadership* can be understood as "a process whereby an individual influences a group of individuals to achieve a common goal". Given this understanding, leadership is seen as a process that is not unilateral, as the leader's behavior is also influenced by his or her followers (Gesang and Süß 2021; Northouse 2019) and can also take place in groups, so leadership can impact followers even if they are not directly affected. Harris et al. (2013) find empirical evidence that employees who hear rumors about their leaders' directing abuse toward a third-party report higher levels of work frustration and lower levels of perceived organizational support. Leadership is also directed toward a common goal, so leaders seek to influence their followers to alter their attitudes, values, motivation, and behaviors (Northouse 2019). Leaders can employ a wide range of behaviors to exert influence, such as providing support and information and motivating and empowering followers (Bass 1999; Kotter 2001).

Former research on leadership categorizes leadership into task- and relation-oriented leadership behavior (Yukl et al. 2002). *Task-oriented* leadership behavior captures leadership that focuses on completing a task efficiently and reliably by planning and setting priorities, goals and rules, and monitoring followers (Yukl 2010). Leadership styles that fit into task-oriented leadership are for instance a transactional leadership style (DeRue et al. 2011) and an authoritarian leadership style. *Relation-oriented* leadership behavior focuses on the relationship between followers and

leaders by means of such behaviors as supporting and encouraging followers, coaching, and consulting followers in decision-making (Yukl 2010). Yukl et al. (2002) expand this taxonomy by adding *change-oriented* leadership behavior, and DeRue et al. (2011) do so by adding *passive leadership* behavior. According to Yukl (2010), *change-oriented* behavior aims at implementing changes in organizations using transformational, inspirational, and charismatic leadership. DeRue et al. (2011) define passive leadership behavior as absent, inactive, or active only under certain circumstances, e. g. laissez-faire leadership. The taxonomy of leadership into task-oriented, relation-oriented, change-oriented, and passive leadership behavior covers leadership, as most other taxonomies of leadership can be mapped across these categories (DeRue et al. 2011).

Leadership research focuses primarily on the positive aspects of leadership. Thus, most taxonomies of leadership do not consider deviant and hostile forms of leadership, and DeRue and colleagues' taxonomy is no exception. Therefore, destructive forms of leadership can be captured drawing on Schyns and Schilling's (2013) definition of destructive leadership as "a process in which over a longer period of time the activities, experiences and/or relationships of an individual or the member of a group are repeatedly influenced by their supervisor in a way that is perceived as hostile and/or obstructive".

Previous studies on *leadership's effect on stress* show a connection between some leadership styles and behaviors with stress perceived by followers. Leadership can have a direct impact on a strain by being a stressor itself or an indirect impact by buffering or increasing the effects or outcomes of other stressors. For instance, task-oriented leadership behavior that is characterized by high levels of monitoring and low levels of autonomy for followers, as is typical of authoritarian leadership styles, can increase followers' perceived work stress (Kang-Hwa and Hung-Yi 2018) and decrease their well-being and emotional regulation (Chu 2014). On the opposite, the total absence of control, as occurs with passive or laissez-faire leadership styles, can also cause stress, as this leadership style is often associated with role conflict, work fatigue (Barling and Frone 2017; Skogstad et al. 2007, 2014; Vullinghs et al. 2020), and workplace bullying (Dussault and Frenette 2015; Skogstad et al. 2007). As for transformational leadership, that aims at initiating changes through inspiration, intellectual stimulation, individualized consideration and idealized influence (Avolio and Bass 2004; Bass 1999; Bass and Avolio 1994), results are less clear. Followers that were led by leaders with high levels of transformational leadership, reported fewer effort-reward imbalances on the one hand (Weiß and Süß 2016) but also reported increased job stress on the other hand (Parveen and Adeinat 2019).

Leadership behavior can have an *indirect impact on how employees experience stressors* and on their coping options. Supervisors who provide feedback can often ameliorate stress-related outcomes by helping employees improve their ability to withstand stressors (Demerouti et al. 2001). Feedback can also clarify role expectations, thereby reducing role conflict (Ashford and Tsui 1991), and can be experienced by employees as a form of esteem (Brooks et al. 2019) that can be a buffer against stress from demanding work (Lehr et al. 2009). However, feedback that is based on corrective criticism can increase emotional exhaustion and can be identified as a cause of chronic stress (Diebig et al. 2016). The interpersonal relationship

and the degree of information exchange between leaders and followers are also identified as valuable resources for employees in coping with work demands, as employees who perceive high levels of social support from their supervisors report lower levels of work stress (McCalister et al. 2006) and burnout (Charoensukmongkol et al. 2016). Other sources of stress, such as work-family conflict, role conflict, and workplace bullying are also reduced by supervisor support (Hauge et al. 2011). A good leader-member exchange quality is also associated with lower levels of role stress in some studies (Jian and Dalisay 2018; Nelson et al. 1998) and with lower levels of stress and burnout (Harms et al. 2017). Previous studies highlighted that digital technologies do significantly change work on several levels which comes along with new demands for followers (see Sect. 2.1). As the effectiveness of leadership behavior does depend upon the situation in which it is applied (as theories of situational leadership as the contingency theory (Fiedler 1964) or the path-goal theory point out (House 1996)), it remains to be seen whether these insights can be transferred to the technostress context.

2.3 Research questions

A systematical literature review requires clearly defined *research questions* that set the direction of the synthesis and serve as the foundation of the search strategy (Hiebl 2021). As structure is necessary to understand the mechanisms between leadership and technostress and to acquire a sound overview of the extant research and what it lacks, we conducted a literature review to organize the literature, synthesize leadership's influence on technostress, and set new guidelines for future research.

To reach these objectives, we first identify the current status of technostress research that addresses leadership by describing the composition of the literature on leadership's influence on technostress and providing an overview of the quantitative distribution of leadership studies in technostress research over time, and the methodological approaches used. Therefore, our first research question is formulated as follows:

RQ1 How is leadership analyzed in the extant technostress research in terms of development over time, and methodologies being used?

While the first research question has a descriptive nature, the second research question deals with the synthesis of the underlying processes for how leadership can affect technostress. Findings in the work-design research emphasize the need to consider contextual factors like leadership in designing good work environments for employees, as the same technology can lead to different outcomes depending on how it is used and how it is integrated into existing work systems (Fischer and Herrmann 2011; Schuepbach 2007). The transaction-based model of stress and the current research on technostress suggest that technology use is not always experienced as a stressor and that, even when technology is perceived as a stressor, it does not always lead to strain or other stress-related outcomes, as both depend on the composition of external and individual factors (Sect. 2.1).

Previous studies indicate that leadership is both a resource for followers who are facing digital demands and a constraint on available coping options (Sect. 2.2), so an investigation of how leadership can affect technostress and its outcomes can expand theoretical knowledge on the mechanisms that underlie technostress. Therefore, the second research question focuses on the role of leadership along the emergence of technostress and technostress-related outcomes:

RQ2 How is leadership related to followers' technostress and its related health outcomes?

No systematic review of the relationship between leadership and technostress is extant, making it difficult to identify relevant research gaps. Systematic literature reviews are well suited to gather cross-study knowledge and to map the state of research based on the patterns in previous research questions. Identifying the gaps and limitations in current research that suggest avenues for future research can prevent duplication of studies, so the third research question asks:

RQ3 What gaps in the current research on the relationship between technostress and leadership can be identified that offer avenues for future research?

3 Method

A *systematic literature review* is an appropriate method to answer the three research questions, as it can identify relevant scientific studies while helping to ensure reliability in data collection and analysis (Snyder 2019). This section presents, explains, and visualizes the study design using a flow diagram (Fig. 1) to ensure the necessary transparency and replicability (Atkinson et al. 2015; Shamseer et al. 2015; Snyder 2019). We used an adapted version of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al. 2009) to perform a systematic review in five steps: (1) data extraction using a pilot search and a main search to identify relevant publications based on a specified search string, (2) identification and removal of duplicates, (3) primary screening of titles and abstracts using

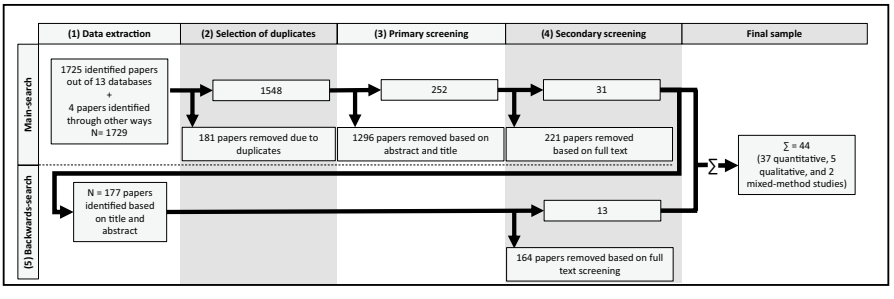

Fig. 1 Flow diagram of the systematic literature review process

selection criteria formulated based on the research questions, (4) secondary screening of the remaining publications, and (5) a backward search using the publications that remain from the second screening. The five steps of this process are explained in more detail in the following and are visualized in a flow diagram in Fig. 1.

The search string that we applied for the (1) data extraction was generated in an iterative process. In the first step, the authors identified two sets of keywords based on the current technostress and leadership literature and with regard to their respective expertise (Pittaway et al. 2004). One set of keywords included "technostress," "digital stress," and the aforementioned technostressors, as well as several ways of spelling. The other set of keywords, used to identify publications that deal with the subject of leadership, contained the keywords "leader," "supervisor," and—as our language skills could ensure accurate screening and analysis for only German and English articles—the German term for leadership "*Führung*," combined with wildcards (*). The keywords for technostress and leadership were combined into a search string that was iteratively tested and optimized during an initial pilot search that took place between June and August 2021. The pilot search was limited to the databases PubMed, JSTOR, EBSCO Business Source Premier, Web of Science, and Scopus, which are multi-publisher databases that are used in other systematic reviews on technostress (Borle et al. 2021a, 2021b; La Torre et al. 2019). We also choose EBSCO Business Source, as it is often used in the business sciences and PubMed because of its wide coverage of the biomedical literature. This first search generated exactly 400 publications. One of the objectives of this pilot search was to test the search strategy and optimize the search string and the inclusion criteria based on its result. As a result, we modified the search string by incorporating additional keywords related to "digital stress" and also included peer-reviewed conference papers in our inclusion criteria.

After testing our search string (see Appendix Table 1) and inclusion and exclusion criteria (see Appendix Table 2) we carried out the *main search* in the data-extraction process in October 2023. By using a search strategy based on electronic cross-journal databases, we expected wider coverage than would be likely with a search strategy based on selected journals (Hiebl 2021). Since technostress is an interdisciplinary phenomenon (Salazar-Concha et al. 2021; Tarafdar et al. 2019) researched across such disciplines as public health, sociology, business informatics, and economics, we searched in 13 cross-disciplinary and discipline-focused databases: ACM Digital, AIS eLibrary, APA PsychInfo, EBSCO, Emerald Insight, Jstor, Pubmed, SAGE, ScienceDirect, Scopus, Taylor & Francis Online, WISO, and Web of Science. No restrictions were applied concerning the publication date. In databases that had filter options for languages, we filtered for German and English articles; otherwise, we removed articles written in other languages in the primary screening. Based on the search string, we identified 1725 articles. Furthermore, we identified in the process of the secondary screening four relevant articles that the screened articles referred to and included them in our final sample, even if the origin articles were not of relevance. This leaves us with 1729 articles from which we removed 181 duplicates in the (2) *selection of duplicates*, leaving 1548 articles for primary screening.

In the (3) *primary screening*, two researchers screened the titles and abstracts of the remaining sample (n = 1548) according to a set of inclusion and exclusion criteria: Only quantitative and qualitative empirical field studies were included, so conceptual studies, lab experiments, and meta-studies were excluded. We considered only articles that were published in peer-reviewed journals or conference proceedings and relied on *Beall's List* of predatory open-access publishers to exclude articles published in open-access journals with problematic peer-review processes. In addition, studies were included only if they deal with the effect of leadership on technostress experienced by followers, the perception of technostressors by followers, or followers' technostress-related health outcomes, such as strain, burnout, and depression or other stressors like work-life conflicts. Studies that focused only on either technostress or leadership without considering the other were removed. Examples of such studies were studies that addressed the impact of leadership on the relationship between ICT and productivity or motivation without addressing technostress or technostress-related health outcomes. Studies were excluded if they focus only on either technostress and the technostress-related health outcomes or leadership, not both, such as when they deal with the impact leadership has on the relationship between ICTs and productivity or motivation. Based on the inclusion criteria (see Appendix Table 2), we assigned the articles to one of three categories: A = match, B = neither excludable nor includable based on the abstract and title, and C = no match (Pittaway et al. 2004). The articles categorized as A (n = 84) or B (n = 168) were then screened fully in the next screening step (Atkinson et al. 2015).

The (4) *second screening* was carried out by two researchers, who read the full texts of the remaining 252 articles and sorted out any contradicting classifications (inter-coder disagreements) in agreement (Atkinson et al. 2015; Frank and Hatak 2014; Snyder 2019). An example of such an inter-coder disagreement was Benlian (2020), who tested the effect of work-related technostressors on partnership satisfaction, mediated by positive or negative affect, and tested moderation by the variable "perceived organizational support in work-home boundary management" in the relationship between affect and partnership satisfaction. While leaders unarguably are an influential factor on followers' perceptions of organizational support for work-home boundary management, the items that the study uses to measure this variable do not mention the impact of supervisors or leaders, so the article was finally excluded. In the first screening, 1296 articles were removed based on abstract and title, and in the second screening 221 papers based on a full-text screening. Thus, a sample of 31 articles remained.

Based on the remaining 31 articles, a *(5) backward search* was conducted by screening references based on the previously outlined selection criteria (see Appendix Table 2) (Atkinson et al. 2015). Screening of the studies identified in the backward search was carried out using the same two-step process, where the articles were first screened based on their titles and abstracts and then based on their full text. In the end, the backward search identified 13 articles that met our criteria for inclusion, so the results presented in the following section are based on a final sample of 44 papers. The flow diagram in Fig. 1 illustrates the systematical literature review process along its five steps.

We followed Webster and Watson (2002) as a methodological foundation and extracted relevant information (name, authors, date, journal, impact factor, key findings, sample, method) from the articles and inserted them into a concept matrix. This concept matrix served as the basis for answering research question 1 ("How is leadership analyzed in the extant technostress research in terms of development over time, and methodologies being used?") and for our coding process to answer research question 2 ("How is leadership related to followers' technostress and its related health outcomes? "). Following the methodology of Gioia et al. (2012), as previously done in the review of Nadkarni and Prügl (2021), we used an open coding process to synthesize underlying concepts along the literature (Fisch and Block 2018). In the first step, we identified descriptive codes (first-order constructs), which served as a foundation to derive analytic themes (second-order themes), which were then synthesized into higher-level dimensions (aggregated dimensions).

4 Results

4.1 Descriptive overview of leadership in the technostress literature (RQ1)

To answer the first research question, we provide a descriptive overview of the literature on leadership and technostress in terms of a quantitative distribution of leadership studies in technostress research over time, the methodological approaches used, and the aspects of leadership that the studies analyze.

We identified 44 studies that deal with the impact of leadership on technostress and technostress-related outcomes. The quantitative development of the technostress literature that deals with leadership shows an increase in publication-volume over

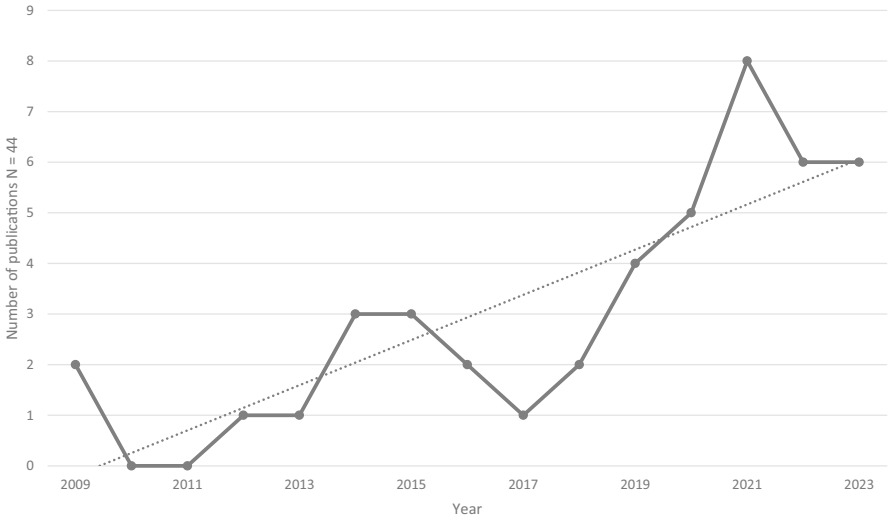

Fig. 2 Frequency of articles on leadership's impact on technostress and its outcomes

time with the oldest studies published in 2009 (Harris and Marett 2009; Lautsch et al. 2009) and a preliminary peak of eight articles published in 2021 (Fig. 2). The increase in publications can be attributed partially to the increase in technostress because of the COVID-19 pandemic, as we found substantive references to the COVID-19 pandemic in 60 percent of the studies published since 2020 (Azpíroz-Dorronsoro et al. 2023; Bartsch et al. 2021; Chambel et al. 2022; Chen and Wu 2023; Dicu et al. 2022; Dolce et al. 2020; Günther et al. 2022; Islam et al. 2022; Jämsen et al. 2022; Jin et al. 2020; Lanzl 2023; Olsen et al. 2023; Spagnoli et al. 2020; van Slyke et al. 2022; Vaziri et al. 2020). The identified articles were published in 32 peer-reviewed journals in the areas of, among others psychology, (e.g., Journal of Applied Psychology), management and leadership (e.g., Academy of Management Journal), and information technology (e.g., Computers in Human Behavior). The variety of journals that published studies on the topic underscores its multidisciplinary nature. The journals' latest impact factors of the year 2022, which indicate the sample's quality (Tranfield et al. 2003), ranked between 1.4 (Information Resources Management Journal; Discrete Dynamics in Nature and Society) and 10.6 (Journal of Service Management), with an average impact factor of 4.9 (see Appendix Table 3). Three of the identified articles were published in conference proceedings (Fieseler et al. 2014; Massa et al. 2023; Stana and Nicolajsen 2021) but remained in the sample because the proceedings were peer-reviewed.

Regarding the *methods used*, of the 44 articles, 37 were quantitative and five were qualitative (Cavazotte et al. 2014; Dicu et al. 2022; Jämsen et al. 2022; Obushenkova et al. 2018; Stana and Nicolajsen 2021), while two papers use a mixed-method design, one analyzes open-ended semi-structured interviews with cross-sectional survey data in two studies (Spreer and Rauschnabel 2016), and one analyzes both qualitative and quantitative data of the same sample (Lautsch et al. 2009). Both mixed-method articles rely on cross-sectional data. One of the qualitative studies, Dicu et al. (2022), is of longitudinal nature and relies on a mix of methods that includes interviews and diaries. 28 of the quantitative studies are of cross-sectional nature: (Azpíroz-Dorronsoro et al. 2023; Bartsch et al. 2021; Bauwens et al. 2021; Bentley et al. 2016; Bregenzer and Jimenez 2021; Chen and Wu 2023; Cheng et al. 2021; Chesley 2014; Çiçek and Kılınç 2021; Dolce et al. 2020; Fieseler et al. 2014; Ghislieri et al. 2017; Grant et al. 2019; Harris et al. 2012, 2015; Harris and Marett 2009; Islam et al. 2022; Jin et al. 2020; Ma and Turel 2019; Massa et al. 2023; Molino et al. 2019; Park et al. 2020; Salanova et al. 2013; Spagnoli et al. 2020; Stich et al. 2019; Turel and Gaudioso 2018; van Slyke et al. 2022; Zaza et al. 2021). Six of the studies are of longitudinal nature: (Butts et al. 2015; Derks et al. 2015; Günther et al. 2022; Lanzl 2023; Olsen et al. 2023; Valle et al. 2021). One qualitative study, Dicu et al. (2022), and three quantitative studies, Chambel et al. (2022), Klebe et al. (2023), and Vaziri et al. (2020), rely on both cross-sectional and longitudinal data.

All of the studies in the sample deal with ICT use, but only 20 studies consider ICT use as a criterion for their samples by, for instance, focusing on followers whose work deals to a significant degree with ICTs (Fieseler et al. 2014; Salanova et al. 2013), computers (Harris et al. 2015; Valle et al. 2021), smartphones (Cavazotte et al. 2014; Derks et al. 2015), or instant messengers (Cheng et al. 2021) or who work remotely (Chambel et al. 2022; Chen and Wu 2023;

Dicu et al. 2022; Dolce et al. 2020; Grant et al. 2019; Jämsen et al. 2022; Klebe et al. 2023; Lautsch et al. 2009; Massa et al. 2023; Spagnoli et al. 2020; van Slyke et al. 2022), or that work in a virtual work setting (Bartsch et al. 2021), or in IT (Zaza et al. 2021).

In gathering information about technostress, technostress-outcomes, and leadership behavior, all of the empirical studies in our sample rely on self-assessments and none use medical measurements for strain, such as cortisol levels, blood pressure, or heart rate. 40 of the empirical studies deal with employees in companies, three studies with employees of educational facilities like schools, universities, or childcare facilities (Bauwens et al. 2021; Jin et al. 2020; Spagnoli et al. 2020) and one in the public sector (Jämsen et al. 2022). With 40 articles relying on data related to followers, the followers' perspective is clearly predominant in our sample (see Appendix Table 4). Four articles rely on a sample of followers and leaders (Cavazotte et al. 2014; Lautsch et al. 2009; Obushenkova et al. 2018; Stana and Nicolajsen 2021), but only two studies analyze leaders and followers as dyads (Cavazotte et al. 2014; Lautsch et al. 2009). None of the identified studies collects quantitative data from leaders. Table 5 gives an overview of the identified articles, it includes additional information regarding the analyzed articles ("author(s) and year of publication", "study aim(s)", "methodological approach", "study design", "sample", "leadership", "instruments to measure leadership", "relevant outcome(s)") (see Appendix Table 5).

4.2 Leadership's impact on technostress (RQ2)

In this section we present the results of our analysis concerning research question 2 "How is leadership related to followers' technostress and its related health outcomes?". By relying on the Gioia methodology (2012) we synthesized first order constructs from the identified studies which we then grouped into theoretical themes. The first order themes were of descriptive nature and aimed at briefly summarizing leaderships impact on follower technostress (for example: "leadership support reduces distress" or "leadership technology support buffers perception of technostress") which were then aggregated into broader descriptions of leadership as higher themes (for example: leadership support). We then checked for trends along the studies that were assigned to the themes and which led to the distinction into the aggregated dimensions of technostress-increasing leadership (see Sect. 4.2.1) and technostress-reducing leadership (see Sect. 4.2.2). The synthesized categorization, while useful for mapping leadership's impact on follower technostress, does not cover a crucial aspect of the leader–follower dynamic in digital work. It fails to account for how leadership is evolving due to digital technology use and how this transformation influences its impact on follower technostress. To acknowledge the importance ICT has on how leadership is carried out, we included a third dimension "technology-enabled leadership" that maps how leadership carried out through digital technologies impacts followers.

4.2.1 Technostress-increasing leadership

Three second-order themes form the aggregated dimension "technostress-increasing leadership". It covers leadership behavior that increases technostressors perceived by followers and/or amplifies strain related to digital work: destructive leadership, leaders-availability expectations, and task-oriented leadership.

Theme 1: Destructive leadership

"Destructive leadership" examines how destructive leadership, understood here as supervisor behavior towards followers that is "perceived as hostile and/or obstructive" (Schyns and Schilling 2013), contributes to increased technostress levels among followers. The theme covers first-order concepts that dealt with abusive leadership or destructive leadership and was found in five studies (Butts et al. 2015; Dolce et al. 2020; Molino et al. 2019; Stich et al. 2019; Valle et al. 2021). The impact of destructive leadership on followers' technostress is two-sided: on the one hand, destructive leadership behavior itself represents a demand for followers and increases stressors on the job as well as job demands outside work (Butts et al. 2015; Dolce et al. 2020; Molino et al. 2019). Followers that worked in a digital work environment and were led by abusive leaders reported higher workloads (Molino et al. 2019), cognitive demands (Dolce et al. 2020), off-work hours technological assisted job demands (Dolce et al. 2020; Molino et al. 2019), tendencies of workaholism (Molino et al. 2019), and had to engage more in labor surface acting when interacting with their supervisors (Valle et al. 2021). On the other hand, destructive leadership affects followers' resources and thus their ability to deal with those demands as followers led by abusive leaders had more difficulties in recovering from work demands (Dolce et al. 2020) and felt limited in their work-related autonomy (Dolce et al. 2020). This interplay between increased demands and decreased resources led to followers reporting higher emotional exhaustion (Dolce et al. 2020; Molino et al. 2019) as well as interference between the work and family domain (Butts et al. 2015; Valle et al. 2021) if they were led by destructive supervisors.

Theme 2: Leaders' availability expectations

The analytical theme "leaders' availability expectation" revolves around leadership behaviors related to leaders' expectations and actions concerning their followers' availability via ICT outside of working hours. The pervasive work-related use of ICT has raised concerns regarding its potential demands as it has been linked to a blurring of boundaries between work and private life as well as job demands and even burnout (Park et al. 2020). Leaders can significantly influence whether followers use ICT for work-related purposes outside working hours. On the one hand, leaders can exacerbate this phenomenon by proactively transcending the boundaries between work and private life as they communicate with followers via ICT beyond regular working hours (Cheng et al. 2021). On the other hand, leaders can inadvertently establish the perceived need for followers to be accessible outside their working hours through their own use of digital technology during those times, thereby unintentionally normalizing off-work availability (Stana and Nicolajsen 2021). This can create the perception that followers are also obligated to be available outside working hours (Stana and Nicolajsen 2021). Qualitative studies have also shown that the simple provision of smartphones can be perceived as a "deal" between followers

and leaders that includes higher flexibility but also higher availability expectations as well as higher levels of supervisor control (Cavazotte et al. 2014; Obushenkova et al. 2018). High availability expectations by supervisors often resulted in increased conflicts or interferences between work and private life (Cavazotte et al. 2014; Cheng et al. 2021; Derks et al. 2015; Obushenkova et al. 2018), feelings of being controlled (Cavazotte et al. 2014) and strain (Obushenkova et al. 2018; Stana and Nicolajsen 2021). However, leaders that required a separation between work and private life reduce interferences and work-family conflicts for followers working remotely (Lautsch et al. 2009). The theme underscores the versatile influence leaders have in shaping how followers use ICT and highlights leaders' impact on a normative level, such as, by setting rules or expectations or as a result of their own ICT use (Cavazotte et al. 2014; Derks et al. 2015; Obushenkova et al. 2018; Stana and Nicolajsen 2021). Especially in work environments without clear rules regarding ICT use outside working hours, leaders' own ICT use can shape how technology is being used by their followers.

Theme 3: Task-oriented leadership

Leadership that focused primarily on completing tasks efficiently and reliably through planning, setting priorities, goals, and rules, and monitoring followers (Yukl 2010) was partially associated with an increase in technostress (Cheng et al. 2021; Fieseler et al. 2014; Spreer and Rauschnabel 2016). Related to the use and introduction of digital technology, followers whose supervisors require that they adapt certain digital technology may feel more resentful about the adoption of digital technology (Spreer and Rauschnabel 2016). Whereas leaders encouraging followers to use digital technologies does not have a significant effect on technostress or work exhaustion (Fieseler et al. 2014). Leaders that use instant messengers after working hours to assign tasks to followers do increase work-life conflicts for followers (Cheng et al. 2021). A study by Spagnoli et al. (2020) revealed a positive impact of authoritarian leadership on technostressors as well as a moderating impact of workaholism on technostressors for followers working remotely. These results suggest that followers whose leaders impose the use of digital technologies are less likely to adopt these ICTs, and that followers led by authoritarian leaders are more likely to perceive digital technologies as demanding.

4.2.2 Technostress-reducing leadership

Leadership behaviors that help followers to navigate through the demands of digital work and thus reduce the perceived technostressors or mitigate the technostressor-strain relationship and thus act as an inhibitor or moderator of technostress were grouped as technostress-reducing leadership behavior. Along the literature, we identified two themes of leadership behavior that had a decreasing impact on followers' technostress: leadership support and change-oriented leadership.

Theme 4: Leadership support

The analytical theme "leadership support" revolves around leadership behaviors that provide support and assistance to followers in managing technostress and well-being in a digital work environment. It encompasses leaders providing technological and social support as well as leaders fostering segmentation between

work-life and thus helping followers harmonize work and family. The theme "leadership support" covers five first-order concepts technological support, social support, family support, health-oriented leadership and leader-member exchange quality, representing different forms of support for followers, leaders can provide. While supervisors' *technological support* had no significant impact on techno-overload (Harris and Marett 2009), followers who reported high levels of supervisor computer help in combination with the liking of computer work reported the lowest levels of techno-overload in a study by Harris and Marett (2009). Whereas a study by Harris et al. (2012) came to the results that supervisor computer help did not significantly impact work-family conflicts but increased the impact of overload on time-based work-family conflicts.

Family-supportive leadership and *social support* provided by leaders are important resources for followers dealing with technology-related demands on the job as they have a reducing impact on burnout of followers working in a digital work environment (Zaza et al. 2021), work-family conflicts (Chambel et al. 2022; Azpíroz-Dorronsoro et al. 2023), distress (Chesley 2014; Turel et al. 2018; Olsen et al. 2023), emotional exhaustion (Chambel et al. 2022; Azpíroz-Dorronsoro et al. 2023), psychological strain (Bentley et al. 2016) and burnout (Park et al. 2020). As well as off the job by buffering the impact of technology-assisted work-related demands outside work hours and thus maintaining work-life balance and followers' well-being (Chambel et al. 2022; Park et. al 2020; Vaziri et al. 2020). Besides its buffering impact on the stressor-strain relationship, social support had been also shown to mitigate technostressors (Chesley 2014; Azpíroz-Dorronsoro et al. 2023). In contrast to the previously cited studies, Lanzl (2023) finds a positive, albeit small, relationship between the extent to which a supervisor cares about followers well-being and followers' technostressors. The author suggests that the relationship between techno-invasion and social support may be explained by followers' willingness to be contacted outside regular working hours if they have a close relationship with their supervisor, while the relationship with other technostressors requires further investigation.

In the context of remote work, which can come along with risks like social isolation (Bentley et al. 2016) and increased interference between work and private life, leadership support represents an important resource for followers, as it reduces social isolation, psychological strain (Bentley et al. 2016) and helps followers to deal with work-life conflicts (Chambel et al. 2022; Vaziri et al. 2020). Furthermore, teleworkers that were led by supportive supervisors reported an increase in teleworker's perceived eustress, which represents stress that is beneficial to followers' well-being (van Slyke et al. 2022). *Health-oriented leadership* had been shown to have a direct reducing impact on follower strain (Bregenzer and Jimenez 2021; Klebe et al. 2023) and an increasing impact on followers' work-related resources (Bregenzer and Jimenez 2021). In the study of Chen and Wu (2023) supervisor's health-oriented leadership was not significantly related to followers' stress but indirectly mediated though followers' self-care. Furthermore, Klebe et al. (2023) found a significant link between health-promoting employee leadership and follower stress but only for followers that experienced low levels of ICT hassles.

That followers who perceive support from their supervisors are better equipped to handle digital demands is also underscored by the identified studies dealing with the *leader-member exchange quality's* impact on followers' technostress (Harris et al. 2015; Jin et al. 2020). Followers that are part of the ingroup, which is characterized by higher levels of support and resources provided by supervisors, were better equipped to handle technostressors in a way that work-family conflicts are less likely to occur (Harris et al. 2015). On the other hand, a study by Jin et al. (2020) showed that the interaction between security-related technostress and leader-member exchange quality was not significant but leaders-member exchange quality had a reducing impact on burnout.

Theme 5: Change-oriented leadership

The theme "change-oriented leadership" that aims at implementing change using transformational, empowering, and enabling leadership (Yukl 2010) was mostly associated with lower technostress levels for followers. Followers that were led by transformational leaders were more open-minded towards adopting work-related ICT, the studies linking transformational leadership to a decrease in skepticism towards ICT in followers (Salanova et al. 2013) and techno-uncertainty (Çiçek and Kılınç 2021). Furthermore, followers that are led by transformational leaders report lower levels of technostressors (Çiçek and Kılınç 2021) and exhaustion when adopting ICT for work-related tasks (Fieseler et al. 2014).

The literature on empowering and enabling leadership is a bit more contradictory, as enabling leadership has a decreasing impact on teamwork tension for followers working in virtual teams (Bartsch et al. 2021). Empowering leadership had been shown to reduce the impact of techno-invasion on emotional exhaustion but to strengthen the impact of techno-overload on emotional exhaustion (Bauwens et al. 2021). Though the results of Bauwens and colleagues' study (2021) suggest that autonomy and self-responsibility might be perceived by followers that already feel overloaded by ICT as an additional demand, the literature that deals with leadership styles that encourage followers' autonomy, like transformational leadership and empowering leadership largely implies that autonomy and empowerment provided by leaders might be important resources for followers dealing with technostressors. This conclusion can be supported by the results of Grant et al. (2019) pointing out that followers led by leaders that provide them with high levels of autonomy and flexibility report higher levels of mental health (Grant et al. 2019).

4.2.3 Technology-enabled leadership

The preceding themes focus on the influence of leadership behaviors on follower technostress, yet they do not explicitly consider the specific role of digital technologies as a channel in the leader–follower interaction. As digital technologies continue to play an increasingly relevant role in work-related communication, they lead to significant changes in the environment in which leadership takes place, by shifting it further into the digital sphere. In order to investigate how digital developments influence the effect of leadership behaviors on technostress, we introduce a third aggregated dimension. The dimension "technology-enabled leadership" deals with how leaders use ICT to exercise leadership and assesses its impacts on follower

technostress. Within this dimension, we identify two second-order themes: "technology-enabled technostress-increasing leadership" and "technology-enabled technostress-reducing leadership". These themes show how digital technologies interact with leadership behavior and influence follower technostress.

Theme 6: Technology-enabled technostress-reducing leadership

As already discussed before, leadership can represent an important resource for followers working with digital technologies. With ICT taking on a more important role in leader–follower interactions, the analytical theme explores the impact of leadership that is exercised through these technologies on followers' technostress. Especially for followers working remotely studies suggest the increased need of leadership support (Dicu et al. 2022; Jämsen et al. 2022) and that those followers might benefit from technology-enabled leadership support as it can reduce social isolation, strain (Bentley et al. 2016), work-family conflict (Chambel et al. 2022), and increases teleworkers' perceived eustress (van Slyke et al. 2022). Hence, the focus lies on how leaders can support or encourage their followers through digital channels.

On the one hand, Chambel and colleagues' (2022) results suggest, that family-supportive supervisor behavior's impact on work-family conflict and exhaustion is not moderated by the levels of remote work. Besides, a quantitative study by Lautsch et al. (2009) showed that supervisor contact with telecommuters did not significantly affect followers work-to-family nor family-to-work conflicts. In the study by Islam et al. (2022), remote work did not serve as a significant moderator in the relationship between leader-member exchange and anxiety or depression. On the other hand, technostress literature suggests that it can be more challenging for followers to receive leadership support through digital channels, as they can feel reluctant to ask their supervisors for help through ICT or find the support received through digital channels as not sufficient (Dicu et al. 2022; Jämsen et al. 2022). The difficulties for followers in perceiving leadership support through digital channels are also underscored by the findings of Bregenzer and Jimenez (2021) and Klebe et al. (2023) emphasizing that health-oriented leadership loses its reducing impact on strain for followers with high levels of remote work (Bregenzer and Jimenez 2021) or ICT hassles (Klebe et al. 2023).

However, Lautsch's study took place in 2009 when telework was still a marginal phenomenon, practiced primarily by highly qualified employees with leading responsibility and experience with working remotely. Dicu et al. (2022) and Jämsen et al. (2022) collected their sample in turn of the mandatory remote work due to the COVID-19 pandemic. Concluding, it can be assumed that the different results of these studies could partially be attributed to the times in which the sampling of these studies took place. Thus, technostress literature indicates that with the increasing digitalization, the communication between leaders and followers also shifts towards digital channels and that important resources provided by supervisors might be more difficult to grasp by followers.

Theme 7: Technology-enabled technostress-increasing leadership

The analytical theme "technology-enabled technostress-increasing leadership" covers the first-order concepts: (1) contact outside work hours via ICT, and (2) ICT as a vessel for destructive leadership. The analytical theme deals with the role digital

technologies do play in leadership's impact on followers' technostress. As already shown in theme 2 "leaders' availability expectations", ICTs enable leaders to cross borders between work and family life, and thus extend their impact on followers even outside work. This can result in conflicts between work and private life and decrease recovery times.

This dissolving of borders can be especially demanding for followers whose leaders use ICT to carry out destructive leadership behaviors. Digital technologies can exert the previously in theme 1 stated influence abusive leaders have on their followers, as they enable them to contact followers more frequently on the job and even outside work hours. Literature has shown that followers that are being led by destructive leaders report higher degrees of technology enabled-off work demands (Molino et al. 2019; Dolce et al. 2020). This either suggests that abusive leaders use ICT to contact followers outside work hours more frequently or that the behavior itself of contacting followers outside work hours is seen as destructive by followers. The latter would be strengthened by the research of Stich et al. (2019) that have drawn a link between the perceived extent of work-related emails and followers' perception of social stressors like feeling intimidated by supervisors or constant critique by supervisors.

Furthermore, technology-enacted abusive supervision can trigger emotions like anger in followers (Butts et al. 2015), so they have to engage in emotional labor surface acting (Valle et al. 2021). Abusive leaders contacting followers outside work hours can also increase the time followers are exposed to job-related demands and thus limits their ability to distance themselves from work-related demands. This spillover to the family domain can result in reduced recovery from work (Dolce et al. 2020) as well as work-to-life conflicts (Valle et al. 2021). The interplay of increased demands, especially through the ubiquity of digital technologies that makes it harder for followers to gain distance from leaders, combined with limited resources and ability to recover, suggest that followers of abusive leaders may face particular problems dealing with technostress.

4.2.4 Conceptual model of leadership's influence on technostress

Building upon the synthesized themes, we have developed a comprehensive conceptual model illustrating the intricate influence of leadership on follower technostress throughout the technostress process. The technostress process unfolds from the use of ICT to the appraisal of ICT as a stressor and finally to the experience of strain. This process is depicted in the lower section of Fig. 3. Conversely, the upper section of Fig. 3 portrays the leadership component.

These two sections are interconnected by three descending arrows, each representing a discrete pathway we synthesized to illustrate leadership's nuanced influence on follower technostress. The first pathway illuminates the influence of leadership on followers' appraisal of ICT use as stressors (Butts et al. 2015; Chesley 2014; Çiçek and Kılınç 2021; Derks et al. 2015; Dolce et al. 2020; Ma and Turel 2019; Molino et al. 2019). Conceptually, this pathway takes a forefront position in the technostress process within the context of primary appraisal in the transactional-based model of stress. There are several ways in which leaders can shape followers'

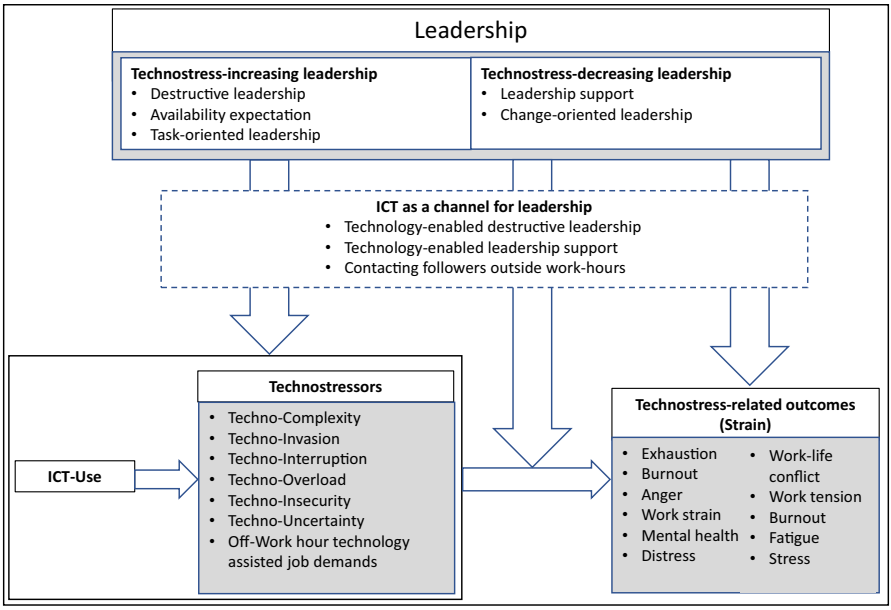

Fig. 3 Conceptual model of leadership's impact on followers' technostress

perception of ICT use as demanding: On the one hand, leaders significantly influence the extent and manner in which followers adopt ICT. This influence can occur at a normative level, such as through rule-setting or establishing expectations (Cavazotte et al. 2014; Derks et al. 2015; Obushenkova et al. 2018; Stana and Nicolajsen 2021). Furthermore, leaders can indirectly create expectations by modeling ICT use themselves and thus acting as role models. On the other hand, leadership's impact on technostressors manifests both directly and as a moderator between ICT usage and technostressors. However, leadership can also affect the outcomes of technostress, either by moderating the stressor-strain relationship as demonstrated in the second pathway, or by directly influencing technostress-related strain as seen in the third pathway (Bentley et al. 2016; Chesley 2014; Fieseler et al. 2014; Vaziri et al. 2020; Zaza et al. 2021). These two pathways can conceptually be located along the secondary appraisal of the transaction-based model of stress.

Within the context of these pathways, leadership exerts a dual influence on followers' technostress, manifesting both diminishing and amplifying effects on follower technostress. Thus, we have synthesized these impacts into two distinct dimensions: "technostress-increasing leadership" and "technostress-decreasing leadership". Leadership behaviors that cultivate autonomy, empowerment, and support offer valuable resources to followers working in a digital environment (see Sect. 4.2.2). Therefore, we have grouped leadership behaviors that foster support and change-oriented behaviors under the aggregated dimension of "technostress-decreasing leadership".

Conversely, leadership may also constrict available resources or emerge as a stressor itself, thereby increasing the perceived demands of digital work and

technostress-related outcomes, as expounded in Sect. 4.2.1. In contrast to leaders who provide support, destructive leadership has been correlated with higher demands for followers in the digital work environment. Furthermore, change-oriented leadership has demonstrated associations with reduced technostress and heightened openness among followers towards adopting digital technologies. Conversely, under leaders exhibiting task-oriented leadership, such as authoritarian leadership or dictation to use certain digital technologies, followers exhibited a reduced willingness to embrace digital technologies, coupled with heightened reports of technostressors. Therefore, we classified leadership behaviors that are characterized by destructive tendencies, task-oriented approaches, and those fostering expectations of availability outside work hours into the dimension of "technostress-increasing leadership". This dichotomy between "technostress-increasing" and "technostress-decreasing" leadership is visualized in the upper segment of Fig. 3.

In both cases—technostress-reducing and technostress-increasing leadership—leaders employ ICT as a channel for exercising leadership (visualized in the box labeled "ICT as a channel for leadership" in Fig. 3). It can be used to provide supportive and change-oriented leadership across geographical distances and to provide remote working followers with the necessary resources. However, it appears that technostress-reducing leadership may experience a diminishment of its effectiveness when exercised through digital technology.

Moreover, technology-enabled leadership carries potential drawbacks for followers, as it can amplify the impact of technostress-increasing leadership. This amplification can lead to interferences between work and private life, culminating in increased demands. The pervasive nature of ICT can make it difficult for followers to evade the influence of leaders both during work hours and off-work hours, potentially resulting in strain and impairing followers' ability to recover from work-related demands. To visualize how ICT can shape leadership's influence on follower technostress, we have placed it between leadership and followers' technostress within our conceptual model.

It is worth noting that the conceptual model is not an isolated system, and it is important to consider the impact of leadership within a broader context rather than isolated from other individual or contextual factors. Leadership's influence on technostress and technostress-related outcomes can also operate indirectly through interactions with contextual or individual factors. For instance, by altering individual resources like autonomy (Bartsch et al. 2021; Dolce et al. 2020), workaholism (Molino et al. 2019), and recovery (Dolce et al. 2020). Moreover, leadership has been shown to moderate the impact of individual factors like workaholism (Spagnoli et al. 2020) or the level of preference for computer work (Harris and Marett 2009) on technostress and technostress-related outcomes. Furthermore, the effect of leadership itself can depend on organizational and technological factors, such as the political work environment (Park et al. 2020) or mode of work (e.g., remote work, telecommuting) (Bregenzer and Jimenez 2021; Dicu et al. 2022; Jämsen et al. 2022; Lautsch et al. 2009; Spagnoli et al. 2020).

5 Discussion and avenues for future research (RQ3)

5.1 Discussion

With 44 articles, the literature on leadership makes up a small portion of technostress literature (La Torre et al. 2019). This is surprising given the increasing role of ICT in everyday work, and as health risks associated with work-related ICT use are attracting increasing interest in the scientific community (Charalampous et al. 2019). When it comes to analyzing the antecedents of technostress and the factors that influence technostress, leadership plays a comparably small role in technostress research. Nonetheless, the near-continuous growth of the technostress literature focused on leadership indicates a growing interest among researchers, which peaked in the Covid-19 pandemic (see Sect. 4.1). Given that systematic literature reviews have yet to extensively address the influence of leadership on technostress, our objective was to present an overview of the literature on this topic, and thus offering easier access to the rather fragmented and cross-disciplinary literature on technostress literature that deals with leadership.

Based on our analysis, we derived a conceptual model that incorporates the distinction of leadership into leadership that reduces and increases technostress of followers and locates leadership impact along the transactional process of technostress (see Sect. 4.2). These findings contribute to technostress research by extending existing classifications of technostress-antecedents and technostress-inhibitors (La Torre et al. 2019; Ragu-Nathan et al. 2008; Tarafdar et al. 2015) by the influence of leadership. We hereby respond to the call by Sarabadani et al. (2018) to introduce new inhibitors into technostress research.

The concept of technostress-inhibitors is predominantly understood as organizational or social factors that either mitigate the relationship between technostressors and strain or directly reduce strain (Ragu-Nathan et al. 2008). Technostress-antecedents are understood as factors that can influence the occurrence of technostressors (La Torre et al. 2019), but predominantly as factors that amplify stressors. Leadership had been shown to fit into both categories as it has an influence on whether followers perceive work-related ICT use as a stressor comparable to other technostress-antecedents. Furthermore, leadership can influence the relationship between stressor and strain. However, as we found both technostress-increasing and technostress-decreasing leadership as anteceding the perception of technostressors as well as moderators between stressors and strain, we conclude that the distinction of technostress-inhibitors and technostress-antecedents does not fully cover the influence of leadership. Since the two appraisal processes underlying the transaction-based stress model are circular in nature and influence each other, we consider the distinction between technostress-inhibitors and technostress-antecedents to be somewhat limited in mapping the effects of leadership on technostress. Especially as empirical studies have shown that the same leadership behavior has an impact on the evaluation of ICT use as a stressor as well on the stressor-strain relationship (e.g. Chesley 2014; Turel and Gaudioso 2018).

By analyzing how different types of leadership affect follower technostress, our findings represent a significant contribution to leadership research in the context of contingency theory. Our findings highlight that followers who engage with digital technologies experience distinct advantages from leadership support and empowering leadership. This underscores the benefits of leadership paradigms like transformational and servant leadership in preventing technostress, and strengthens the call of Scharzmüller et al. (2018) for leaders to provide followers with sufficient support and autonomy to handle the challenges of digital work. Moreover, the aggregated dimension of "technology-enabled leadership" shows that the effectiveness of these forms of leadership when preventing technostress outcomes depends on how digital technologies are being used by leaders. That the impact of technostress-inhibiting leadership behavior can lose parts of its impact when carried out through ICT, is in line with the results of Liu et al. (2020) who found similar results for the outcome variable productivity. We conclude that while digital technologies offer great opportunities for the rapid exchange and delivery of information, some leaders appear to face challenges in using ICT as a vessel for leadership. This underlines the relevance of specific leadership training for leading virtual teams. This is of greater importance as technology-enabled leadership can also bear risks for followers if carried out poorly or even used in a destructive way. The aggregated findings concerning the potentially detrimental influence of leaders' ICT use—either by dissolving borders between work and private life and thus reducing recovery times for followers or as a vessel that can enable abusive leaders to extend their influence on followers—do underscore the importance that leaders themselves ethically use ICT and foster health-oriented use of digital technologies and that the use of mobile technologies is accompanied by norms that ensure recovery times off work.

These findings concerning leadership's impact on followers' technostress and technology-enabled leadership do also present a contribution to the growing body of digital leadership research (Tigre et al. 2023). While research on digital leadership deals with the relationship between leadership and ICT on outcomes such as team effectiveness, productivity, or the factors that facilitate ICT adoption (Avolio et al. 2014), leadership's impact on technostress presents a perspective that had not yet been addressed in previous reviews or meta-studies of e-leadership or digital leadership (Avolio et al. 2014; Tigre et al. 2023). Though technostress is a significant predictor of productivity and ICT adoption (Avolio et al. 2014), we strongly believe that leaders' impact on followers' health needs to take a prominent place in the discourse about "effective leadership" in a digital work environment. Moreover, there are other discrepancies between the literature on digital leadership and the technostress literature on leadership. Technologies that were predicted to play an essential role in future e-leadership practices like embedded tracking systems, internet of things, artificial intelligence (Avolio et al. 2014; Tigre et al. 2023), play no role in the current technostress literature on leadership. Other than AI or robotic-assisted leadership (Avolio et al. 2014), e-mails (Butts et al. 2015; Stich et al. 2019) or instead messengers (Cheng et al. 2021), mobile devices like the smartphone (Cavazotte et al. 2014; Derks et al. 2015; Obushenkova et al. 2018; Park et al. 2020; Stana and Nicolajsen 2021), tablets (Spreer and Rauschnabel 2016) or computers/laptops (Harris et al. 2012; Harris and Marett 2009), as well as forms of remote work (Bentley et al.

2016; Chambel et al. 2022; Dicu et al. 2022; Grant et al. 2019; Günther et al. 2022; Jämsen et al. 2022; Lautsch et al. 2009; van Slyke et al. 2022), seem to play the predominant role in our sample. While it can be argued from our results that those widely used technologies can present stressors that can lead to harmful outcomes and therefore still need to be present in the discourse about digital work's impact on followers' health, current technostress literature on leadership does not seem to keep up with other research strands when it comes to technological process.

5.2 Avenues for future research

Based on our analysis we derive several avenues for future research. From a methodological point of view, we identified two limitations of the present technostress literature dealing with leadership. The current state of technostress literature dealing with leadership can be described as predominantly based on cross-sectional and self-reported data that is based on the follower's perspective (see Sect. 4.1). As cross-sectional data provides only momentary insights and does not allow statements about the causal relationship between leadership and technostress (Carlson and Morrison 2009), we conclude that technostress research on the impact of leadership still lacks longitudinal or experimental studies. Especially studies whose sample collection took place during the pandemic are likely to find that the effect of leadership on followers who work remotely can be influenced by macro-developments like school closures and regulations regarded to personal contact. Against this background, the first recommended avenue for future research is *longitudinal studies* or *experimental studies* to gain more consistent and causal insights into the effect of leadership on technostress. This call for longitudinal studies is also raised by Dolce et al. (2020); Bartsch et al. (2021); Bregenzer and Jimenez (2021); Spagnoli et al. (2020); Chambel et al. (2022).

The majority of self-reported data of followers present the second methodological limitation of the existing technostress literature. Especially, as many studies deal with health-related behaviors, self-reported data should be treated with caution (Newell et al. 1999). By focusing predominately on followers' perspectives, current technostress literature largely does not consider that leaders can also be subject to technostress. As leaders' own experiences of stress (Harms et al. 2017) and technostress (Boyer-Davis 2018; Sandoval-Reyes et al. 2023) can influence their leadership behaviors and affect their followers, we believe that including leaders' perspectives is necessary to get a full picture of the relationship between leadership and followers' experiences of technostress in future research. Moreover, current leadership literature sees leadership as a dynamic interplay between leaders and followers (Gesang and Süß 2021; Northouse 2019). Thus, the conventional top-down approach to analyze leadership is not sufficient to represent the complex relationship between leaders and followers. We, therefore, suggest that future studies should involve *leaders' perspectives* in technostress literature to get a more adequate picture of the relationship between leadership and followers' experiences of technostress. Stana and Nicolajsen's (2021) qualitative study underscores this argument by providing new

insights into the unintended consequences of leaders' use of ICT on followers' perceived obligation to be accessible via ICT outside work hours.

The mixed findings regarding the effectiveness of leadership support through digital channels call for further research to investigate the factors that impact leadership support through digital channels. The effectiveness of providing sufficient support through ICT may depend on the abilities of the leaders to communicate and thus to lead via ICT—labeled as e-communication by Roman et al. (2019). But further research analyzing leaders' digital competencies and how they utilize digital tools to provide support is needed to identify successful e-communication patterns in the context of technostress. An avenue for future research could be that qualitative studies examine how followers perceive technology-enabled leadership support, which could identify factors that influence the provision of leadership support through digital channels.

Another avenue for future research would be the identification of individual factors that might impact the relationship between leadership and technostress, as it is likely, that followers are impacted differently by leadership behavior, depending on their preferences, abilities, or personality traits (Matthews et al. 2021). Nearby, future research projects could consider followers' segmentation preferences' impact on how followers perceive leaders' availability expectations or that followers with high levels of techno-literacy do benefit less from technology support provided by supervisors. Yet, there are only few studies (e.g., Spagnoli et al. 2021) that take those factors into account when analyzing the impact of leadership on followers' technostress.

While a few of the identified studies imply that leadership's impact on followers' technostress might be mediated by individual or contextual factors, those studies are still rare. Against this background, future research should investigate the interplay between leadership and individual as well as contextual factors on different levels. Conceptually most studies took a dyadic approach by analyzing how leadership behaviors impacted followers' health without factors on the team level. Research outside the technostress literature had linked destructive leadership behaviors to outcomes on the group level such as cooperation or good citizen behavior (Priesemuth et al. 2014). Future research should analyze mediating mechanisms on the team level that link specific leadership behaviors to technostress outcomes and thus provide a better understanding of the underlying mechanisms. For example, multi-level studies that analyze how destructive leadership may create a hostile work environment that hinders effective information flow thus impacting technostress among followers, or supportive leadership creating a supportive environment where followers are more likely to provide support for each other, could provide valuable insights.

6 Limitations

Like all studies, our study has limitations. The first limitation refers to the process of selecting and analyzing the body of literature, which is inherently influenced by the subjective evaluations of the researchers involved. We aimed to offset this limitation by proceeding systematically and transparently in our search process.

The second limitation, that the *sample size* (n = 44) is small, is mitigated by its similarity to the sample sizes of other literature reviews on technostress such as Borle et al. (2021a, b) with n = 21, Sarabadani et al. (2018) with n = 23, or La Torre et al. (2019) with n = 105 and our sole focus on studies that deal with both leadership and technostress. We searched 13 databases, which is a high number compared to other literature reviews in the field of economics (Hiebl 2021), conducted a backward search, and applied a broad search string, so we adequately covered the technostress literature that deals with leadership. While this part of the technostress literature may be small, it can be assumed that several papers deal with leadership's effect on stress triggered by digital work without referring to the terms "technostress" or "digital stress" (e.g., Bentley et al. 2016). We identified some of these studies while conducting the backward search, but future reviews could search for articles on the effect, other than technostress, that leadership has on the health of followers who work in a digital work environment that may be outside the technostress literature. The limited number of studies we identified underscores the need for further conceptual discussions of the technostress construct.

The third limitation refers to the themes, aggregated dimensions, and our conceptual model, which by nature only captures certain aspects of the relationship between leadership and technostress as they were driven by our research questions and represent a generalization and abstraction of the body of literature. This also applies to how leadership is represented in our analysis. Furthermore, our results only capture a small fraction of leadership behaviors compared to the complexity of leadership in leadership research.While some leadership behaviors such as support provided by leaders (Chesley 2014; Dicu et al. 2022; e.g. Harris and Marett 2009; Jämsen et al. 2022; van Slyke et al. 2022; Zaza et al. 2021), are present in technostress literature, research lacks insights on other forms of leadership. Especially passive forms of leadership—like the laissez-faire leadership—or the transactional leadership style were not found in the technostress literature and were therefore not considered in our analysis. This limitation is aggravated by the variety of understandings of leadership that are present in leadership research and the numerous studies that do not provide a clear definition of leadership or do not sufficiently delineate leadership from management.

The fourth limitation pertains to the challenges inherent in labeling or categorizing leadership behaviors. A critical reader might point out the situational nature of leadership. We consider this contingency and argue based on it for the need to analyze leadership in the context of digital work. Furthermore, we acknowledge that there are several unobserved situational factors that do impact how leadership is acted out and perceived beyond the digital context and that leadership itself is not always stable but also object of external influences. This is particularly evident in themes 6 and 7 that emphasize the influence of digital technologies on leaderships' impact on follower technostress.

Furthermore, our results must be seen in the context in which the identified studies were conducted, as the data many of them analyze were collected during the COVID-19 pandemic. Because of the exceptional conditions in which work was carried out during that time, the results of these studies are to be used with caution, as they may not be representative of work done in other settings. These results may not

even be generalizable to remote work during the height of the pandemic, as regulations differed between countries and were not consistent throughout the pandemic.

7 Conclusion

In the context of digitalization, employees are facing demands (Ragu-Nathan et al. 2008) that can entail stress-related risks for the health of employees who work with digital technologies (Brown et al. 2014; Kim et al. 2015; Leung 2011). As new digital technologies disrupt work processes, we must ask how leadership in digital work contexts should be structured to support followers in handling new digital demands. The need to rethink how leadership affects followers' health is also growing, as mobile digital technology and remote work change the environments in which leadership is provided and increasingly move it into digital spheres. Leadership must adapt to digitalization and the challenges that accompany it.

Given these developments, we conducted a systematical literature review to determine the status quo of leadership research in the technostress literature. To answer our first research question, we undertook an examination of the evolution of the body of literature (n = 44) over time, alongside an assessment of the methodologies employed (RQ1), showing an increase in publications dealing with that topic. Furthermore, self-reports and cross-sectional studies are predominant in literature dealing with leadership's impact on follower technostress. To explain how leadership is related to technostress and technostress-related outcomes (RQ2), we derived a comprehensive conceptual model to map leadership's impact on follower technostress, showing the complex relationship between different leadership behaviors and follower technostress as well as technostress-related outcomes along the transactional-based model of stress. We located leadership along the primary as well as the secondary appraisal as it had been shown to influence whether follower perceive technostress and whether technostress-related consequences such as emotional exhaustion occur. Along this process leadership has a dual influence on follower technostress, as some leadership behavior can increase as well as decrease follower technostress.

The former dimension of leadership is characterized by destructive behaviors towards followers, accompanied by high expectations for availability outside work hours and a strong tasks-orientation. These leadership behaviors can limit available resources or even become stressors themselves, thereby increasing demands in a digital work environment and challenging followers' coping abilities. In contrast, leadership behaviors that fosters autonomy, empowerment, and support represents valuable resources for followers dealing with technostress. In light of our findings, we propose that conducting longitudinal studies and examining leadership from the perspective of leaders themselves are promising avenues for future research (RQ3).

Concluding, our paper contributes to the extant discussion by analyzing the existing technostress literature on leadership and providing a conceptual model of leadership's impact on followers' technostress. Hereby closing a gap in current literature, as technostress represents a topic that was up to now often missed in literature reviews and meta-analyses that deal with leadership and followers'

well-being (Harms et al. 2017; Inceoglu et al. 2018; Kuoppala et al. 2008; Montano et al. 2017; Skakon et al. 2010). As part of this conceptual model we provided a first distinction of leadership behaviors that have a diminishing ("technostress-decreasing leadership") and an amplifying ("technostress-increasing leadership") impact on technostress and thereby extend existing distinctions of technostress-inhibitors and technostress-antecedents (La Torre et al. 2019). Based on identified limitations and contradicting findings of the current body of literature we highlighted avenues for future research and thereby hope to lay a foundation as well as direction for future research on the impact leadership has on follower's technostress.

Appendix

See Tables 1, 2, 3, 4 and 5.

Table 1 Search string

("technostress" OR "techno stress" OR "techno-stress" OR "digital stress" OR "digital-stress" OR "techno-overload" OR "techno overload" OR "techno-invasion" OR "techno invasion" OR "techno-complexity" OR "techno complexity" OR "techno-insecurity" OR "techno insecurity" OR "techno-uncertainty" OR "techno uncertainty" OR "techno-stressor" OR "techno stressor" OR "technostressor")	AND	(leader* OR Führung* OR supervisor*)

Table 2 Selection criteria

	Inclusion criteria	Exclusion criteria
Language	English, German	Other languages
Publication medium	Peer-reviewed academic journal, peer-reviewed academic proceedings	Not published in peer-review academic journal/proceedings
Study design	Empirical field studies (experimental studies; surveys; interview studies)	Meta-analysis; literature reviews; article reviews; commentaries; conceptual studies without empirical part; lab experiments
Population	Employed working adults (followers; leaders)	Samples outside the work-context (for example students)
Period of publication	No limitation	None
Leadership impact on outcomes	At least one of the following criteria must be met for inclusion direct or indirect influence of leadership on followers' evaluation of ICT or digital work as demanding direct or indirect influence of leadership on the occurrence of followers' technostress or technostressors direct or indirect influence of leadership on followers' technostress-related consequences for health (e.g. depression, burnout, exhaustion, strain or other stressors like work-family conflict, role-conflict) leadership has an influence on stress, health, stress-related consequences, stressors in a digital work setting (e.g. virtual work, remote work) Leadership is perceived as a stressor because of ICT-use	None of the inclusion criteria are met; organizational outcomes like commitment, productivity, job satisfaction are the only outcomes measured

Table 3 Bibliographic sources of the identified articles

Journal	Articles	Impact factor (2022)
Academy of Management Journal	1	10.5
Applied ergonomics	1	3.2
Behavior & Information Technology	2	3.7
bmij	1	n/a
Business & Information Systems Engineering	1	7.9
COGNITION TECHNOLOGY & WORK	2	2.6
Computers in Human Behavior	3	9.9
Corporate Communications: An International Journal	1	2.0
Discrete Dynamics in Nature and Society	1	1.4
Employee Relations	3	3.4
Frontiers in Psychology	3	3.8
German Journal of Human Resource Management	2	3.8
Human Relations	1	5.7
Information Resources Management Journal	1	1.4
Information Technology & People	1	4.4
International Journal of Psychology	1	3.2
International Journal of Workplace Health Management	1	2.2
Journal of Academy of Business and Economics	1	n/a
Journal of Applied Psychology	1	9.9
Journal of Medical Internet Research	1	7.4
Journal of Occupational and Organizational Psychology	1	6.2
Journal of Organizational and End User Computing	1	6.5
Journal of Personal Selling & Sales Management	1	4.4
Journal of Service Management	1	10.6
Journal of the Association for Information Systems	1	5.8
New Technology, Work and Employment	1	5.8
Online Information Review	1	3.1
Proceedings of the 25th HCI International Conference, HCII 2023	1	Conference proceedings
Proceedings of the 47th Hawaii International Conference on System Science	1	Conference proceedings
Proceedings of the 54th Hawaii International Conference on System Science	1	Conference proceedings
Social Sciences	1	1.7
Sustainability	1	3.9
The international journal of human resource management	1	5.6
The Journal of Social Psychology	1	2.1
Work, Employment & Society	1	3.7
$\sum = 35$	44	$\varnothing = 4{,}9$

Table 4 Overview of the perspectives considered in the identified articles

Author(s) and year of publication	Followers' perspective	Leaders' perspective	Dyadic perspective
Qualitative studies			
Cavazotte et al. (2014)	X	X	X
Obushenkova et al. (2018)	X	X	
Stana and Nicolajsen (2021)	X	X	
Dicu et al. (2022)	X		
Jämsen et al. (2022)	X		
$\sum = 5$	$\sum = 5$	$\sum = 3$	$\sum = 1$
Quantitative studies			
Harris and Marett (2009)	X		
Harris et al. (2012)	X		
Salanova et al. (2013)	X		
Chesley (2014)	X		
Fieseler et al. (2014)	X		
Butts et al. (2015)	X		
Derks et al. (2015)	X		
Harris et al. (2015)	X		
Bentley et al. (2016)	X		
Ghislieri et al. (2017)	X		
Turel et al. (2018)	X		
Grant et al. (2019)	X		
Ma and Turel (2019)	X		
Molino et al. (2019)	X		
Stich et al. (2019)	X		
Dolce et al. (2020)	X		
Jin et al. (2020)	X		
Park et al. (2020)	X		
Spagnoli et al. (2020)	X		
Vaziri et al. (2020)	X		
Bauwens et al. (2021)	X		
Bartsch et al. (2021)	X		
Bregenzer and Jimenez (2021)	X		
Cheng et al. (2021)	X		
Çiçek and Kılınç (2021)	X		
Valle et al. (2021)	X		
Zaza et al. (2021)	X		
Chambel et al. (2022)	X		
Günther et al. (2022)	X		
Islam et al. (2022)	X		
van Slyke et al. (2022)	X		
Azpíroz-Dorronsoro et al. (2023)	X		
Chen and Wu (2023)	X		

Table 4 (continued)

Author(s) and year of publication	Followers' perspective	Leaders' perspective	Dyadic perspective
Lanzl (2023)	X		
Klebe et al. (2023)	X		
Massa et al. (2023)	X		
Olsen et al. (2023)	X		
$\sum = 37$	$\sum = 37$	$\sum = 0$	$\sum = 0$
Mixed methods			
Author(s) and year of publication	Followers' perspective	Leaders' perspective	Dyadic perspective
Lautsch et al. (2009)	X (qualitative and quantitative data)	X (qualitative data)	X
Spreer and Rauschschnabel (2016)	X (qualitative and quantitative data)		
$\sum = 2$	$\sum = 2$	$\sum = 1$	$\sum = 1$

Table 5 List of all articles analyzed

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Harris and Marett (2009)	Investigating the impact of liking of computer work on job satisfaction and perceived technology work overload by considering the impact of computer help provided by supervisors and coworkers	Quantitative, cross-sectional	225 workers (working more than 20 h/week on computer)	Supervisor computer help	Three-item scale ($\alpha = .91$): My supervisor will help me with any computer-related problems I have My supervisor will share computer-related information when I need it I can discuss computer-related problems with my supervisor	Liking of computers and supervisor computer help have no significant impact on perceived technology work overload. Supervisor computer help significantly interacts with liking of computers on technology work overload, as followers experiencing low support and low liking of computer work report highest technology work overload
Lautsch et al. (2009)	Investigating how supervisors can support telecommuters to improve their work-family well-being and to achieve high performance	Quantitative and qualitative, cross-sectional	90 dyads of supervisors and subordinates	Supervisor contact with telecommuters	Number of times supervisors are in contact with the telecommuting employees per week	Supervisors requirement for separation between work and supervisors that adopted the same monitoring behaviors for telecommuters and non-telecommuters and family is negatively related to work-family conflicts for teleworkers. The requirement to work standard hours does not have a significant effect on work-family conflicts

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
				Supervisor's monitoring behavior	Do you use written performance standards to guide work activities more often, less often or about the same for telecommuters, compared to non-telecommuting employees? Do you provide feedback on their performance more often, less often, or about the same for telecommuters, compared to non-telecommuting employees?	
				Supervisor's requirement for separation between work and family	Coded from qualitative data: 1 = supervisor requires telecommuters to separate work and family; family separation; 0 = otherwise	

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
				Supervisor's requirement for telecommuters to work the same hours as non-telecommuters	1 = supervisor requires telecommuters to work the hours that are standard for the work group; 0 = otherwise	
Harris et al. (2012)	Investigation of the impact of related role overload on work-to-family conflict and the moderating roles of technology social support by supervisors and coworkers	Quantitative, cross-sectional	298 full-time employees with a minimum of 25 h per week working on a computer	Supervisor computer help	Three-item scale (α = .71): My supervisor will help me with any computer-related problems I have My supervisor will share computer-related information when I need it I can discuss computer-related problems with my supervisor	Supervisor computer help does not significantly impact time-based nor strain-based work-to-family conflicts. The effect of technology overload on time-based work-to-family conflicts is higher when supervisor help is high. Supervisor help does not significantly moderate the impact of overload on strain-based work-to-family conflicts
Salanova et al. (2013)	Testing the structure and the predictors of technostrain and technoaddiction in the workplace	Quantitative, cross-sectional	1072 ICT users	Transformational leadership	Ten-item scale (Salanova et al. 2011) (α = .86). example of an item: The person who supervises me directly organizes and distributes responsibilities	Transformational leadership negatively impacts skepticism against ICTs but does not affect other dimensions (fatigue, anxiety, inefficacy) of technostrain nor technoaddiction significantly

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Cavazotte et al. (2014)	Investigating how the provision of company sponsored smartphones affects employees	Qualitative, cross-sectional	42 interviews with employees using corporate smart phones	Availability expectations	Qualitative study—example: "I've already told him that I want a fast answer at any given time, even if it's a weekend"	While adopting company sponsored smartphones, followers report increased control and surveillance from supervisors, increased work-life conflicts as well as increased expectations for availability
				Control and surveillance	Qualitative study—example: "I am able to know what my team is doing, monitoring my team in real time, knowing whether they're following my guidelines in terms of deadlines"	
Chesley (2014)	Investigation of the "pathways through which work related ICT use may influence work strain and worker distress." (p. 597)	Quantitative, cross-sectional	2.810 national representative sample of US employees	Supervisor support	Nine-item scale ($\alpha = .90$) issuing information sharing, supervisor expectations, supervisor recognition and how understanding and supporting a supervisor is of his/her subordinates	Daily work-related ICT is related to higher levels of work strain mediated by work speed, interruptions and multitasking on the job and furthermore had a direct impact on distress. Supervisor support reduces work strain and distress. Supervisor support reduces speed, interruption, multitasking, work strain and distress

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Fieseler et al. (2014)	Investigation of how leadership effects employee's perception of technostress, work situation and job satisfaction	Quantitative, cross-sectional	491 Salespersons using ICT for their work	Supervisor's influence on technology use	Supervisor influence on ICT use (Avlonitis and Panagopoulos 2005)	The direct impact of supervisor's influence on technology use on technostress and work exhaustion is not significant. Supportive, inspiring and motivational leadership has a negative impact on work exhaustion. The variance in work exhaustion was explained for approximately 57% by technostress and leadership
				Supportive, inspiring and motivational leadership	Nine items of the MLQ 5X (Avolio and Bass 2004)	
Butts et al. (2015)	Investigating the effects of electronic communication received during nonwork time on emotional responses (anger happiness) and work-to-nonwork conflicts	Quantitative, longitudinal	341 employees	Supervisor sender of electronic communication outside work-hours	Sender was coded: 1 = communication by supervisor 0 = communication by others than supervisor	Followers display more anger in response to supervisors' digital communication during non-work time than in response to coworkers' communication. Affective tone of communication during non-work time had an indirect effect through anger on work-to-nonwork conflict but only if the sender is an abusive supervisor
				Abusive supervision	Zellars et al. (2002) scale of abusive supervision ($\alpha = .89$),	

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Derks et al. (2015)	Investigation of how social norms regarding the work-home boundary moderate the daily impact of smartphone use on Work-home interference	Quantitative, longitudinal	100 full-time employees with access to a work-related smartphone	Supervisor expectation to be available after work hour	Four item scale (the authors list only three) (α = .87): My supervisor expects me to respond to work-related messages during my free time after work When I don't answer my email during my free time, my supervisor clearly shows that he/she does not appreciate it I feel that I have to respond to messages from my supervisor immediately during leisure time	Followers with access to a work-related smartphone experience higher work-home interference if their supervisor expected them to be available outside regular work hours. This expectation increases the impact the degree of smartphone use has on work-home interference
Harris et al. (2015)	Investigating the relationship between technology overload and Work-family conflict with leader-member exchange quality as a possible moderator	Quantitative, cross-sectional	219 employees working primary with computers	Leader-member exchange quality	Leader-member exchange quality 12-Item (α = .93) (Liden 1998)	Leader-member exchange quality has a negative impact on work-family conflicts and buffers the effect of communication overload and system feature overload and increases the positive effect of information overload on work-family conflict

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Bentley et al. (2016)	Investigation of the impact of support for teleworkers wellbeing	Quantitative, cross-sectional	804 teleworkers	Perceived social support	Second order scale *organizational social support* (α = .84) consisting out of *perceived organizational support* and of *perceived social support* that was measured by the subscales *supervisor support* (α = .85) and *peer support* (α = .94) An Example for supervisor support was: "How often has your immediate supervisor provided you with the following over the past 6 months: helpful information and advice and helpful feedback" (O'Driscoll 2000)	Organizational social support has a direct significant negative effect and a negative indirect effect (mediated by social isolation) on psychological strain

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Spreer and Rauschschnabel (2016)	Investigation of the causes for resistance of salespeople towards the adaptation of mobile sales assistants	Quantitative and qualitative, cross-sectional	Study 1 (qualitative): 32 interviews with salespeople Study 2 (quantitative): 174 salespeople	Supervisor influence on technology use	Four-item construct *Enforcement* based on Fishbein and Ajzen (1975) ($\alpha = .93$): The order of my supervisor to use an MSA is rather deterrent than motivating When I am forced to use an MSA, I will now use it less than ever It restricts me in my freedom of decision when my superior requires the usage of an MSA When my superior forces me to use an MSA, I feel internal resistance against it	Enforcement to use technology and technostress have a positive effect on resistance

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Ghislieri et al. (2017)	Investigation of impact of off-work hours technology assisted job demand on work-family conflict and work-family enrichment, considering workload, emotional dissonance and supervisory coaching	Quantitative, cross-sectional	671 employees	Supervisor coaching	Five-item scale (Graen and Uhl-Bien 1991) (α = .91) Example: Your supervisor informs you whether he/she is satisfied with your work	Supervisory coaching is negatively and off-work hour technology-assisted job demands is positively related to work-family conflicts but supervisory coaching only for the male subgroup
Turel et al. (2018)	Investigating the impact of leadership and competitive climates on technostress	Quantitative, cross-sectional	n1 = 175 state government employees n2 = 178 IT professionals	Leadership climate	Construct of two subscales: 1. supportive atmosphere and support and 2. Participation in decision making (Schyns and van Veldhoven 2010) (α = .74)	Leadership climate has a negative effect on distress and reduced the effect of technostress on distress

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Obushenkova et al. (2018)	Investigating how user-device attachment to company-provided smartphones change psychological contract expectations in regards to connectivity and connectivity outcomes for employees and managers	Qualitative, cross-sectional	8 leaders, 20 followers	Experienced expectations to be available outside work hours through smartphone	Qualitative study—example: "Just because we have a smartphone, the expectation that we always answer calls or check the email […] it can create some tension between the manager and the staff. Because they assume that you have already seen it [the message]"	Most followers experience an increased expectation by leaders to be available outside work hours. This is perceived as negative as it is accompanied by a decreasing work-life balance and strain

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Grant et al. (2019)	Development and validation for a e-work life scale	Quantitative, cross-sectional	260 e-workers	Flexibility provided by supervisor when e-working	Factor "flexibility" comprising of three items: My supervisor gives me total control over when and how I get my work completed when e-working My work is so flexible I could easily take time off e-working remotely, if and when I want to My line manager allows me to flex my hours to meet my needs, providing all the work is completed	Flexibility provided by supervisors had a positive impact on mental health
Ma and Turel (2019)	Investigation of the interplay between work-related IT use with power-distance and masculinity on technostress	Quantitative, cross-sectional	485 employees	Power-distance	Five items by Yoo et al. (2011) (Pilot study: $\alpha = .78$; main study $\alpha = .81$)	Power-distance has an increasing effect on perceived technostress and enhances the impact IT use has on technostress. IT use loses its significance as a predictor for employees with below average levels of power distance and masculinity

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Molino et al. (2019)	"to investigate unsustainable dynamics within organizations considering the association between specific job requests and exhaustion through the mediation of workaholism" (p. 1)	Quantitative, cross-sectional	432 employees	Destructive leadership	Four-item scale by Schmidt (2008) (α = .79) Example item: My supervisor invades the privacy of subordinates	Destructive leadership enhances off-work hour technology-assisted job demands. Workload fully mediated the relationship between destructive leadership and emotional exhaustion. The effect of destructive leadership, workload, and off-work hour technology-assisted job demands on exhaustion was mediated by workaholism
Stich et al. (2019)	Investigation under what conditions the extent of email use is appraised as a stressor	Quantitative, cross-sectional	118 employees	Constant critique by supervisor	One item of the six-item *work relationship stressor scale* (α = .878)	Employees whose desired extent of email use fits their actual email use report lower stressors (including critique by supervisors or feeling intimidated by supervisor) than employees reporting a misfit
				Feeling intimidated by supervisor	One item of the six-item *work relationship stressor scale* (α = .878)	

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Dolce et al. (2020)	Investigating the role of destructive leadership in the job-demands-resources and recovery model during the COVID-19 pandemic	Quantitative, cross-sectional	716 remote workers	Destructive leadership	Four-item scale by Schmidt (2008) ($\alpha = .77$) Example item: My supervisor invades the privacy of subordinates	Destructive leadership's effect on exhaustion was fully mediated by autonomy, cognitive demands, off-work hour technology-assisted job demands and recovery in the sample of French remote workers. Destructive leadership is positively related to off-work hour technology-assisted job demands
Jin et al. (2020)	Investigating the contingency effect of LMXD and teacher agility on the role of security-related stress in suppressing teacher job burnout	Quantitative, cross-sectional	271 high educational teachers	Leader-member exchange quality	Leader-member exchange quality 12 item-scale (Chiniara and Bentein 2018) ($\alpha > .70$)	Leader-member exchange quality has a negative impact on burnout. The interaction between leader-member exchange quality and security-related technostress on burnout was not significant

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Park et al. (2020)	Investigation of the relationship between work-related smartphone use after work and job burnout together with a 3-way-interaction of social support and organizational politics on this relationship	Quantitative, cross-sectional	387 employees	Social supervisor support	Three-item scale (Cohen and Syme 1985; Smith et al. 2013) (α = .857): My supervisor helps me get the job done My supervisor is willing to extend himself/herself to help me perform my job My supervisor is willing to listen to my personal problems	Social supervisor support increases the impact of work-related smartphone use after work on job burnout in an unfair political work environment and reduces its impact in fair political work environments
Spagnoli et al. (2020)	Exploring the role of authorian leadership in the relationship between workaholism and technostress	Quantitative, cross-sectional	339 administrative university employees who worked partly or completely from home	Authoritarian leadership	Six items from the *Toxic Leadership Scale* (Schmidt 2008) (α = .87)	Authoritarian leadership has a direct positive impact on technostress. Authoritarian leadership moderates the impact workaholism has for remote workers

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Vaziri et al. (2020)	Investigation of the predictors of changes to the work-family interface during the COVID-19 pandemic	Quantitative, cross-sectional & longitudinal	474 employees	Compassionate leadership	Three items from Shiota et al. (2006). Example: During the COVID-19 pandemic my supervisor takes care of people who are vulnerable	Decrease in work-family relationship for followers with high technostress levels and less compassionate leaders during the COVID19-pandemic. Followers with compassionate leaders are more likely to report decreasing conflicts between work and private life while also reporting increasing enrichment between those spheres. Followers whose supervisor show low level of family supportive supervisory behavior are more likely to report a decline in both Work-family enrichment and conflict as well as family-work enrichment and conflict
				Family supportive supervisory behaviors	Four-item scale by Hammer et al. (2013). Example: My supervisor makes me feel comfortable talking to him/her about my conflicts between work and nonwork	

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Bauwens et al. (2021)	Investigating how technostress affects quality of care in childcare through emotional exhaustion while considering a moderating effect of empowering leadership	Quantitative, cross-sectional	309 Dutch childcare workers	Empowering leadership	Six-item scale by Pearce & Sims (2002) (α = .908)	The technostressors techno-invasion and techno-overload enhance emotional exhaustion. While empowering leadership buffers the impact of techno-invasion, it strengthened the impact of techno-overload on emotional exhaustion
Bartsch et al. (2021)	Investigation of leadership effectiveness regarding employees' work performance in virtual settings during the COVID-19 pandemic	Quantitative, cross-sectional	206 service employees mostly working in virtual work settings	Enabling leadership	Weber et al.'s (2019) six-item scale plus the item "As a leader, she/he enables virtual teamwork	Enabling leadership has a reducing impact on teamwork tension and a positive impact on job autonomy and team cohesiveness but does not significantly affect individual work tension for followers working mostly in virtual work settings. Managing leadership has a significant negative effect on autonomy
				Managing leadership behavior	Weber et al.'s (2019) six-item. Example: "As a leader, she/he effectively pre-structures tasks."	

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Bregenzer and Jimenez (2021)	Investigating risk factors of digitalization at the workplace and if health-promoting leadership moderates the relationship between risk factors and followers' resources and stress	Quantitative, cross-sectional	1412 employees	Health-promoting leadership	Health-promoting leadership conditions questionnaire (HPLC) (Jiménez et al. 2017)	Health-promoting leadership has a direct negative effect on stress and a positive on resources. Health-promoting leadership loses its impact on stress for followers working mostly mobile
Cheng et al. (2021)	Determining whether employees engage in cognitive disengagement coping methods in response to task assignments of supervisors via an instant messenger after work hours	Quantitative, cross-sectional	176 employees using an instant messenger for work	Task assignments of supervisors via an instant messenger after work hour	Permeability (Ayyagari et al. 2011) ($\rho A = .89$): The use of LINE makes me accessible to the supervisors The use of LINE enables the supervisors to assign tasks to me after work hours The use of LINE enables the supervisors to keep in touch with me	Task assignments of supervisors via an instant messenger after work hour increases work-family conflicts

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Çiçek and Kılın (2021)	Investigation of the relationship between transformational leadership and technostress	Quantitative, cross-sectional	334 employees in logistic	Transformational leadership	Transformational leadership scale by Bass and Avolio (1994)	The dimensions of transformational leadership had mostly a negative impact on the technostressors with transformational leadership explaining 20.9% of the variance of techno-overload, 9.9% of techno-invasion, 13.5% of techno-complexity, 7.7% of techno-insecurity and 10.7% of techno-uncertainty
Stana and Nicolajsen (2021)	To investigate the question "what can the sociological analytical concept of obligation reveal about ICT-related technostress in organizations?" (p. 6632)	Qualitative, cross-sectional	10 employees (top-managers, middle managers and employees without leadership responsibilities)	Leaders signaling their off-work availability	n/a	Leaders feel obligated to be reachable outside work hours and therefore signal off-work availability. This leads to a normalization of availability outside working hours and this obligation-based habit of being constantly available can create strain on family life
Valle et al. (2021)	Investigating the effect of technology-enacted abusive supervision on work and family outcomes	Quantitative, cross-sectional	260 full-time working adults	Technology-enacted abusive supervision	Six-item scale by Harris et al. (2011) adopted to leadership behavior carried out via ICT ($\alpha = .95$)	Technology-enacted abusive supervision has an indirect effect on emotional exhaustion through labor surface acting. Technology-enacted abusive supervision can lead to spillovers to the family domain (family undermining)

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Zaza et al. (2021)	To analyze the impact of IT-related job demands and the resources of supervisor support and mentoring on burnout and through burnout on turnover and turn away intention	Quantitative, cross-sectional	246 IT-professionals	Supervisor support	Six items from the *supervisor support scale* of Jiang and Klein (1999) ($\alpha = 0.92$)	Supervisor support reduces the burnout dimensions work exhaustion, cynicism and increases professional efficacy. Psychosocial mentoring has no effect. The job demand boundary spanning activities increase work exhaustion and continuous learning increases professional efficacy
Chambel et al. (2022)	Investigation of the association between work-family relationships and employees' well-being in telework situation with family-supportive supervisor behaviors as a potential resource	Study 1: Quantitative, cross-sectional Study 2: Quantitative, longitudinal	Two studies: 318 employees of a bank that just implemented telework; 290 bank employees in two waves (prior and 10 months after lockdown)	Family supportive supervision	4-item version of Hammer et al. (2009) (Study 1: $\alpha = .91$; study 2: $\alpha = .94$)	Family supportive supervisor behavior has a decreasing impact on work-family conflict and an increasing impact on work-family enrichment. This effect is not influenced by the intensity of telework. Through these variables, family supportive supervision had an indirect impact on exhaustion. This indirect effect was also not moderated by the intensity of telework

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Dicu et al. (2022)	Identification of "different coping types white collar workers develop while managing the situation of mandatory working from home due to the COVID-19 pandemic" (p. 301)	Qualitative, longitudinal	15 white-collar employees	Supervisor support	n/a	Identified different types of employees in time of remote work. Some reported negative feelings like frustration and stress and a lack of resources offered by their employer (including supervisor support), while others where not interested in additional resources
Günther et al. (2022)	Investigation if "telework-specific sets of HRM practices and leadership behaviors […] can support employee well-being in the beginning of the COVID-19 crisis" (p. 354)	Quantitative, longitudinal	262 teleworkers	Telework-oriented leadership	Second order construct existing out of Health care-oriented leadership (3 items), information and communication-oriented leadership (2 items) and guidance-oriented leadership (3 items)	Telework-oriented leadership reduces psychological strain

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Islam et al (2022)	Investigation of the impact of between leader-member exchange and work-family enrichment on followers' mental health under consideration of remote work	Quantitative, cross-sectional	214 Bangladeshi service employees in the public and private sector	Leader-member exchange	Measured by Basu and Green's (1997) LMX-questionnaire	Leader-member exchange was positively related to social functioning and negatively to loss of confidence. There was no significant relationship between leader-member exchange and anxiety and depression. Remote work did not significantly moderate any of these relationships

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Jämsen et al. (2022)	Investigation of"how the abrupt transfer to remote work is reflected in employees' perception of relational communication at their work" (p. 1)	Qualitative, cross-sectional	1091 Finnish public sector employees working remotely during the pandemic	Supervisor support	Qualitative study—example: "Within my team, we meet daily via Skype. Instead, when it comes to my supervisor, it feels like even the slightest contact they previously had has been left out. Interaction and communication are malfunctioning. I understand that this has been challenging for supervisors and administration as well. But right now, they should be taking care of that: "No one is left behind and the ship is kept on course."	The lack of social support was explained by followers feeling reluctant to ask for help through ICTs or by describing that remote work needs higher levels of support, which was not available. Others experienced an increase in support by their supervisors during COVID
van Slyke et al. (2022)	Investigating the antecedents and consequences of eustress and distress in the context of telework	Quantitative, cross-sectional	511 teleworkers	Managerial support	Measured by Cole et al. (2006) *scale for supervisor support* ($\alpha = .897$)	Managerial and supervisor support increases eustress experienced by teleworkers

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Azpíroz-Dorronsoro et al. (2023)	Investigating the impact of the COVID-19 pandemic and technological exposure on emotional exhaustion and work-life conflict under consideration of social support and mindfulness	Quantitative, cross-sectional	1037 Spanish employees in the banking industry	Social support	Social support (4 item; $rho_c = .92$) provided by supervisors as a first-order factor that was aggregated alongside social support provided by co-worker (3 items) into a second-order factor of social support	Social support is negatively related to emotional exhaustion and techno-stressors. There is no interaction between techno-stressors and social support. The relationship between social support and work-family conflict is mediated by techno-stressors as well as by emotional exhaustion
Chen and Wu (2023)	Investigating the relationship between health-oriented leadership communication and remote worker's stress and self-care during the COVID-19 pandemic	Quantitative, cross-sectional	363 full-time US employees working fully or partially remotely	Health-oriented leadership communication	Supervisor's health-oriented leadership measurement by Franke et al. 2014 ($\alpha = .80$)	Supervisor's health-oriented leadership was positively related to employees' self-care which also significantly mediated the relationship between health-oriented leadership and employees' stress. There was no significant direct relationship between health-oriented leadership and employees' stress

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Lanzl (2023)	Investigation of how different dimensions of social support act as technostress inhibitors and whether their "importance […] changed in times of intense mobile and telework" (pp. 332–333)	Quantitative, longitudinal	637 German employees	Supervisor social support	Six items based on Graen and Uhl-Bien (1995)	Contrary to the authors' assumptions, supervisor support is positively related to techno-invasion, techno-insecurity and techno-uncertainty before the Covid-19 pandemic (March 2019). At the second data point during the pandemic (December 2020), supervisor support is only significantly related to techno-invasion. There were no significant changes in the relationships between supervisor support and technostressors between the two points of measurement
Klebe et al. (2023)	Investigating and comparing "the effectiveness of staff care for employee exhaustion, strain and engagement under the influence of low and high ICT hassles." (p. 2)	Study 1: cross-sectional vignette experiment; Study 2: Quantitative, longitudinal	Study 1: 134 German full-time employees Study 2: 214 full-time office-worker working fulltime remotely	Health-promoting employee leadership	Study 1: manipulated in form of a written structured vignette study Study 2: 1-items of the sub-scale "staff care" of the "Health-oriented Leadership" questionnaire of Pundt and Felfe (2017) ($\alpha = .91$)	Study 1: negative relationship between staff care and exhaustion which is moderated by ICT hassles in a way that the effect of staff care is weaker when ICT hassles are high Study 2: negative relationship between staff care and strain which lost significance when ICT hassles are high

Table 5 (continued)

Author(s) and year of publication	Study aim(s)	Methodological approach, study design	Sample	Leadership	Instruments to measure leadership	Relevant outcome(s)
Massa et al. (2023)	Investigating the influence of organizational an ICT-related factors on the attitudes towards remote work and remote productivity	Quantitative cross-sectional	836 remote workers	Remote leadership support	First-order factor (3 self-developed items) that was aggregated alongside technical support (3 items) into a second-order factor of techno-job resources (α = .90)	Techno-job resources are negatively related to techno-job demands and positively to attitude towards remote working
Olsen et al. (2023)	Investigating job stress and engagement among young employees by drawing on the job demands-resources model	Quantitative longitudinal	303 Norwegian employees (age < 35 years) of a telecom operator	Leader support	Single-item "My manager expresses support by facilitating my family needs, expressing concerns, and providing support when I need encouragement" based on Greenhaus et al. (2012)	Leader support is negatively related to stress

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Declarations

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